APPENDIX A - PERMITS
#24-086

USACE Department of the Army Permit #SAJ-2014-00606 (SP-CSH)
Modifications 1 & 2

1. Approved Permit Drawings
2. Water Quality Certification/Joint Coastal Permit **#0298107-009-JN (inc. mod-010-JN)**,
    a. FWC Regional Biologist Contact Information
    b. Dune Repair Plan
3. As-Built Certification
4. USFWS Project Specific Biological Opinion 24 September 2015
5. Standard Manatee Conditions
6. Sea Turtle & Smalltooth Sawfish Conditions 2006
7. Sediment QA/QC Plan
8. Hardbottom Biological Monitoring Plan (Revised w/Mod 2)

- USFWS Statewide Programmatic Biological Opinion (SPBO), 13 March 2015
- USFWS Piping Plover Programmatic Biological Opinion (P^3BO), 22 May 2013
- NMFS Gulf Regional Biological Opinion for Hopper Dredges/Beach Nourishment (GRBO), 19 November 2003, Revision 1, 24 June 2005, Revision 2, 9 January 2007

DEPARTMENT OF THE ARMY PERMIT

Permittees: Manatee County
5502 33rd Avenue Drive West
Bradenton, Florida 34209

Town of Longboat Key
600 General Harris Street
Longboat Key, Florida 34228

Permit No: SAJ-2014-00606 (SP-CSH)

Issuing Office: U.S. Army Engineer District, Jacksonville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U.S. Army Corps of Engineers (Corps) having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: The Permittee is granted a 15 year permit to periodically dredge Longboat Pass Navigation Channel and to place the dredged beach-compatible sand along the adjacent Manatee County shorelines of southern Anna Maria Island and northern Longboat Key.

The dredge footprint is limited to the existing federally authorized Longboat Pass navigation channel. The channel will be maintained at a design dredge depth of -13.6 feet NAVD, with a maximum allowable overdepth of -15.6 feet NAVD, using a hydraulic cutterhead dredge. The fill template will have a variable term width at an elevation of 5 feet NAVD, and a foreshore slope of 1:15 (vertical: horizontal).

Dredged sediments will be placed along a 2 mile segment of Anna Maria Island shoreline between FDEP survey monuments R-30 and R-41+305 feet and along a 1.4 mile segment of Longboat Key between R-43.5 and R-50.5. The proposed sediment placement areas include beach and nearshore marine habitat, totaling approximately 69 acres along Anna Maria Island and 60 acres along Longboat Key.

A pipeline exclusion zone will be established offshore of Anna Maria Island and Longboat Key near hardbottom areas, as identified on the permit drawings. A water-sediment slurry will be pumped by the hydraulic dredge from the borrow area (Longboat Pass channel) to the beach. A system of dikes will be used to contain the water-sediment slurry on the beach to allow settlement of the sediment. The dikes will be placed parallel to the coastline, and will be of sufficient length to allow settlement of the sediment on the beach. Bulldozers and other earth moving machinery will be used to position the material in the approved fill template.

The work described above is to be completed in accordance with the 12 pages of drawings and 8 attachments affixed at the end of this permit instrument.

Project Location: The project would affect waters of the United States associated with Longboat Pass, which extends from Sarasota Bay to the Gulf of Mexico, Section 10 and 15, Township 35 South, Range 16 East, Manatee County, Florida.

The beach nourishment segments are located within the Gulf of Mexico on Anna Maria Island north of the inlet, between FDEP Reference Monuments R-30 and 305 feet south of R-41, Sections 4, 9 and 10, Township 35 South, Range 16 East; and on Longboat Key south of the inlet, between R-43.5 and R-50.5, Sections 15, 22, and 23, Township 35 South, Range 16 East, Manatee County, Florida.

Directions to site: From I-75, take exit 224 for US-301 toward Palmetto/Ellenton, go 0.3 miles. Keep right at the fork to continue toward US-301 N and merge onto US-301 N, go 3.6 miles. Continue on 10th St W, go 0.6 miles. Turn left at 8th Ave W/US-41. Continue to follow US-41 for 1.8 miles. Turn right at Manatee Ave W, go 8.4 miles to Anna Maria Island. Turn left at E Bay Dr., go 0.4 miles. Continue south on FL-789/Gulf Dr., go approximately 3.5 miles to Longboat Pass.

Approximate Coordinates:

Anna Maria Island:	Begin Project: 27.47259°, -82.70121° End Project: 27.44759°, -82.69118°
Longboat Key:	Begin Project: 27.43967°, -82.69072° End Project: 27.42611°, -82.67585°

Permit Conditions

General Conditions:

1. The time limit for completing the work authorized ends on ____________________. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith

transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature and the mailing address of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. **Reporting Addresses:** The Permittee shall submit all reports, notifications, documentation and correspondence required by the general and special conditions of this permit to the following address**:**

   a. For standard mail: U.S. Army Corps of Engineers, Regulatory Division, Special Projects & Enforcement Branch, 1520 Royal Palm Square Boulevard, Suite 310, Fort Myers, Florida 33919-1036

   b. For electronic mail: CESAJ-ComplyDocs@usace.army.mil (not to exceed 10 MB). Files over 10MB can be uploaded to our web application at https://safe.amrdec.army.mil/safe. Permittee shall reference this permit number, SAJ-2014-00606 (SP -CSH), on all submittals.

2. **Commencement Notification:** Within 10 days from the date of initiating the work authorized by this permit for each nourishment event of the authorized project, the

Permittee shall provide a written notification of the date of commencement of authorized work to the Corps.

3. **As-Built Certification:** Within 60 days of completion of authorized work for each maintenance event, the Permittee shall submit as-built drawings of the authorized work for that event and a completed “As-Built Certification by Professional Engineer” form (Attachment 3) to the Corps. The as-built drawings shall be signed and sealed by a registered professional engineer and include the following:

a. A plan view drawing of the location of the authorized work footprint, as shown on the permit drawings, with transparent overlay of the work as constructed in the same scale as the permit drawings. The plan view drawing should show the approved beach fill templates.

b. A list of any deviations between the work authorized by this permit and the work as constructed. In the event that the completed work deviates, in any manner, from the authorized work, describe on the attached “As-Built Certification By Professional Engineer” form the deviations between the work authorized by this permit and the work as constructed. Clearly indicate on the as-built drawings any deviations that have been listed. Please note that the depiction and/or description of any deviations on the drawings and/or “As-Built Certification By Professional Engineer” form does not constitute approval of any deviations by the Corps.

c. Include the Department of the Army permit number on all sheets submitted.

4. **Pre-Construction Meeting:** The Permittee will schedule a pre-construction meeting with the Enforcement Section representative prior to the start of work to review the limitations and special conditions of the permit. During this meeting participants will be required to sign a form acknowledging knowledge and comprehension of what has been authorized and associated requirements. The Permittee should not start work prior to the pre-construction meeting without written approval by the Corps.

The Permittee is advised to contact the U.S. Fish & Wildlife Service (FWS), South Florida Ecological Services Office, to review the terms and conditions of its Biological Opinion(s), and to insure compliance Endangered Species Act (ESA).

5. **Points of Contact:** The Permittee shall provide a list of all points of contact associated with the project within 10 days from initiation of work to the address identified in Reporting Address Special Condition. The list should include area of responsibility and contact information for each point of contact.

6. **Biological Opinions:** This permit does not authorize the Permittee to take an endangered species, in particular the threatened piping plover (*Charadrius melodus*), the threatened red knot (*Calidris canutus rufa*), the threatened Northwest Atlantic Ocean (NWAO) Distinct Population Segment (DPS) of the loggerhead sea turtle (*Caretta caretta*), the endangered leatherback sea turtle (*Dermochelys coriacea*), the endangered green sea turtle (*Chelonia mydas*), the endangered hawksbill sea turtle (*Eretmochelys imbricata*), and the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*). In order to legally take a listed species, the Permittee must have separate authorization under the Endangered Species Act (ESA) (e.g., an ESA Section 10 permit, or a Biological Opinion under ESA Section 7, with "incidental take" provisions with which you must comply).

The Biological Opinions referenced below contain mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Authorization under this permit is conditional upon compliance with all of the mandatory terms and conditions associated with incidental take of the enclosed Biological Opinions, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of each Biological Opinion, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute noncompliance with this permit. The FWS or NMFS are the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the ESA.

7. **FWS Biological Opinion (BO):** The Permittee provided information to the FWS during consultation for red knot. The BO, dated September 24, 2015, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the BO. The permittee shall follow the measures included to minimize impacts to red knot. The September 24, 2015 FWS BO is included as an attachment to this permit (Attachment 4).

8. **Statewide Programmatic Biological Opinion (SPBO)**: The Permittee provided information to the FWS during consultation for sea turtles. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the 2015 SPBO and agreed to follow the measures included to minimize impacts to sea turtles, including terrestrial loggerhead sea turtle critical habitat. The FWS provided concurrence the maintenance dredging activities and sand placement activities are consistent with the SPBO provide the Permittee follows the term and conditions contained therein. The 2015 SPBO can be viewed at:

http://www.fws.gov/panamacity/resources/2015SPBO.pdf

The Permittee is responsible for obtaining and complying with the 2015 SPBO. If the Permittee is unable to view the 2015 SPBO at the above website, the Permittee shall contact the Corps to receive a copy of the 2015 SPBO.

9. **Programmatic Piping Plover Biological Opinion (P^3BO):** The Permittee provided information to the FWS during consultation for piping plover. The Permittee has reviewed the Reasonable and Prudent Measures, Terms and Conditions of the 2013 P^3BO and agreed to follow the measures included to minimize impacts to piping plover. The FWS provided concurrence the sand placement activities are consistent with the P^3BO provide the Permittee follows the term and conditions contained therein. The P^3BO can be viewed at:

http://www.saj.usace.army.mil/Portals/44/docs/Planning/EnvironmentalBranch/EnvironmentalDocs/PipingPloverProgrammaticBiologicalOpinion.pdf

The Permittee is responsible for obtaining and complying with the P^3BO. If the Permittee is unable to view the P^3BO at the above website, the Permittee shall contact the Corps to receive a copy of the P^3BO.

10. **Gulf Regional Biological Opinion**: Dredging is approved under the current National Marine Fisheries Service (NMFS) Gulf Regional Biological Opinion (GRBO) and its references which can be viewed on the following website:

http://el.erdc.usace.army.mil/seaturtles/refs-bo.cfm.

The Permittee is responsible for obtaining and complying with the GRBO. If the Permittee is unable to view the GRBO at this website, the Permittee shall contact the Corps to receive a copy of the GRBO. The GRBO contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is specified in the GRBO. Your authorization is conditional upon your compliance with all of the mandatory terms and conditions associated with the incidental take of the GRBO, which terms and conditions are incorporated by reference in the permit. Failure to comply with the terms and conditions associated with the incidental take of the GRBO, where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. However, depending on the affected species NMFS is the appropriate authority to determine compliance with the terms and conditions of its GRBO and with the Endangered Species Act (ESA). For further clarification on this point, you should contact NMFS. Should NMFS determine the conditions of the GRBO have been violated, normally they will enforce the violation of the ESA, or refer the matter to the Department of Justice.

11. **Manatee Conditions:** The Permittee shall comply with the “Standard Manatee Conditions for In-Water Work – 2011” (Attachment 5) and the minimization measures outlined on page 4 of the above referenced 2015 SPBO to avoid potential impacts on manatees.

12. **Sea Turtle and Smalltooth Sawfish Conditions:** The Permittee shall comply with National Marine Fisheries Service's “Sea Turtle and Smalltooth Sawfish Construction Conditions” dated March 23, 2006 (Attachment 6).

13. **Dredging Quality Management (DQM):** All dump scows shall be equipped with DQM system for monitoring purposes. The system must have been certified by the Engineer Research and Development Center (ERDC) within the last year. The DQM must be turned on and transmitting during the transporting of the dredged material and/or dumping operations.

14. **Mean Grain Size and Silt content**: The sand utilized for the placement on the beach will have a maximum silt content of 10% (passing #230 sieve), and a maximum shell content of 15% (retained on #4 sieve). The Permittee will utilize the borrow site as shown on permit drawing sheet 10 (Attachment 1). The beach fill material shall not contain construction debris, toxic material, other foreign matter, coarse gravel or rocks.

15. **Sediment Quality Control/Quality Assurance:** The permittee shall implement the attached “Sediment Quality Control/Quality Assurance Plan” (Attachment 7). Material not in compliance with the Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. The Permittee shall include the Corps in any reporting required by another agency.

16. **Hardbottom Monitoring Plan:** The permittee shall adhere to the approved Hardbottom Biological Monitoring Plan (Attachment 8). Monitoring reports and data associated with the physical monitoring plan shall be submitted to the Corps at the address listed in Special Condition #1 within 90 days of completion of the review.

17. **Spill Reporting:** In the event of leakage, overflow, or spillage of excavated material from a pipeline, dredge, or other source associated with the authorized activity, the Permittee shall notify the Corps within 48 hours of the incident. Notification shall include the cause of the discharge, time/location of the discharge, a description of the material discharged, an estimate of the area/volume of the discharge, and a description of impacts to aquatic resources, e.g., hardbottom, seagrass, mangrove. Additionally, the

notification shall include measures being taken to contain the discharge and protect aquatic resources. Failure to repair leaks or change the method of operation which is resulting in the leakage, overflow, or spillage will result in suspension of dredging operations and require prompt repair or change of operation to prevent overflow, leakage, or spillage as prerequisite to the resumption of dredging. The Corps may require remediation of impacts to aquatic resources resulting from the discharge.

18. **Cultural Resources/Historic Properties:** No structure or work shall adversely affect impact or disturb properties listed in the National Register of Historic Places (NRHP) or those eligible for inclusion in the NRHP.

a. If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permittee shall cease all activities involving subsurface disturbance in the within a 100-meter diameter of the discovery and notify the Corps within the same business day (8 hours). The Corps shall then notify the Florida State Historic Preservation Officer (SHPO) and the appropriate Tribal Historic Preservation Officer(s) (THPO(s)) to assess the significance of the discovery and devise appropriate actions. Project activities shall not resume without verbal and/or written authorization.

b. In the unlikely event that unmarked human remains are identified on non-federal lands, they will be treated in accordance with Section 872.05 Florida Statutes. All work and ground disturbing activities within a 100-meter diameter of the unmarked human remains shall immediately cease and the Permittee shall immediately notify the medical examiner, Corps, and State Archeologist within the same business day (8-hours). The Corps shall then notify the appropriate SHPO and THPO(s). Based, on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the Corps may modify, suspend or revoke the permit in accordance with 33 CFR Part 325.7. Such activity shall not resume without written authorization from the State Archeologist and from the Corps.

c. Site 8MA1235 shall be avoided along with a 100-foot buffer zone. Project activities which may adversely impact the resource shall not occur in the buffer, including, but not limited to, anchoring, dredging, spudding, pipeline placement, excavation, etc. Part of the 100-foot cultural resource buffer lies within the equilibrium toe of fill from the beach fill template. However, nourishment activity, which does not engage in excavation, is not expected to adversely impact the resource and is authorized to occur in the vicinity of the buffer zone.

19. **Posting of Permit:** The Permittee shall have available and maintain for review a copy of this permit and approved plans at the construction site.

20. **Agency Changes/Approvals:** Should any other agency require and/or approve changes to the work authorized or obligated by this permit, the Permittee is advised a modification to this permit instrument is required prior to initiation of those changes. It is the Permittee's responsibility to request a modification of this permit from the Tampa Permits Section. The Corps reserves the right to fully evaluate, amend, and approve or deny the request for modification of this permit.

21. **Assurance of Navigation and Maintenance:** The Permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structures or work herein authorized, or if in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the Permittee will be required, upon due notice from the Corps, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344)

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413)

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE – MANATEE COUNTY)	(DATE)

(PERMITTEE NAME-PRINTED)

(PERMITTEE – TOWN OF LONGBOAT KEY)	(DATE)

(PERMITTEE NAME-PRINTED)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(DISTRICT ENGINEER)	(DATE)

Jason A. Kirk, P.E.
Colonel, U.S. Army
District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

____________________________________ ____________________
(TRANSFEREE-SIGNATURE) (DATE)

____
(NAME-PRINTED)

____
(ADDRESS)

____
(CITY, STATE, AND ZIP CODE)

Attachments to Department of the Army
Permit Number SAJ-2014-00606 (SP-CSH)

1. PERMIT DRAWINGS: 12 pages, dated 2/24/2014

2. WATER QUALITY CERTIFICATION: Specific Conditions of the water quality permit/certification in accordance with General Condition number 5 on page 2 of this DA permit. Environmental Resource Permit No. 0298107-004, dated 3/19/2015 and ERP Modification No. 0298107-006, dated 8/5/2015, 40 pages.

3. AS-BUILT CERTIFICATION FORM: 2 pages

4. U.S. FISH AND WILDLIFE SERVICE'S BIOLOGICAL OPINION: 82 pages, dated September 24, 2015.

5. MANATEE CONDITIONS: 2 pages, *Standard Manatee Conditions for In-Water Work – 2011*

6. SEA TURTLE – SAWFISH CONDITIONS: 1 page, *Sea Turtle and Smalltooth Sawfish Construction Conditions, revised March 23, 2006*

7. SEDIMENT QUALITY CONTROL/QUALITY ASSURANCE PLAN: 6 pages, dated October 3, 2014

8. HARDBOTTOM BIOLOGICAL MONITORING PLAN: 23 pages, dated April 2015.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-8915

REPLY TO
ATTENTION OF

September 24, 2020

Regulatory Division
West Permits Branch
Tampa Permits Section
SAJ-2014-00606 (SP-CSH)
Modification- 1

Manatee County
c/o Charlie Hunsicker
5502 33rd Avenue Drive West
Bradenton, Florida 34209

Town of Longboat Key
c/o Charles Mopps
600 General Harris Street
Longboat Key, Florida 34228

Dear Mr. Hunsicker & Mr. Florensa:

The U.S. Army Corps of Engineers (Corps) has completed the review and evaluation of your modification request in which you asked to revise the plans authorized by Department of the Army permit number SAJ-2014-00606, issued to Manatee County and the Town of Longboat Key, dated March 21, 2016.

The proposed modification is to revise the Biological Monitoring Plan (BMP) scope for consistency with the FDEP's Standard Operating Procedures for nearshore hardbottom monitoring of beach nourishment projects. Specifically, the proposed modification is to eliminate future benthic community monitoring at the six permanent transects on the mitigation artificial reef modules located offshore of Longboat Key, between R-48.5 and R-52 in Manatee County. No other changes to monitoring protocol are proposed other than the elimination of benthic community quadrats beginning with the 2020 surveys. The modification must be completed in accordance with the revised Biological Monitoring Plan, which replaces Attachment 8 of the original permit, and the special conditions, which are incorporated in, and made a part of the permit.

1. **Reporting Address:** The Permittee shall submit all reports, notifications, documentation and correspondence required by the general and special conditions of this permit to either (not both) of the following addresses:

    a. For electronic mail (preferred): SAJ-RD-Enforcement@usace.army.mil (not to exceed 15 MB).

    b. For standard mail: U.S. Army Corps of Engineers, Regulatory Division, Enforcement Section, P.O. Box 4970, Jacksonville, FL 32232-0019.

The Permittee shall reference this permit number, SAJ-2014-00606 (SP-CSH), on all submittals.

16. **Hardbottom Monitoring Plan:** The permittee shall adhere to the revised approved Hardbottom Biological Monitoring Plan (Attachment 8), dated November 1, 2019. Monitoring reports and data associated with the physical monitoring plan shall be submitted to the Corps at the address listed in Special Condition #1 within 90 days of completion of the review.

The impact of your proposal on navigation and the environment has been reviewed and found to be insignificant. The permit is hereby modified in accordance with your request. You should attach this letter to the permit. All other conditions of the permit remain in full force and effect.

If you have any questions concerning this permit modification, please contact the project manager Caitlin Hoch-Nussbaum by telephone at 813-355-0789 or by electronic mail at Caitlin.S.Hoch@usace.army.mil.

Thank you for your cooperation with our permit program. The Corps' Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to complete our automated Customer Service Survey at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. Please be aware this Internet address is case sensitive; and, you will need to enter it exactly as it appears above. Your input is appreciated – favorable or otherwise.

BY AUTHORITY OF THE SECRETARY OF THE ARMY:

for:
Andrew D. Kelly
Colonel, U.S. Army
District Commander

Enclosures

cc:
Isaac Brownman, Town of Longboat Key
Albert Browder, Olsen Associates
Krista Egan, Olsen Associates
Cheryl Miller, Coastal Eco-Group

CESAJ-RD-PE

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-8915

REPLY TO
ATTENTION OF

February 1, 2021

Regulatory Division
West Permits Branch
Tampa Permits Section
SAJ-2014-00606 (SP-CSH)
Modification-2

Manatee County
c/o Charlie Hunsicker
5502 33rd Avenue Drive West
Bradenton, Florida 34209

Town of Longboat Key
c/o Isaac Brownman
600 General Harris Street
Longboat Key, Florida 34228

Dear Mr. Hunsicker & Mr. Brownman:

The U.S. Army Corps of Engineers (Corps) has completed the review and evaluation of your modification request in which you asked to revise the plans authorized by Department of the Army permit number SAJ-2014-00606, issued to Manatee County and the Town of Longboat Key, dated March 21, 2016.

The proposed modification is to revise the Biological Monitoring Plan (BMP) scope for consistency with the FDEP's Standard Operating Procedures for nearshore hardbottom monitoring of beach nourishment projects, and to incorporate the revised FDEP permit into the Department of the Army permit. The modification must be completed in accordance with the revised Biological Monitoring Plan, which replaces Attachment 8 of the original permit, and the special conditions, which are incorporated in, and made a part of the permit.

16. **Hardbottom Monitoring Plan:** The permittee shall adhere to the revised approved Hardbottom Biological Monitoring Plan (Attachment 8), dated October 2020. Monitoring reports and data associated with the physical monitoring plan shall be submitted to the Corps at the address listed in Special Condition #1 within 90 days of completion of the review.

The impact of your proposal on navigation and the environment has been reviewed and found to be insignificant. The permit is hereby modified in accordance with your request. You should attach this letter to the permit. All other conditions of the permit remain in full force and effect.

If you have any questions concerning this permit modification, please contact the project manager Caitlin Hoch-Nussbaum by telephone at 813-355-0789 or by electronic mail at Caitlin.S.Hoch@usace.army.mil.

Thank you for your cooperation with our permit program. The Corps' Jacksonville District Regulatory Division is committed to improving service to our customers. We strive to perform our duty in a friendly and timely manner while working to preserve our environment. We invite you to complete our automated Customer Service Survey at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. Please be aware this Internet address is case sensitive; and, you will need to enter it exactly as it appears above. Your input is appreciated – favorable or otherwise.

BY AUTHORITY OF THE SECRETARY OF THE ARMY:

for:
Jason A. Kirk, P.E.
Colonel, U.S. Army
District Commander

Enclosures

cc:
Lauren Floyd, Coastal Protection Engineering
CESAJ-RD-PE

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

October 29, 2020

CO-PERMITTEES:
Manatee County
Parks and Natural Resources
Attn: Charlie Hunsicker
5502 33rd Avenue Drive West
Bradenton, FL 34209

and

Town of Longboat Key
Attn: Isaac Brownman
600 General Harris Street
Longboat Key, FL 34228

AGENT:
Coastal Protection Engineering
Attn: Lauren Floyd, MS
5301 N. Federal Hwy, Suite 335
Boca Raton, FL 33487

Permit Modification No. 0298107-010-JN
Permit No. 0298107-009-JN, Manatee County
Longboat Pass Navigational Maintenance Dredging

Dear Messrs. Hunsicker and Brownman:

The Florida Department of Environmental Protection (Department) is issuing an administrative modification to Permit No. 0298107-009-JN to improve consistency in biological monitoring requirements between project areas. As part of this modification, the Department will revise the Biological Monitoring Plan as well as Specific Conditions 26 and 27.

Background
Longboat Key has an extensive permitting history ranging from beach restoration/nourishment to the construction of erosion control structures and the maintenance of navigable depths within the

associated passes. At this particular site, Longboat Pass (Site No. 0298107) permits were issued to WCIND (0298107-002-JC) to create and maintain two (2) sediment impoundment basins, and jointly to the Town of Longboat Key and Manatee County (0298107-004-JC) to maintain navigable depths within Longboat Pass. Only the permitting history of this site (02980107) will be summarized below.

On December 2, 2009, the Department issued a de minimus exemption, File No. **0298107-001-BE**, to the West Coast Inland Navigation District (WCIND), for the collection of 12 vibracores throughout the Longboat Pass flood shoal. Sand samples were collected from three (3) designated areas within the flood shoal to investigate sand quality for future establishment of a sand trap for periodic maintenance dredging

On December 5, 2012, the Department issued Permit No. **0298107-002-JC** and granted Variance No. **0298107-003-BV** to the WCIND. The permit authorized the creation and maintenance of two impoundment basins (Cut 1 and Cut 2) within the flood shoal of Longboat Pass with the disposal of beach quality material on the beach or nearshore area, on the northern end of Longboat Key. The variance from the provisions of Rule 62-4.244(5)(c), F.A.C., temporarily established an expanded mixing zone of 150 meters offshore and 500 meters downcurrent from the beach point of discharge. The project also included the subsequent dredging of sand captured by the basins and placement of the dredged material in one of the placement locations on the north end of Longboat Key (R-44 to R-48) or in the Coquina Beach template (R-36 to R-41 + 500 feet) on Anna Maria Island. Subsequent modifications of this permit include: Modification No. **0298107-005-JN**, to change the maximum allowable turbidity level within the OFW; and Modification No. **0298107-008-JN**, to extend the permit duration until December 5, 2027 and update/revise various conditions.

On March 19, 2015, the Department issued Permit No. **0298107-004-JC** to Manatee County and the Town of Longboat Key to maintain Longboat Pass at its current specifications (a maximum dredge depth of -13.6 feet NAVD), and to place beach-compatible sand from the dredging onto the beaches north and south of the inlet. The fill template contains a variable berm width at an elevation of 5 feet NAVD, and a foreshore slope of 1:15 (vertical:horizontal). Following the initial placement, the maintenance schedule and volume of material to be dredged would be determined based on physical monitoring data.

For additional background, please see the ***CONSOLIDATED NOTICE OF INTENT TO ISSUE JOINT COASTAL PERMIT AND AUTHORIZATION TO USE SOVEREIGN SUBMERGED LANDS*** for Permit No. 0298107-004-JC at the following website:

ftp://ftp.dep.state.fl.us/pub/ENV-PRMT/manatee/issued/0298107_Longboat_Pass/004-JC/Intent/

On August 5, 2015, the Department issued Permit Modification No. **0298107-006-JN** to correct the project description by including a maximum allowable overdepth of -15.6 feet NAVD and to revise the biological monitoring requirement of Specific Condition No. 28.

On August 1, 2016, the Department issued Permit Modification No. **0298107-007-JN** to authorize temporary construction access areas and temporary impacts to the associated dune system where widening of these access areas is necessary. The Department also updated the General Conditions and Specific Condition 16 *'Marine Turtle Nest Surveys and Relocation Condition'*.

On February 28, 2020, the Department issued Permit Modification No. **0298107-009-JN**, which superseded Permit No. 0298107-004-JC, to revise the biological monitoring protocol on the Town's artificial reef modules. The Department used this opportunity to combine all the previous modifications associated with 0298107-004-JC into a clean permit, file no. 0298107-009-JN.

Justification and Staff Assessment

At the request of Department staff and Manatee County, Permit No. 0298107-009-JN will be modified to revise the Biological Monitoring Plan (Plan) dated January 2020. Specific Conditions 26 and 27 will also be revised to increase clarity, bring language in line with current Department standards and requirements of the revised Plan, and to add a table that summarizes surveys, monitoring events, and tasks required by the Plan.

As part of the previous modification of the permit (Modification No. 0298107-009-JN), monitoring for the Longboat Key project area was revised by removing the requirement to collect quantitative community data from mitigative artificial reefs that had met their success criteria from the Plan. To make monitoring of mitigative reefs in the two project areas more consistent, this modification does the same for the Anna Maria Island project area (i.e., removes the requirement to collect quantitative community data from mitigative artificial reefs that have met their success criteria from the Plan). To provide the Department with reasonable assurance that project-related impacts to mitigative reefs would be documented and offset if they occurred, physical monitoring and qualitative biological monitoring of all mitigative reefs adjacent to the Longboat Key and Anna Maria Island project areas is still required by the revised Biological Monitoring Plan (dated October 2020).

Additionally, this modification removes the requirement to monitor nearshore hardbottom adjacent to the Anna Maria Island project area (only) from the Plan. Nearshore hardbottom seaward of the permitted equilibrium toe of fill of the Anna Maria Island project area was impacted (unpermitted) by the 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project and its 2014 Extension (Department Permit No. 0281452-001-JC and Modification No. 0281452-005-JN, respectively). Manatee County has committed to offset the acreage of unpermitted impacts as well as the small amount of remaining unimpacted hardbottom by constructing a mitigative artificial reef. Since all unmitigated natural hardbottom offshore the Anna Maria Island project area is being offset by mitigation, monitoring of these resources will no longer be required by the Plan. The new mitigative artificial reef will be permitted and constructed as part of the next City of Anna Maria Island

Coquina Beach Nourishment Project and the permit for the project will stipulate mitigation success criteria that must be met to ensure impacts have been offset.

Specific conditions of the permit shall be revised as follows (~~strikethroughs~~ are deletions, underlines are additions):

26. **No additional impacts to hardbottom resources are authorized by this permit.** Biological monitoring of hardbottom resources (including nearshore hardbottom and artificial reefs) shall be conducted to document potential project-related adverse impacts to these resources, and to provide an analysis of the impacts (e.g., construction-related burial or sedimentation). Any damage to unmitigated hardbottom resources, either persistent or temporary, shall require mitigation. Impacts and their mitigation may be handled through compliance and enforcement action, and the amount of mitigation may be determined according to the Department's UMAM assessment. Monitoring shall comply with and meet the requirements of the current approved Biological Monitoring Plan. No construction shall occur until the Biological Monitoring Plan has been approved by the Department, and a baseline survey has been completed and submitted to the Department as required in Specific Condition 27a.

27. Nearshore hardbottom (along the Longboat Key project area) and artificial reefs shall be monitored as specified by the approved Plan.~~once, prior to the initial construction, immediately following construction, and annually, for three years post-construction, for a total of five (5) monitoring events.~~ Construction on Longboat Key shall not begin until baseline (pre-construction) surveys of all resources in and adjacent to the project area (nearshore) have been conducted according to the ~~Biological Monitoring~~ Plan and the results of these surveys have been submitted to the Department. Table 2 (below), titled "Longboat Pass Navigational Maintenance Dredging Project Monitoring Summary", summarizes surveys, monitoring events, and tasks required by the Plan; these are described in detail in the Biological Monitoring Plan itself.

    a. When sand dredged from Longboat Pass is placed in the Anna Maria Island fill placement area, post-construction mitigative artificial reef monitoring shall be conducted (see Section 3.0 of the current approved Plan and Table 2 below). The December 2013/January 2014 pre-construction monitoring event for the 2014 Coquina Beach Nourishment Project (Department Permit No. 0281452-001-JC and Modification No. 0281452-005-JN) shall serve as the pre-construction (baseline) for the 1993, 2005, and 2011 Mitigative Artificial Reefs for the Anna Maria Island portion of the project. ~~If less than two (2) years old, the most recent monitoring survey for the 2014 Coquina Beach Restoration Project may be used as the baseline (pre-construction) survey for the Anna Maria Island beach placement area.~~ Each nourishment of the Anna Maria Island project area shall initiate a complete round of post-construction monitoring, which shall include a total of three (3) annual mitigative artificial reef monitoring events, at years 1, 2, and 3 post-construction.

b. When sand dredged from Longboat Pass is placed in the Longboat Key fill placement area, pre- and post-construction natural hardbottom and mitigative artificial reef monitoring shall be conducted (see Section 4.0 of the current approved Plan and Table 2 below). Only one pre-construction monitoring event shall be required, and this monitoring event ~~A new baseline survey~~ shall ~~be completed~~ ~~for the~~ serve as the baseline for all post-construction monitoring on Longboat Key ~~placement area prior to construction. In either case, the survey used as the initial survey shall serve as baseline for all subsequent nourishment events under this permit~~. Each nourishment of the Longboat Key project area shall initiate a complete round of post-construction nearshore hardbottom and mitigative artificial reef monitoring, which shall include an immediate post-construction monitoring event (within six months of project completion), and three annual post-construction monitoring events (Years 1, 2, and 3).

~~b. Each subsequent nourishment event shall initiate another complete round of post-construction monitoring, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).~~

c. In some cases, ~~the dredged~~ sand dredged from Longboat Pass may be placed alternately between the Anna Maria and Longboat Key shorelines, and on some occasions the sand may be split between the two shorelines during the same dredge/fill event. Regardless of whether both beach sections (Anna Maria Island and Longboat Key) are nourished together or independent of one another, each nourishment event shall initiate ~~another~~ a complete round of post-construction monitoring for the areas that are nourished.~~, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).~~

d. The Anna Maria Island and Longboat Key biological monitoring shall be conducted and reported on independently. Unless otherwise approved in writing by DEP staff, all monitoring events shall be conducted during summer months (May 1 through September 30), as close as practicable to the date that baseline monitoring was conducted. Standard operating procedures shall be used during each monitoring event to provide consistent and repeatable collection of data. ~~All surveys shall be conducted in compliance with the current approved Biological Monitoring Plan, and~~ ~~m~~Monitoring progress and results shall be reported as required by the Plan (see Section 6.0 of the current approved Plan and Table 2 below). ~~weekly until the completion of each survey, at which point the JCP Compliance Officer shall be notified that the survey is complete.~~

Table 2. Longboat Pass Navigational Maintenance Dredging Project Monitoring Summary

Project Area	**Survey**	**Survey Type**	**Monitoring Period**	**Deliverables**
Anna Maria	Artificial Reef Physical	In-situ Delineation	**Post-Construction** (N=3 per placement event) Years 1, 2, and 3	Shapefiles
		Line-Intercept (Permanent and Temporary transects)		Excel spreadsheet, PDF of field sheets
	Artificial Reef Video	Video (Permanent transects only)		Video
Longboat Key	Natural Hardbottom within ETOF	Video (Transects)	**Pre-Construction** (N=1): once prior to first fill placement. **Post-Construction** (N=4 per fill placement event) Immediately (within 6 months) and years 1, 2, and 3).	Video
	Natural Hardbottom Seaward of ETOF	In-situ HB Delineation		Shapefiles
		Line-Intercept		Excel spreadsheets, PDF of field sheets
		Interval Sediment Depth		
		Quadrats (BEAMR)		
		Video		Video
	Artificial Reef Physical	In-situ Delineation		Shapefiles
		Line-Intercept (Permanent and Temporary transects)		Excel spreadsheet, PDF of field sheets
		Video (Permanent transects only)		Video

The approved plans shall be revised as follows:

The Biological Monitoring Plan (dated January 2020) shall be replaced by the revised Biological Monitoring Plan (dated October 2020).

After thorough review of your application, staff finds that the proposed modification is not expected to adversely affect water quality or change the determination that the project is clearly in the public interest. Staff has also determined that the proposed alteration does not increase the potential for adverse impact on the coastal system, public beach access seaward of the mean high water line or nesting sea turtles and hatchlings and their habitat, and that the proposed alteration does not reduce the design adequacy of the project. Since the proposed modification is not expected to result in any adverse environmental impact or water quality degradation, the **permit is hereby modified** as stated above. By copy of this letter and the attached drawings, we are notifying all necessary parties of the modification.

This letter of approval does not alter the **March 19, 2030** expiration date of the permit. The only Specific Conditions of the permit that are altered by this modification are those stated above. This letter and the attached plan must be attached to the original permit.

This permit is hereby modified unless a sufficient petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, Florida Statutes (F.S.), as provided below. The procedures for petitioning for a hearing are set forth below. Mediation under Section 120.573, F.S., is not available for this proceeding.

NOTICE OF RIGHTS

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rule 28-106.201, F.A.C., a petition for an administrative hearing must contain the following information:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name, address, any email address, any facsimile number, and telephone number of the petitioner; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;

(c) A statement of when and how the petitioner received notice of the agency decision;

(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;

(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition
In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant must be filed within 14 days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. Under Section 120.60(3), F.S., however, any person who has asked the Department for notice of agency action may file a petition within 14 days of receipt of such notice, regardless of the date of publication. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

Extension of Time
Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, before the applicable deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation
Mediation is not available in this proceeding.

FLAWAC Review
The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review
Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Rules 9.110 and 9.190, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, M.S. 35, Tallahassee, Florida 32399-3000; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this action is filed with the Clerk of the Department.

When there has been no publication of notice of agency action or notice of proposed agency action as prescribed in Rule 62-110.106, F.A.C., a person may request a copy of the agency action. The Department shall upon receipt of such a request, if agency action has occurred, promptly provide the person with notice. The Department does not require notice of this agency action to be published. However, the applicant may elect to publish notice as prescribed in Rule 62-110.106, F.A.C., which constitutes notice to the public and establishes a time period for submittal of any petition.

If you have any questions regarding this matter, please contact Karina Kronsis by email at Karina.Kronsis@dep.state.fl.us or by telephone at (850) 245-7545.

EXECUTION AND CLERKING:

Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

____
Gregory W. Garis
Program Administrator
Beaches, Inlets and Ports Program
Office of Resilience and Coastal Protection

Attachments: Revised Biological Monitoring Plan (Approved October 2020)

CERTIFICATE OF SERVICE
The undersigned duly designated deputy clerk hereby certifies that this permit and all copies were sent on the filing date below to the following listed persons:

cc:	Greg Garis, DEP	Jennifer Hinton, DEP
	Ivana KennyCarmola, DEP	JCPCompliance@dep.state.fl.us
	Robert Brantly, DEP	MarineTurtle@MyFWC.com
	Vincent George, DEP	FWCConservationPlanningServices@myFWC.com
	Luke Davis, FWC	Tampareg@usace.army.mil
	Brendan Biggs, DEP	

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to Section 120.52, F. S., with the designated Department Clerk, receipt of which is hereby acknowledged.

__________________ October 29, 2020
Clerk **Date**

APPROVED
Biological
Monitoring Plan
Permit#: 0298107-010-JN
Approved: October 22, 2020
Beaches Inlets and Ports Program

Biological Monitoring Plan

Longboat Pass Navigational Maintenance Dredging Project

FDEP Permit No. 0298107-009-JN

USACE Permit No. SAJ-2014-00606

October 2020

Table of Contents

1.0 INTRODUCTION

The Longboat Pass Navigational Maintenance Dredging Project authorized by Florida Department of Environmental Protection (FDEP) Permit No. 0298107-009-JN includes the dredging of a navigation channel in Longboat Pass with sediment placement along the adjacent Manatee County shorelines, including the south end of Anna Maria Island and the north end of Longboat Key (Figure 1). The dredge area for the project is the Longboat Pass Channel. The sediment placement areas include previously permitted and constructed fill areas along approximately 2 miles of the southern Anna Maria Island shoreline between R-30 and R-41+305 and about 1.4 miles on the north end of Longboat Key between R-43.5 and R-50.5 (Figure 1). The placement location and fill volume will vary between maintenance dredging events depending on the timing and volume removed from the channel, but following each dredge event, dredged material will be placed within either (or both) of the two templates.

The sand placement areas on Anna Maria Island (Coquina Beach) and Longboat Key (north end) have previously been nourished and permitted as well as unpermitted impacts to nearshore hardbottom have been mitigated through construction of artificial reefs, as described at the openings of Sections 3.0 and 4.0. Given that the permitted equilibrium toe of fill (ETOF) in the areas of hardbottom resources for each of the project areas is the same or landward of previously permitted ETOFs for nourishment projects in this area, the Longboat Pass Navigational Maintenance Dredging Project is not expected to impact any unmitigated hardbottom. Still, several areas of artificial (mitigative) reef and unmitigated natural hardbottom are present in Gulf of Mexico waters offshore Anna Maria Island and Longboat Key and their proximity to the permitted ETOFs indicates this nearshore hardbottom is potentially under the influence of the proposed project. As such, monitoring of hardbottom resources (natural and artificial) within areas under the influence of the project (updrift, downdrift, and adjacent to the ETOF as well as within the mixing zone at both placement sites) will be conducted to document potential unanticipated impacts if they occur. This monitoring plan has been developed to address the potential direct and/or indirect impacts to the nearshore hardbottom communities and the mitigative artificial reefs beyond the permitted ETOF.

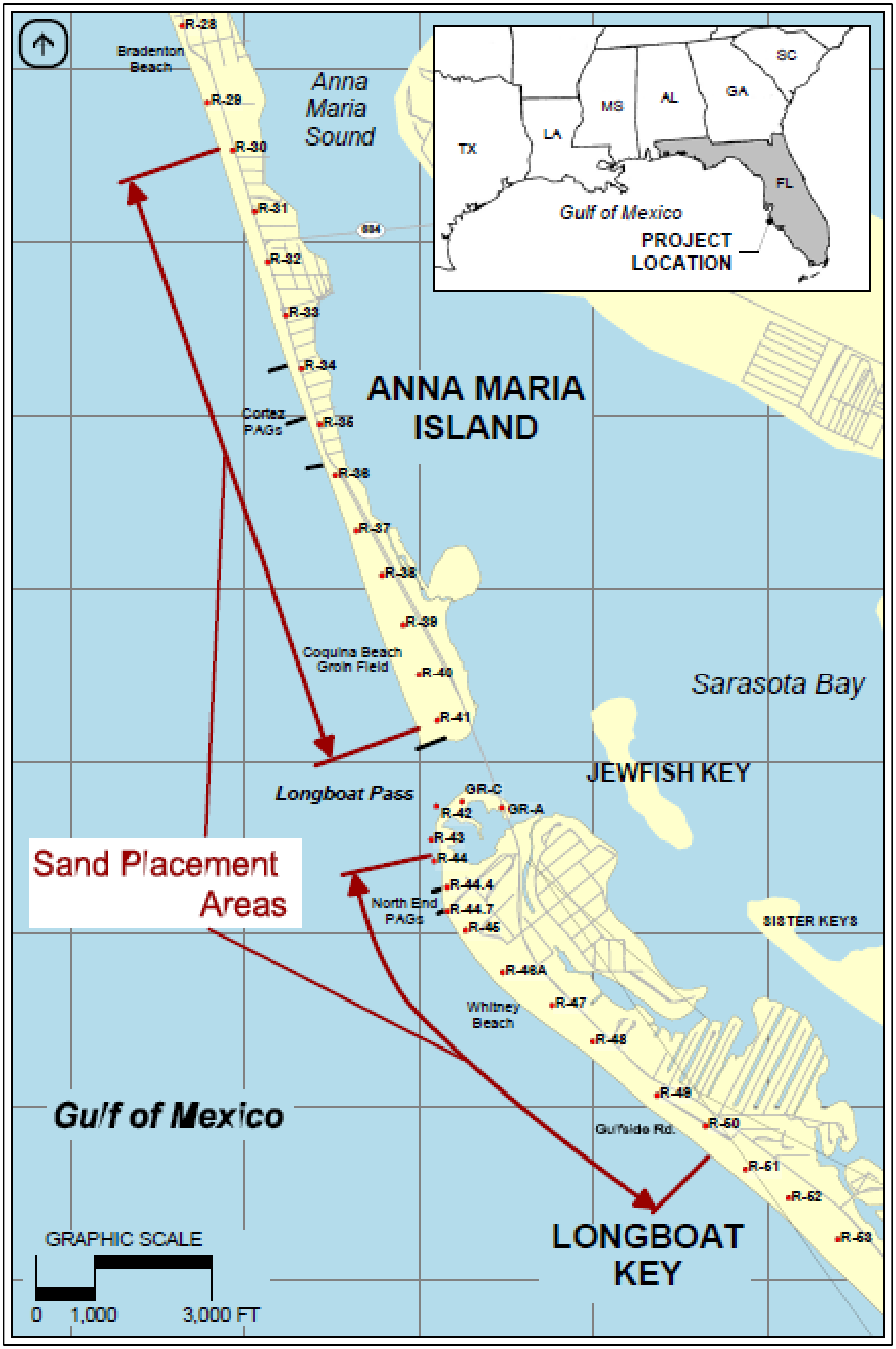


Figure 1. Longboat Pass Navigational Maintenance Dredging Project location.

2.0 MONITORING METHODS

The methods described below will be used to monitor artificial reefs adjacent to the Anna Maria Island project area and natural hardbottom and artificial reefs adjacent to the Longboat Key project area; details specific to each project area are provided in Sections 3.0 and 4.0, respectively. Section 5.0 summarizes the monitoring schedule and reporting requirements.

2.1 Monitoring Transects Beyond the ETOF

The following methods will be utilized on the monitoring transects located outside the ETOF in order to determine any project-related impacts to natural hardbottom and artificial reef habitats from the Longboat Pass Navigational Maintenance Dredging Project. All transects located on natural hardbottom will be permanently established. Artificial reef monitoring will include a combination of permanent transects and additional temporary line-intercept transects. Transect details for the Anna Maria Island and Longboat Key project areas are provided in Sections 3.0 and 4.0, respectively.

2.1.1 Line-Intercept

2.1.1.1 Natural Hardbottom Transects

Line-intercept data will be collected along each permanent nearshore hardbottom transect outside of the ETOF to document larger areas of uninterrupted sand (physical transitions along the monitoring transects between sand and hardbottom) and to track changes in sediment cover on the hardbottom. During each monitoring event, the landward and seaward position of each sand patch / trough at least 0.5 m in length shall be recorded along each transect by reference to transect tape meter marks. Meter mark references will be to one decimal place (e.g., patch from 2.4 to 3.2 m).

2.1.1.2 Mitigative Artificial Reef Transects

To measure the percentage of hardbottom present within the delineated boundary (gross acreage) of each artificial reef, line-intercept data will be collected along permanent and temporary transects during each monitoring event. For the line-intercept survey, a diver shall swim the length of each transect (permanent and temporary) on each mitigative reef. During the swim, the diver shall note the location along the transect tape and measure the linear extent of all artificial hardbottom (limestone boulders) and sand gaps between boulders. Meter mark references will be to one decimal place (e.g., patch from 2.4 to 3.2 m). Following each monitoring event, the percentage of each transect line accounted for by boulders (hardbottom) and by gaps/sand will be calculated for each transect on each mitigative reef.

2.1.2 Interval Sediment Depth

These measurements document sediment dynamics – specifically sediment movement and changes - along each natural hardbottom transect beyond the ETOF. Sediment depth data will be collected at 1-m intervals along each of the natural hardbottom transects located outside of the ETOF. This method will not be used on artificial reef transects. Sediment depth measurements shall be rounded to the nearest cm (i.e., sand thickness of less than 0.5 cm will be recorded as 0, while sand thickness greater than 0.5 cm but equal or less than 1 cm will be recorded as 1 cm, etc.). Measurements greater than 30 cm will be recorded as > 30 cm. Sediment depth measurements shall be taken along the entire length of each natural hardbottom transect including sand patches.

2.1.3 Benthic Characterization (BEAMR)

The Benthic Ecological Assessment for Marginal Reefs (BEAMR) method (Lybolt and Baron, 2006) is a quadrat-based assessment technique used to evaluate the benthic cover of macroalgal dominated marginal reefs and hardbottom formations. BEAMR samples three characteristics of the benthos: physical structure, planar percent cover of sessile benthos, and coral density. Physical characteristics recorded from quadrats include the maximum topographic relief (cm) and the maximum sediment depth (cm). Estimates of the planar percent cover of all sessile benthos are pooled to 19 major functional groups that include: sediment, macroalgae, turf algae and cyanobacteria, encrusting red algae, sponge, hydroid, octocoral, stony coral, tunicate, bare hard substrate, anemone, barnacle, bryozoan, bivalve, Millepora spp., seagrass, sessile annelid, wormrock, and zoanthid.

Datasheets for BEAMR sampling have a standardized layout that prompts biologists to enter data in all fields. The maximum diameter (cm) and species of each stony coral (Scleractinia), and the maximum height and genus of each soft coral (Octocorallia), is recorded. The minimum area cover estimate in BEAMR methodology is 1%, based on presence; therefore, the area cover of organisms representing less than 1% is necessarily overestimated. Furthermore, macroalgae percent cover data are augmented by a breakdown of all genera exhibiting at least 1% cover, and sediment descriptors are collected describing the general texture (e.g. sand, shell-hash, or mud). As with all non-consumptive surveys, BEAMR is necessarily constrained to visually conspicuous organisms with well-defined, discriminating characteristics for identification.

BEAMR samples will be collected within permanently placed 0.5-m2 quadrats along natural hardbottom transects adjacent to the Longboat Key project area. No biological data is required on Anna Maria Island artificial reef transects, which will consist only of physical data (i.e. line-intercept data). The location of transects and number of quadrats to be sampled per transect for the Longboat Key project area are described in Section 4.0.

2.1.4 Video Documentation

Video surveys shall be conducted along all permanent monitoring transects using a digital video camera in a waterproof housing. Video of the seafloor along each transect will progress no faster than 5 m per minute at a height of 40 cm above the hardbottom along each transect line. A 360º panoramic view shall also be recorded both at the beginning and at the end of each transect.

2.2 Video Transects within the ETOF

Video will be collected on the monitoring transects located within the ETOF in order to document any burial and exposure of these communities. This information is not required by FDEP, as impacts to these resources have already been offset through construction of mitigative artificial reefs. As such, this information will not be used to determine project impact, but may help better understand the movement of sand following construction of beach nourishment projects. Video will also be collected along permanent artificial reef transects.

2.3 In-Situ Hardbottom and Mitigative Artificial Reef Delineation

In order to quantify changes in hardbottom exposure, divers will delineate natural hardbottom and artificial reefs during each monitoring survey. Biologists will base hardbottom investigations on the most recent, clear aerial imagery available and/or previous habitat delineations. To map the hardbottom edge, divers will follow the edge of the hardbottom or perimeter of the artificial reef around the full extent of each formation while towing a buoy with a DGPS antenna mounted on top, attached by cable to a positioning system, interfaced with Hypack Navigational Software. The buoy will be on the shortest possible tether. If sand cover over the hardbottom is intermittent and benthic components are protruding through the sand, the area is still considered to be a hardbottom resource; in this scenario, the hardbottom edge will be delineated as the edge of the area where benthic components are protruding from the sand. Following delineation, the gross acreage (area within the delineated boundary) shall be determined for each mitigative reef.

3.0 ANNA MARIA ISLAND MONITORING PROTOCOL

When sand dredged from the Longboat Pass Navigational Maintenance Dredging Project is placed on the Anna Maria Island fill placement area (Figure 1), post-construction mitigative artificial reef monitoring will be required. Several areas of natural and artificial (mitigative) hardbottom are present in Gulf of Mexico waters offshore Anna Maria Island; this section describes these hardbottom resources and details how methods in Section 2.0 will be implemented for monitoring the mitigative artificial reefs. Section 4.0 describes Longboat Key's hardbottom resources and the specific monitoring protocols associated with placement of sand on Longboat Key. The monitoring schedule and reporting requirements are summarized in Section 5.0.

3.1 Existing Hardbottom Resources

3.1.1 Natural Hardbottom

Nearshore hardbottom habitat is present along the southern shoreline of Anna Maria Island, adjacent to Coquina Beach between FDEP monuments R-35 and R-39. These hardbottom resources are comprised primarily of scattered limestone outcroppings ranging from low-relief, well-scoured areas to some offshore isolated areas of higher relief (up to 2 ft). The benthic community is typically dominated by turf algae and macroalgae, with moderate tunicate and sponge cover. The octocorals *Leptogorgia virgulata* and *L. hebes* are commonly found in this habitat; these colonies remain small (<5 cm) on areas which experience frequent burial and may grow to 20-30 cm in isolated areas of higher relief farther offshore. Scleractinian corals such as *Solenastrea hyades* and *Phyllangia americana* are occasionally observed on the exposed hardbottom but are restricted to offshore areas of higher relief that escape sedimentation. Several fish utilize the nearshore hardbottom resources off Anna Maria Island, including sheepshead (*Archosargus probatocephalus*), red grouper (*Epinephelus morio*) and belted sandfish (*Serranus subligarius*).

The nearshore hardbottom described above (seaward of the 2014 ETOF) was impacted (unpermitted) by the 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project and its 2014 Extension Modification (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN, respectively). Manatee County has committed to offset the acreage of unpermitted impacts as well as the small amount of unimpacted hardbottom that remains by constructing a mitigative artificial reef. Mitigating for all natural hardbottom seaward of the ETOF in the Anna Maria Island project area eliminates the need to monitor these resources. As such, Administrative Modification No. 0298107-010-JN removes natural hardbottom monitoring requirements for the Anna Maria Island project area from this Plan (Section 3.0). Mitigative reef monitoring is still required and methods are specified below.

3.1.2 Mitigative Artificial Reefs

Three artificial reefs, built as mitigation for previous Anna Maria Island beach nourishment projects, sit immediately seaward of the ETOF at Coquina Beach (Figure 2). Background information on each reef is provided below.

3.1.2.1 1993 Artificial Reef

The 1993 Artificial Reef (initially designated the “Nearshore Artificial Reef”) was one of two reefs (the other was built one mile offshore) constructed by Manatee County to offset permitted direct impacts to seven (7) acres of nearshore hardbottom within the ETOF of the 1992/1993 Anna Maria Island Beach Restoration Project (Wetland Resource Permit No. 411728169 and Coastal Construction Permit No. DBS 900260). The 1993 Artificial Reef was constructed approximately 304.8 m (1,000.0 ft) from the shoreline between R-38 and R-39, at a water depth of 4.9 m to 5.2 m (16.0 ft to 17.0 ft) (NAVD) (Figure 2). Approximately 15,000 tons of clean concrete material were placed over a 6.7-acre area. Vertical relief at the reef ranged from 0.2 m to 2.4 m (0.5 ft to 8.0 ft), with an average relief of 0.8 m (2.9 ft). The 1993 Artificial Reef was monitored for success following the initial 1992/1993 Beach Nourishment Project and to document potential impacts (if occurring) following the 2005 Beach Nourishment Project and the 2014 nourishment of Coquina Beach.

3.1.2.2 2005 Artificial Reef

The 2005 Artificial Reef was constructed to offset additional impacts (beyond those predicted) from the 1992/1993 Anna Maria Island Beach Restoration Project and to offset additional impacts (beyond those predicted) due to the 2002 Anna Maria Island Beach Nourishment Project (Permit No. 0039378-001-JC). In total, FDEP required Manatee County to provide 0.45 acres of mitigation to offset 0.65 acres of impacts to nearshore hardbottom. Construction of the 2005 Artificial Reef was completed in February 2005 using limestone boulders with a vertical dimension of approximately 0.9 m to 1.2 m (3.0 ft to 4.0 ft). The 2005 Artificial Reef is located approximately 274.0 m (900.0 ft) from the shoreline between R-36 and R-37 and 30.5 m (100.0 ft) from exposed, natural hardbottom communities, at a water depth of 3.4 m to 4.6 m (11.0 ft to 15.0 ft) (NAVD) (Figure 2). Approximately 1,525 tons of material were placed over a 0.50-acre site. The 2005 Artificial Reef was monitored quarterly for one year following its construction and once more in summer 2007 to document success in compliance with FDEP permit requirements. It was also monitored to document potential impacts (if occurring) following the 2014 Coquina Beach Nourishment Project.

3.1.2.3 2011 Artificial Reef

The 2011 Artificial Reef, which consists of two separate artificial reef complexes, was constructed to offset permitted direct (1.05 ac) and indirect (3.45 ac) impacts to nearshore hardbottom due to the initial 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project (FDEP Permit No. 0281452-001-JC). This artificial reef was constructed between R-35 and R-39, approximately 335 m (1100 ft) offshore of Coquina Beach in water depths ranging from 4.9 m to 5.5 m (16.0 ft to 18.0 ft) (NAVD) (Figure 2). The FDEP required 4.87 gross acres of mitigation to be constructed to offset the total 4.5 gross acres of impacts. Line-intercept surveys conducted within the area of impact prior to construction revealed hardbottom accounted for 68% of the area and the net acreage of required mitigation was set at 3.31 acres.

The 2011 Artificial Reef was constructed of limestone boulders approximately 0.9 m to 1.4 m (3.0 ft to 4.5 ft) in vertical dimension from September through December 2011. Following construction, the as-built survey indicated a total of 5.16 gross acres had been constructed and line-intercept surveys revealed that hardbottom (boulders), on average, accounted for 80% of the area (CPE, 2012), exceeding the permit-required 68% coverage by 12%. The 4.13 net acres constructed was 0.82 net acres more than the net 3.31 acres required by the permit and the FDEP agreed that the 0.82 net acres of excess mitigation could be applied to impacts caused by future projects.

An impact analysis conducted for the revised 2014 City of Anna Maria Nourishment and Coquina Beach Restoration Project (FDEP Permit Modification No. 0281452-005-JN) indicated the proposed project would impact 0.52 net acres of nearshore hardbottom in two unmitigated regions beyond (outside) the 2009 ETOF but within the 2014 ETOF. The areas were located between R-35 and R-36 and in the vicinity of R-38. The FDEP agreed that 0.52 acres of upfront mitigation could be applied from the 0.82 acres of excess mitigation, leaving 0.30 net acres of excess mitigation remaining.

3.1.2.4 Additional Impacts and New Mitigative Artificial Reef

Unmitigated nearshore hardbottom seaward of the 2014 ETOF was impacted (unpermitted) by the 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project and its 2014 Extension Modification (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN, respectively). The total remaining excess of 0.30 acres of mitigation from the 2011 Mitigative Artificial Reef will be used to partially offset these impacts. Manatee County has committed to offset the remaining acreage of unpermitted impacts as well as the small amount of unimpacted hardbottom by constructing a mitigative artificial reef. The new mitigative artificial reef will be permitted and constructed as part of the next City of Anna Maria Island Coquina Beach Nourishment Project for which planning is already underway.

3.2 Mitigative Artificial Reef Monitoring Methods

Mitigative artificial reef monitoring will consist of collecting physical and biological (video) data during post-construction monitoring events (years 1, 2, and 3) following each sand placement event. Each of the three (3) mitigative artificial reefs adjacent to the Coquina Beach section of the project template (1993, 2005, and 2011 Artificial Reefs) shall be surveyed during each artificial reef monitoring event (Figure 2). The aim of mitigative artificial reef monitoring is to identify any unpermitted direct and/or secondary adverse impacts to the mitigative reefs due to the spreading of project sand farther than permitted (i.e., seaward of the permitted ETOF). As such, surveys conducted during each artificial reef monitoring event will document the gross and net acreage of each mitigative reef and the resident biological community. Gross acreage will be determined through in situ delineation (Section 3.2.2.1) and line-intercept surveys along transects will document the percentage of hardbottom within delineated reef areas (Section 3.2.2.2) so that net acreage can be calculated (Section 3.2.2.3). Video surveys will provide qualitative information on the community that has formed on each of the reefs. For each mitigative reef, impacts (project related loss of net acreage) shall be assessed by comparing the net acreage documented during each post-construction monitoring event to the pre-construction (baseline) net acreage. Net hardbottom acreages documented during the December 2013/January 2014 pre-construction monitoring event for the 2014 Coquina Beach Nourishment Project (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN) shall serve as the pre-construction (baseline) condition for the 1993, 2005, and 2011 Mitigative Artificial Reefs (Table 1).

Table 1. Net pre-construction (2013/2014) mitigative artificial reef acreage. Documented gross delineated acreage and mean percent hardbottom along transects are also provided.

Mitigative Reef	Monitoring Event (year)	Gross Acreage (ac)	Hardbottom (%)	Net Acreage (ac)
1993	2013/2014	6.28	49.1	**3.09**
2005	2013/2014	0.51	47.8	**0.24**
2011	2013/2014	5.32	88.7	**4.72**

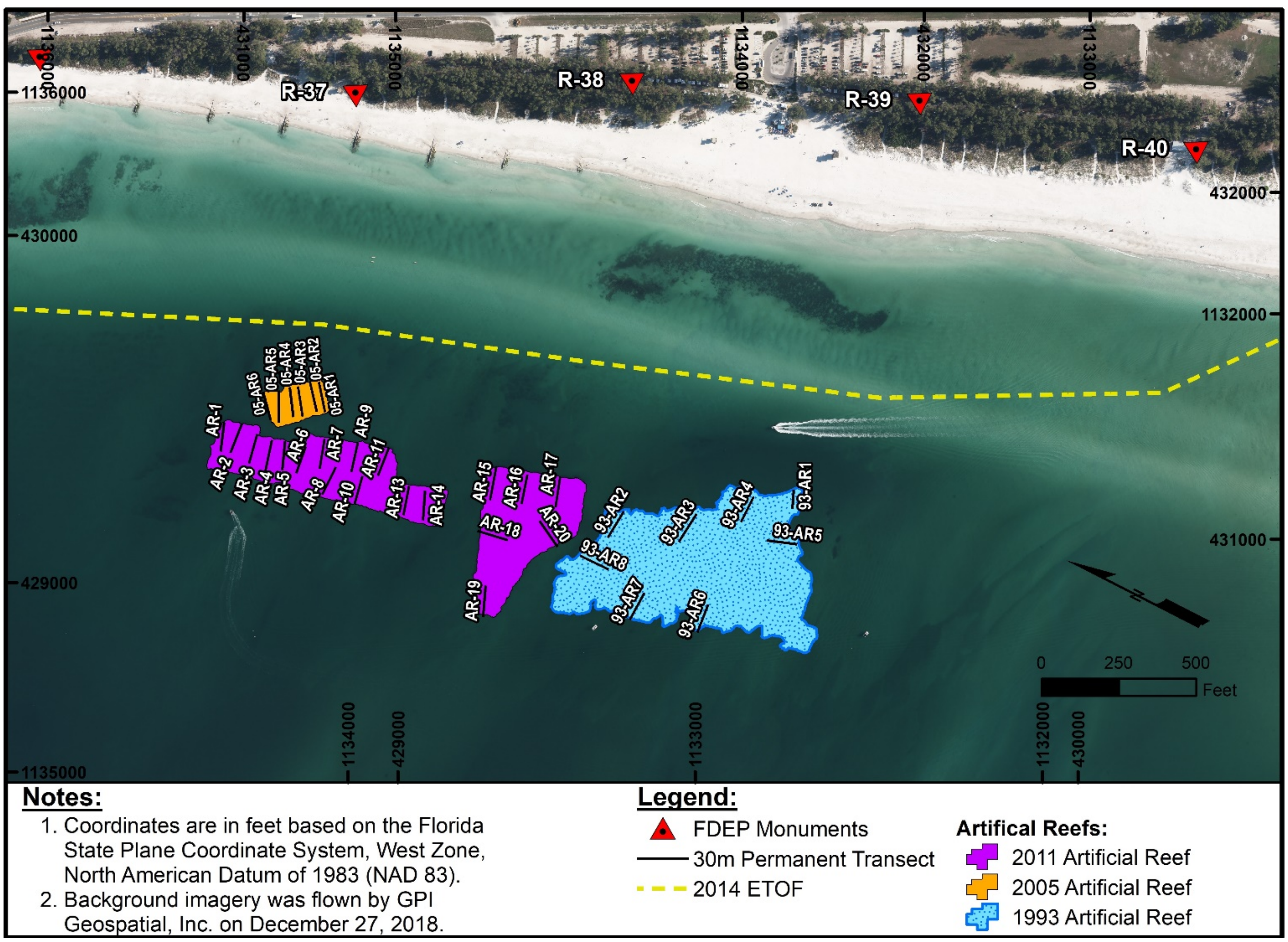


Figure 2. Anna Maria Island mitigative artificial reefs and locations of permanent monitoring transects.

3.2.1 Artificial Reef Monitoring Transects

A general summary of monitoring transects for each mitigative artificial reef is provided in Table 2. Specific information on transects (Sections 3.2.1.1 – 3.2.1.3) and surveys (Section 3.2.2) is provided below.

Table 2. Number of Anna Maria Island mitigative artificial reef transects by type.

Mitigative Reef	Transects		
	Permanent (N)	**Temporary (N)**	**Total (N)**
1993	8	42	50
2005	6	0	6
2011	20	30	50

3.2.1.1 1993 Artificial Reef Transects

Fifty (50) transects shall be surveyed on the 1993 Artificial Reef during each monitoring event, including 42 temporary transects and eight (8) permanent transects (Tables 2 and 3 and Figure 2). All transects shall be 30 m in length. Preceding each monitoring event, the location of the 42 temporary transects will be determined by randomly generating the start points and degree headings for each transect. Divers will use the GPS coordinates to locate each transect when conducting each monitoring event.

Table 3. Start and end positions of permanent transects on the 1993 Artificial Reef. Coordinates are in decimal degrees.

Transect	Start Point		End Point	
	Latitude	**Longitude**	**Latitude**	**Longitude**
93-AR 1*	27.449341	-82.696043	27.449273	-82.696218
93-AR 2*	27.450594	-82.697013	27.450614	-82.697319
93-AR 3*	27.450010	-82.696703	27.450036	-82.697033
93-AR 4*	27.449628	-82.696290	27.449626	-82.696572
93-AR 5	27.449090	-82.696511	27.449345	-82.696616
93-AR 6	27.449518	-82.697750	27.449546	-82.697454
93-AR 7	27.450105	-82.697948	27.450100	-82.697640
93-AR 8	27.450759	-82.697607	27.450475	-82.697599

*In addition to line-intercept surveys, video surveys will be conducted along transects 93-AR 1 to 93-AR 4 during each monitoring event.

3.2.1.2 2005 Artificial Reef Transects

The six (6) permanent transects (05-AR1 through 05-AR6) established on the 2005 Artificial Reef in April 2005 shall be surveyed during each monitoring event (Tables 2 and 4 and Figure 2). All transects shall be 30 m in length.

Table 4. Start and end positions of the six (6) permanent transects on the 2005 Artificial Reef. Coordinates are in decimal degrees.

Transect	Start Point		End Point	
	Latitude	Longitude	Latitude	Longitude
05-AR 1	27.453532	-82.697266	27.453360	-82.697504
05-AR 2	27.453605	-82.697302	27.453427	-82.697540
05-AR 3	27.453678	-82.697401	27.453519	-82.697647
05-AR 4	27.453740	-82.697446	27.453590	-82.697694
05-AR 5	27.453814	-82.697526	27.453678	-82.697812
05-AR 6	27.453933	-82.697605	27.453758	-82.697824

*In addition to line-intercept surveys, video surveys will be conducted along all six (6) transects during each monitoring event.

3.2.1.2 2011 Artificial Reef Transects

Fifty (50) transects shall be surveyed on the 2011 Artificial Reef during each monitoring event, including 30 temporary transects and 20 permanent transects (Tables 2 and 5 and Figure 2). All transects shall be 30 m in length. Preceding each monitoring event, the location of the 30 temporary transects shall be determined by randomly generating the start point and degree heading for each transect. Divers shall use the GPS coordinates to locate each transect when conducting each line-intercept survey.

Table 5. Start and end positions of the 20 permanent transects on the 2011 Artificial Reef. Coordinates are in decimal degrees.

Transect	Start Point		End Point	
	Latitude	Longitude	Latitude	Longitude
11-AR 1*	27.454115	-82.698056	27.454023	-82.698333
11-AR 2*	27.453969	-82.697985	27.453940	-82.698300
11-AR 3	27.453806	-82.698010	27.453749	-82.698307
11-AR 4*	27.453664	-82.697995	27.453589	-82.698305
11-AR 5	27.453556	-82.697945	27.453459	-82.698214
11-AR 6	27.453371	-82.697898	27.453338	-82.698178
11-AR 7*	27.453254	-82.697746	27.453170	-82.698032
11-AR 8	27.453045	-82.698249	27.453049	-82.697942
11-AR 9*	27.452975	-82.697626	27.452906	-82.697913
11-AR 10	27.452751	-82.698178	27.452803	-82.697900
11-AR 11*	27.452709	-82.697524	27.452681	-82.697827
11-AR 12	27.452482	-82.697819	27.452449	-82.698106
11-AR 13*	27.452394	-82.697771	27.452318	-82.698057
11-AR 14*	27.452249	-82.697742	27.452143	-82.698014
11-AR 15*	27.451782	-82.697208	27.451697	-82.697529
11-AR 16*	27.451507	-82.697130	27.451432	-82.697418
11-AR 17*	27.451239	-82.697000	27.451149	-82.697293
11-AR 18	27.451671	-82.697859	27.451393	-82.697802
11-AR 19	27.451274	-82.698597	27.451382	-82.698305
11-AR 20	27.450972	-82.697633	27.451221	-82.697484

*In addition to line-intercept data, video will be recorded along 11 shore facing transects during monitoring events.

3.2.2 Artificial Reef Survey Methods

Physical surveys to document gross acreage and estimate net acreage will be conducted for each mitigative reef (1993, 2005, and 2011 Artificial Reefs) each monitoring event (Sections 3.2.2.1 – 3.2.2.3). Video surveys along specified permanent transects will also be conducted during each monitoring event (Section 3.2.2.4).

3.2.2.1 In-Situ Artificial Reef Delineation

Divers will delineate the edge of the 1993, 2005, and 2011 Artificial Reefs (Figure 2) during each monitoring event using the methodology detailed in Section 2.3. As specified, divers shall swim the edge (perimeter) of each artificial reef around its full extent while towing a buoy equipped with a DGPS antenna attached by a cable to a HYPACK navigation software system onboard a survey vessel. For each monitoring event, the acreage of the delineated area (gross acreage) shall be determined for each mitigative reef.

3.2.2.2 Line-Intercept

To measure the percentage of hardbottom present within the delineated boundary (gross acreage) of each mitigative artificial reef, line-intercept data will be collected along permanent and temporary transects during each monitoring event using the methodology detailed in Section 2.1.1.2. For the 1993 Artificial Reef, divers shall collect line-intercept data along all 42 temporary transects and all eight (8) permanent transects (total of 50 transects) during each monitoring event (Table 3). For the 2005 Artificial Reef, divers shall collect line-intercept data and video data along all six (6) permanent transects during each monitoring event (Table 4). For the 2011 Artificial Reef, divers shall collect line intercept data along all 30 temporary transects and all 20 permanent transects during each monitoring event (Table 5).

3.2.2.3 Net Hardbottom Acreage Calculation

For each monitoring event, the net acreage of each mitigative reef shall be calculated as the product of gross acreage (delineated artificial reef area) and the percentage of hardbottom within the delineated area. Gross hardbottom acreage is determined by the in-situ delineation of the edge of each mitigative reef (Section 3.2.2.1). The percentage of hardbottom within the delineated area is based on the mean measured ratio of hardbottom to gaps (spaces/sand between boulders) as determined by the line-intercept surveys along transects (Section 3.2.2.2). The percentage of linear area covered by artificial hardbottom (boulders/concrete) along each transect shall be averaged across all transects to calculate mean percentage hardbottom. For each mitigative reef, this mean value (mean percent hardbottom) shall be multiplied by the delineated gross acreage of the reef to arrive at an estimate of net hardbottom acreage for each monitoring event. For each monitoring event, the estimated post-construction net acreage shall be compared to the documented pre-construction net acreage in Table 1 for each of the three mitigative reefs. Delineated gross acreages and net acreage estimates along with all raw data used in calculations (i.e., results of in situ artificial reef delineation and line-intercept surveys) shall be provided to the FDEP following each post-construction artificial reef monitoring event.

3.2.2.4 Video Survey

Divers will record video along specific permanent mitigative artificial reef transects on the 1993, 2005, and 2011 Artificial Reefs (Figure 2) during each monitoring event using the methodology detailed in Section 2.1.4. For the 1993 Artificial Reef, divers shall collect video data along the four (4) shore facing permanent transects (Transects 93-AR 1 to 93-AR 4) during each monitoring event (Tables 3 and 6). For the 2005 Artificial Reef, divers shall collect line-intercept data and video data along all six (6) permanent transects during each monitoring event (Tables 4 and 6). For the 2011 Artificial Reef, divers shall collect video data along 11 shore facing transects (Transects 1, 2, 4, 7, 9, 11, 13, 14, and 15, 16, 17) (Tables 5 and 6).

Table 6. Shore facing permanent transects along which video surveys shall be conducted.

Mitigative Reef	Transect
1993	93-AR 1
	93-AR 2
	93-AR 3
	93-AR 4
2005	05-AR 1
	05-AR 2
	05-AR 3
	05-AR 4
	05-AR 5
	05-AR 6
2011	11-AR 1
	11-AR 2
	11-AR 4
	11-AR 7
	11-AR 9
	11-AR 11
	11-AR 13
	11-AR 14
	11-AR 15
	11-AR 16
	11-AR 17

4.0 LONGBOAT KEY MONITORING PROTOCOL

When sand dredged from the Longboat Pass Navigational Maintenance Dredging Project is placed on the Longboat Key fill placement area (Figure 1), pre- and post-construction natural hardbottom and artificial reef biological monitoring will be required. This section describes the natural hardbottom and artificial reef resources located adjacent to the Longboat Key fill placement area, and details how the methods in Section 2.0 will be implemented. The monitoring and reporting schedule is summarized in Section 5.0.

4.1 Existing Hardbottom Resources

4.1.1 Natural Hardbottom

Nearshore hardbottom habitat is present along the northern portion of the Longboat Key project area shoreline (Figure 3). In 2002, CPE conducted a sidescan sonar survey of the nearshore region adjacent to Longboat Key between FDEP survey control monuments R-42 (Longboat Pass in Manatee County) and R-29.5 (New Pass in Sarasota County), along approximately 10 miles of shoreline. The survey documented three hardbottom formations located in the nearshore between R-49 and R-51.5 representing approximately 14 ac. The hardbottom formations are generally low relief (< 1 ft) and likely ephemeral in nature. As part of the 2005/06 Longboat Key Beach Renourishment Project, the permit-required biological monitoring program included in situ diver delineation of the hardbottom formation that occurred inshore of the equilibrium toe of fill (ETOF) (between R-49 and R-49.5) (Figure 3) as well as characterization of the benthic community found there. Quantitative analysis between 2006 and 2009 revealed a community dominated by turf and macroalgae species (CPE, 2010). The macroalgae community primarily consisted of *Hypnea, Gracilaria*, Codium, and Sargassum species. *Dictyota, Caulerpa*, and *Padina* were also frequently observed (CPE, 2010). Coral cover in the nearshore benthic community was generally less than 1% of the total cover assessed. *Leptogorgia virgulata* and *Leptogorgia hebes* were the only octocoral species observed. The stony coral community was dominated by *Solenastrea* spp., but also included *Siderastrea siderea*, *Phyllangia americana*, *Oculina robusta*, and *Cladocora arbuscula*.

4.1.2 Artificial Reefs

In addition to the natural nearshore hardbottom resources adjacent to Longboat Key, there are artificial reefs in the nearshore marine environment seaward of the permitted ETOF. The Town of Longboat Key constructed a series of three artificial reef installations, totaling 1.5 acres of mitigation, in 2005 and 2006 to offset anticipated impacts to 1.5 acres of hardbottom between R-49.5 and R-51.5 from the Town of Longboat Key's 2005/06 Beach Renourishment Project (Figure 3). These reefs were constructed from July 2005 to August 2006. Limestone boulders 3.5 ft in diameter were placed in an area of sand between two natural hardbottom habitats offshore of northern Longboat Key in water depths of 4 m to 6 m (12 ft to 15 ft). To determine the effectiveness of active management techniques (transplantations) and coral recruitment enhancers (larval attractants and grazers) in establishing target epibenthic communities and reducing the temporal lag in habitat function, macroalgae, coral colonies, and urchins were transplanted to designated areas of the artificial reef. Pursuant to FDEP Permit No. 0202209-001-JC, these artificial reefs were monitored for five years to document success.

4.2 Monitoring Methods

Monitoring for the Longboat Pass Navigational Maintenance Dredging Project will occur on the nearshore hardbottom that is located within and immediately south of the Longboat Key project template. Additional transects will be established on the artificial reef to ensure that the project does not affect the mitigation already in place. Hardbottom edge mapping will also track any changes in exposed hardbottom (natural and artificial).

4.2.1 Natural Hardbottom Monitoring Transects

A total of nine (9) permanent nearshore hardbottom transects will be monitored adjacent to the Longboat Key sand placement area. The eight transects previously monitored for the 2005/2006 Longboat Key Nourishment Project will be monitored for the proposed project, including five outside the ETOF and three within the ETOF. Three of the previously monitored transects (TS4, TS5, and TS7) will be extended to terminate at the seaward extent of the hardbottom, and an additional transect (TS9) will be established beyond the ETOF for future monitoring (Figure 4, Table 7).

Ten (10) permanent quadrats (those established to monitor the 2005/2006 Longboat Key Nourishment project) shall be used to sample the entire length of transects TS6, TS7 and TS8 and to sample the original 30 m lengths of TS4 and TS5; the additional transect lengths established along transects TS4, TS5, and TS7 will be sampled at a ratio of 1 quadrat per every 10 m of transect line. These quadrats will be placed to avoid any areas of 100% sand cover (i.e., quadrat placement will be biased to include hardbottom). The location of each permanent quadrat will be recorded and marked by the installation of two pins.

The additional transect that will be established (TS9) will start at the shoreward edge of hardbottom (but not within the ETOF) and will continue to the seaward extent of hardbottom in the immediate area. Permanent quadrats (0.5 m^2 each) shall be installed at a ratio of 1 quadrat per every 3 m of transect line. Quadrats will be distributed along the entire length of the transects, starting from meter 0 (shoreward edge). These quadrats will be placed to avoid any areas of 100% sand cover (i.e., quadrat placement will be biased to include hardbottom). The location of each permanent quadrat will be recorded and marked by the installation of two pins.

The following methods, each described in Section 2.1, will be utilized on the seven (6) monitoring transects located outside the Longboat Key ETOF (TS4 – TS9) (Figure 4, Table 7) in order to determine potential project-related impacts:

- Line-Intercept for Sediment
- Interval Sediment Depth

- Benthic Characterization: BEAMR
- Video Documentation

The three (3) transects located within the ETOF (TS1 – TS3) will be monitored only through collection of video data (described in Section 2.2). These transects (Figure 4, Table 7) are located within the anticipated impact area and impacts to these resources from previous projects have already been offset through construction of mitigative artificial reefs. As such, this information will not be used to determine project impacts, but may help better understand the movement of sand following construction of beach nourishment projects.

Table 7. Longboat Key nearshore hardbottom transects monitoring methodology. Unless otherwise noted, all transects were established and monitored for the Longboat Key 2005/06 Beach Renourishment Project.

Transect	Line-Intercept and Interval Sediment Depth	BEAMR	Video
Outside ETOF			
TS 4[1]	X	X	X
TS 5[1]	X	X	X
TS 6	X	X	X
TS 7[1]	X	X	X
TS 8	X	X	X
TS 9[2]	X	X	X
Within ETOF			
TS 1			X
TS 2			X
TS 3			X

[1] Transects will be extended to include full extent of hardbottom observed during the pre-construction survey.
[2] New (proposed) transects will be established during the pre-construction survey based on the location and extent of hardbottom observed.

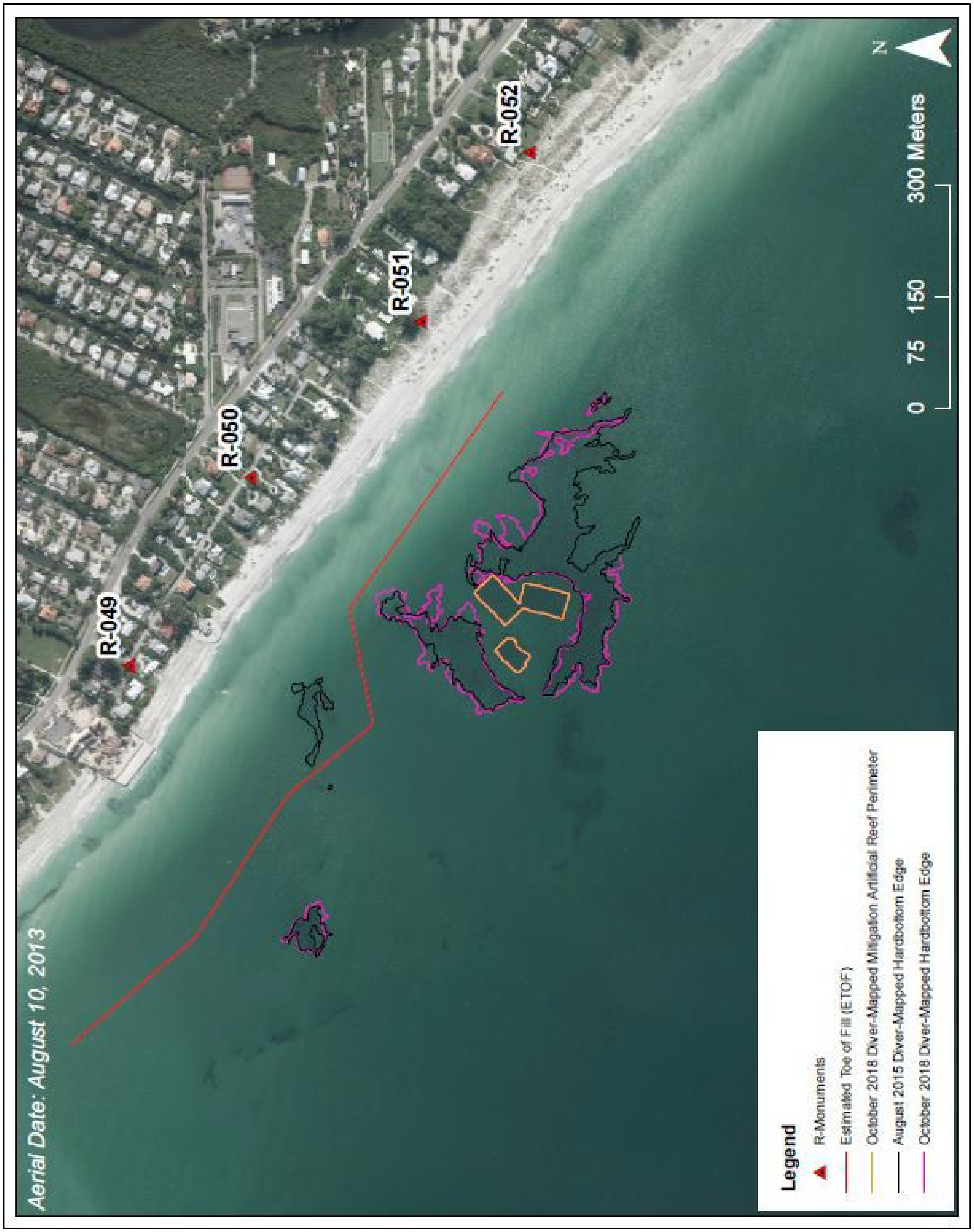


Figure 3. Nearshore hardbottom and artificial reefs located between R-49.5 and R-51.5 on Longboat Key.

Figure 4. Locations of permanent nearshore hardbottom biological and video only monitoring transects and permanent mitigative reef transects in the area between R-49.5 and R-51.5.

4.2.2 Artificial Reef Monitoring Transects

The Longboat Key Artificial Reef will be monitored in order to determine any potential additional and unmitigated impacts as a result of the Longboat Pass Navigational Maintenance Dredging Project. The following methods, each described in Section 2.1, will be utilized on the artificial reef transects:

- Line-Intercept
- Video Documentation

Twenty-seven (27) transects will be monitored on the Longboat Key Artificial Reef during each survey, including 21 temporary transects and six (6) permanent transects. All transects will be 30 m in length. Line-intercept data will be collected along all 27 transects. Video will be collected only along the six permanent transects. Preceding each survey, locations of the 21 30-m temporary artificial reef transects will be determined by randomly generating the start points and degree headings for each transect. Divers will use the GPS coordinates to locate each transect when conducting the survey. The six permanent transects will be installed during the pre-construction survey.

4.2.3 In-Situ Hardbottom and Artificial Reef Delineation

Divers will delineate the edge of nearshore natural hardbottom and the artificial reef during each monitoring survey using the methodology detailed in Section 2.3. The gross acreage (area within the delineated boundary) shall be determined for each mitigative reef following delineation.

4.2.4 Artificial Reef Net Acreage Calculation

For each mitigative reef, net acreage shall be calculated as the product of the gross acreage and the mean percentage of hardbottom within the delineated boundary. Gross acreage is obtained through in-situ boundary delineation. The percentage of hardbottom (measured ratio of hardbottom to sand/gaps) within the delineated boundary of each mitigative reef is obtained through line intercept surveys along permanent and temporary transects. Once collected, the percentage of hardbottom along each permanent and temporary transect must be averaged across all transects within a mitigative reef to arrive at the mean percentage of hardbottom within the mitigative reef. For each mitigative reef, the respective mean value (percentage of hardbottom) shall be multiplied by the respective measured gross acreage to arrive at net acreage.

5.0 MONITORING TEAM AND SCHEDULE

5.1 Monitoring Team Requirements

The names and qualifications of staff performing biological monitoring surveys shall be submitted by the Permittee or their Agent to the FDEP for review and approval. Biological monitoring surveys shall be conducted by staff with previous experience in monitoring hardbottom communities and with scientific knowledge of local benthic marine ecosystems and flora and fauna. All in-water crew members responsible for in situ quadrat data collection shall participate in cross training to verify correct species identification and survey practices as Quality Assurance/Quality Control (QA/QC) procedures at the beginning of each monitoring event. QA/QC results shall reflect consistency of 90% for percent cover and identification of functional groups between observers.

5.2 Monitoring Schedule

The Longboat Pass Navigational Maintenance Dredging Project will include dredging of a navigation channel in Longboat Pass with sediment placement along the adjacent Manatee County shorelines on the southern Anna Maria Island shoreline between R-30 and R-41+305 feet and about 1.4 miles on the north end of Longboat Key between R-43.5 and R-50.5 (Figure 1). The placement location (i.e. Anna Maria Island and/or Longboat Key) will vary between maintenance dredging events depending on the timing and volume removed from the channel, but following each dredge event, dredged material will be placed within either (or both) of the two proposed templates.

In order to address cumulative effects of ongoing/subsequent nourishment, the baseline to which post-construction monitoring will be compared for subsequent nourishments shall remain the pre-construction monitoring event (natural hardbottom and artificial reef) for the first nourishment conducted for the Longboat Pass Navigational Maintenance Dredging Project. A pre-construction (baseline) monitoring event will be required prior to sand placement on the Longboat Key project shoreline. The December 2013/January 2014 pre-construction monitoring event for the 2014 Coquina Beach Nourishment Project (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN) shall serve as the pre-construction (baseline) condition for the 1993, 2005, and 2011 Artificial Reefs (Table 1) for the Anna Maria Island portion of the project.

Each nourishment conducted for the Longboat Pass Navigational Maintenance Dredging Project shall initiate a complete round of post-construction monitoring. Each round of post-construction artificial reef monitoring for the Anna Maria Island project shoreline shall include a total of three (3) annual monitoring events, at years 1, 2, and 3 post-construction (Table 8). Each round of post-construction monitoring for the Longboat Key project shoreline shall include four (4) monitoring events for nearshore hardbottom and artificial reefs: one initial post-construction monitoring event (within six months of project completion), and three annual post-construction monitoring events (Years 1, 2, and 3) (Table 8). All monitoring shall be conducted in summer months (May 1 through September 30), although the pre-construction (baseline) monitoring event for Longboat Key may be conducted outside of this window if necessary, to accommodate the construction schedule. If the pre-construction monitoring event on Longboat Key is collected in non-summer months, then subsequent post-construction monitoring events shall be conducted in the same time of year as the pre-construction monitoring event. In some cases, the dredged sand may be placed alternately between the Anna Maria and Longboat Key shorelines, and on some occasions the sand may be split between the two shorelines during the same dredge/fill event. Regardless of whether both beach sections (Anna Maria Island and Longboat Key) are nourished together or independent of one another, nourishment shall initiate a complete round of post-construction monitoring for the areas that are nourished. The Anna Maria Island and Longboat Key biological monitoring shall be conducted and reported on independently.

Table 8. Longboat Pass Navigational Maintenance Dredging Project monitoring summary and schedule.

Project Area	Survey	Survey Type	Monitoring Period	Deliverables
Anna Maria	Artificial Reef Physical	In-situ Delineation	**Post-Construction** (N=3 per placement event) Years 1, 2, and 3	Shapefiles
		Line-Intercept (Permanent and Temporary transects)		Excel spreadsheet, PDF of field sheets
	Artificial Reef Video	Video (Permanent transects only)		Video
Longboat Key	Natural Hardbottom within ETOF	Video (Transects)	**Pre-Construction** (N=1): once prior to first fill placement. **Post-Construction** (N=4 per fill placement event) Immediately (within 6 months) and years 1, 2, and 3).	Video
	Natural Hardbottom Seaward of ETOF	In-situ HB Delineation		Shapefiles
		Line-Intercept		Excel spreadsheets, PDF of field sheets
		Interval Sediment Depth		
		Quadrats (BEAMR)		
		Video		Video
	Artificial Reef Physical	In-situ Delineation		Shapefiles
		Line-Intercept (Permanent and Temporary transects)		Excel spreadsheet, PDF of field sheets
		Video (Permanent transects only)		Video

6.0 REPORTING REQUIREMENTS

6.1 Notification of Commencement, Progress, and Completion of Work

Commencement dates of monitoring events will be reported via email to the FDEP JCP Compliance Officer (JCPCompliance@dep.state.fl) and to staff in the Beaches, Inlets, and Ports program roughly seven (7) days prior to the start of monitoring and the day that monitoring begins. Brief monitoring progress reports will be submitted (emailed) weekly to the JCP Compliance Officer until completion of the monitoring event, and the JCP compliance officer shall be notified as soon as monitoring activities have ended that the monitoring event has been completed.

6.2 Monitoring Data Submissions

Raw data shall be submitted to FDEP within 45 days following completion of each pre- and post-construction monitoring event. To be eligible for state cost sharing, all benthic monitoring data and statistical analysis must be provided directly and concurrently from the monitoring firm to the FDEP, Permittee, Consultant(s), and Local Sponsor(s) in order to comply with the Florida Auditor General report 2014-064 and to be consistent with Section 287.057(17)(a)(1), F.S. Raw data provided to the FDEP shall consist of the following, each of which is described below: video and photographs, hardbottom edge survey data, raw transect survey data, and field datasheets.

6.2.1 In-situ Hardbottom and Mitigative Artificial Reef Delineations

Hardbottom and artificial reef boundary/perimeter data shall be supplied as separate collections of shapefiles (e.g., as ESRI file geodatabases). Polygons shall represent the in situ mapped boundaries/perimeters of hardbottom areas and mitigative artificial reefs for data obtained from each monitoring event. Polygons representing the baseline (pre-construction or other specified event) in situ mapped hardbottom and artificial reef boundaries/perimeters shall be provided with each collection of shapefiles. For nearshore hardbottom, a line representing the permitted ETOF shall also be provided with each post-construction collection of shapefiles.

6.2.2 Transect Survey Data

Interval sediment depth measurements, line-intercept data, and BEAMR quadrat data collected along transects shall be supplied in Excel format. Separate Excel workbooks shall be supplied for nearshore hardbottom data and for mitigative artificial reefs.

6.2.3 Video Data

Video data collected along transects shall be supplied to the FDEP. Separate folders shall be used to differentiate data collected along hardbottom transects (within and outside ETOF) and along mitigative reef transects. This BMP does not incorporate post collection analysis of video documentation, but relies on in situ surveys (hardbottom edge mapping, sediment depth measurements, line-intercept data, and quadrat monitoring [BEAMR data]) to provide the basis for comparative analyses and effect determinations. However, if visual signs of impact are recorded and/or in situ surveys demonstrate impacts, video survey data could be used for additional data collection and analysis in order to refine assessment of impact area, as video surveys have the advantage (over quadrat surveys) of providing continuous information along transects. In such a case, frame grabbing and application of PointCount procedures to video records may be requested. These data would be reviewed and compared between surveys in order to document qualitative and quantitative changes along transects over time for the purpose of refining impact area assessment. In recognition of the reduced visibility often encountered in the project vicinity, FDEP would need to determine if the quality of the video facilitates use of video analysis.

6.2.4 Field Datasheets

Copies (photographs or scans) of field datasheets shall be submitted in pdf format.

6.3 Monitoring Report Submissions

Monitoring reports shall be submitted to FDEP for review within 90 days of completion of each post-construction monitoring event beginning with the immediate post-construction monitoring event for Longboat Key. The Anna Maria Island and Longboat Key biological monitoring will be conducted and reported on independently. Data shall be analyzed to determine any potential additional and unmitigated impacts to natural hardbottom and/or mitigative artificial reefs due to the Longboat Pass Navigational Maintenance Dredging Project. These reports shall compare the nearshore natural hardbottom and artificial reefs on temporal scales (pre- vs. post-construction). The immediate post-construction report and all following (post-construction) reports shall compare data to the initial baseline (pre-construction or other specified monitoring event). Parametric and non-parametric statistical analyses shall be used to determine if and where changes occurred to natural and artificial hardbottom areas and communities. Notable observations regarding benthic community conditions will be documented to supplement the statistical data analysis.

Annual monitoring reports shall include:

- A map including the Longboat Pass Navigational Maintenance Dredging Project Area and adjacent hardbottom resources and monitoring transects overlaid onto recent, clear aerial photographs;
- A detailed description of monitoring methods and statistical analyses used;
- Graphical representation and analysis of sedimentation on the hardbottom transects outside the ETOF based on line-intercept data, interval sediment depth measurement data, and benthic data from quadrats;

- Analysis of sedimentation on the artificial reef transects based on line-intercept data;
- Graphical representation of dynamics of major benthic groups and sediment cover;
- Multivariate analysis of benthic data from transects located outside the ETOF, including nearshore hardbottom and artificial reefs (*e.g.*, percent cover by corals, octocoral, sponges, and algae);
- A general description of the condition (*e.g.,* exposed or buried) of transects or portions of transects located within the ETOF;
- A comparison of post-construction monitoring results to pre-construction monitoring results;
- A map comparing the most recent annual hardbottom and artificial reef delineation and all previous hardbottom delineations;
- Comparison of pre- vs. post-construction net hardbottom acreage;
- Copies of all transect video submitted on DVDs;
- All raw data in the format that was used for the analysis.

7.0 LITERATURE CITED

Coastal Planning & Engineering, Inc. (CPE). 2010. Town of Longboat Key, Florida, 2005/06 Beach Renourishment Project Fourth Post-Construction Hardbottom Monitoring and Mitigation Report (FDEP Permit No. 0202209-001-JC). January 2012.

Coastal Planning & Engineering, Inc. (CPE). 2012. Coquina Beach Restoration Project, 2011 Artificial Reef Line-Intercept Survey, Field Observation Report, October 11, 2012.

Lybolt, M. and R. Baron. 2006. BEAMR (Benthic Ecological Assessment for Marginal Reefs): a preferred replacement for AGRRA and similar benthic assessment methods tailored for marginal reefs. Proceedings from the 2006 ISRS European Meeting. Bremen,Germany.

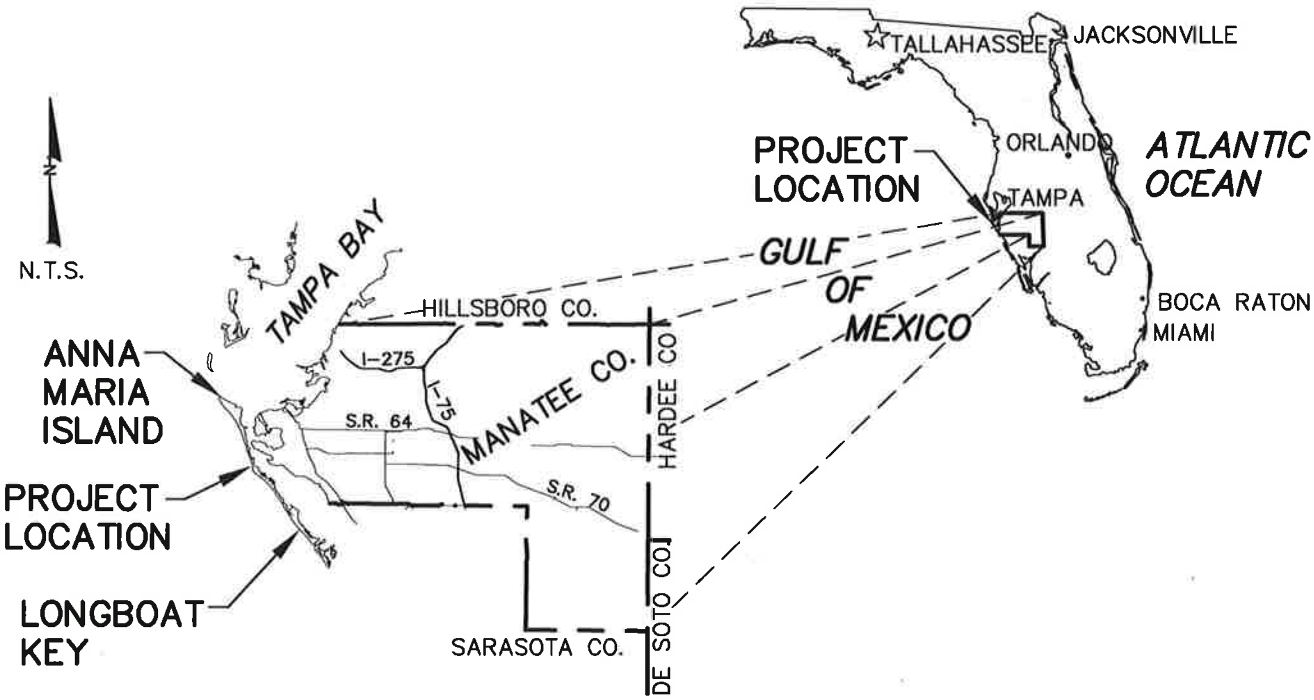
APPENDIX A - PERMITS

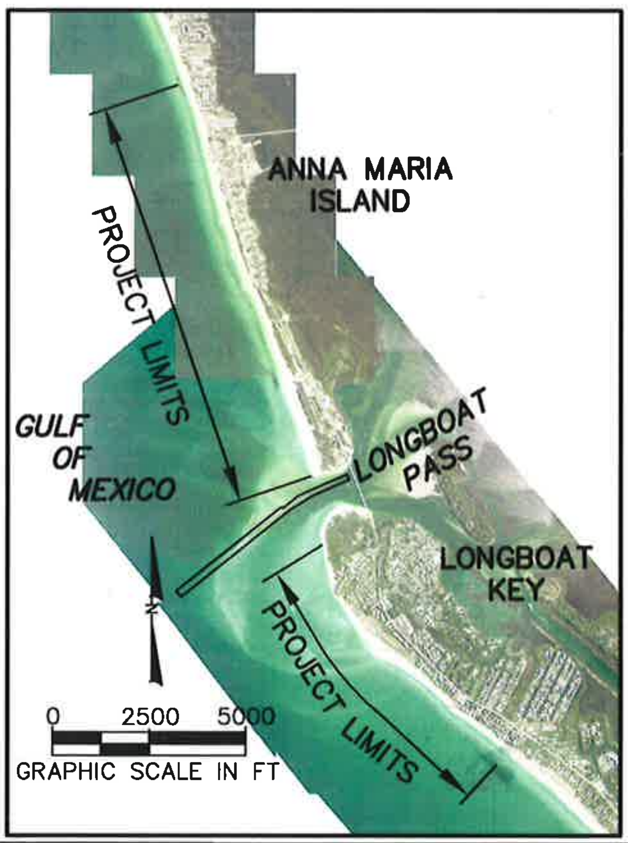
USACE PERMIT ATTACHMENT 1:
APPROVED PERMIT DRAWINGS

12 PAGES (OCT 2014)
2 PAGES (JULY 2016)

SAJ-2014-00606 (SP-MEP)

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT MANATEE COUNTY, FLORIDA





SHEET INDEX

NO.	TITLE
1	COVER SHEET
2–7	PLAN VIEWS
8–9	FILL PROFILES
10	LONGBOAT PASS DREDGE AREA PLAN VIEW
11	CROSS SECTIONS A–A' AND B–B'
12	CROSS SECTIONS C–C' AND D–D'

MICHELLE REES PFEIFFER LICENSE No 76209 STATE OF FLORIDA PROFESSIONAL ENGINEER

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FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer

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10/6/14
DATE

REVISIONS		
DATE	BY	DESCRIPTION

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
COVER SHEET

COASTAL PLANNING & ENGINEERING, INC.
2481 N.W. BOCA RATON BOULEVARD
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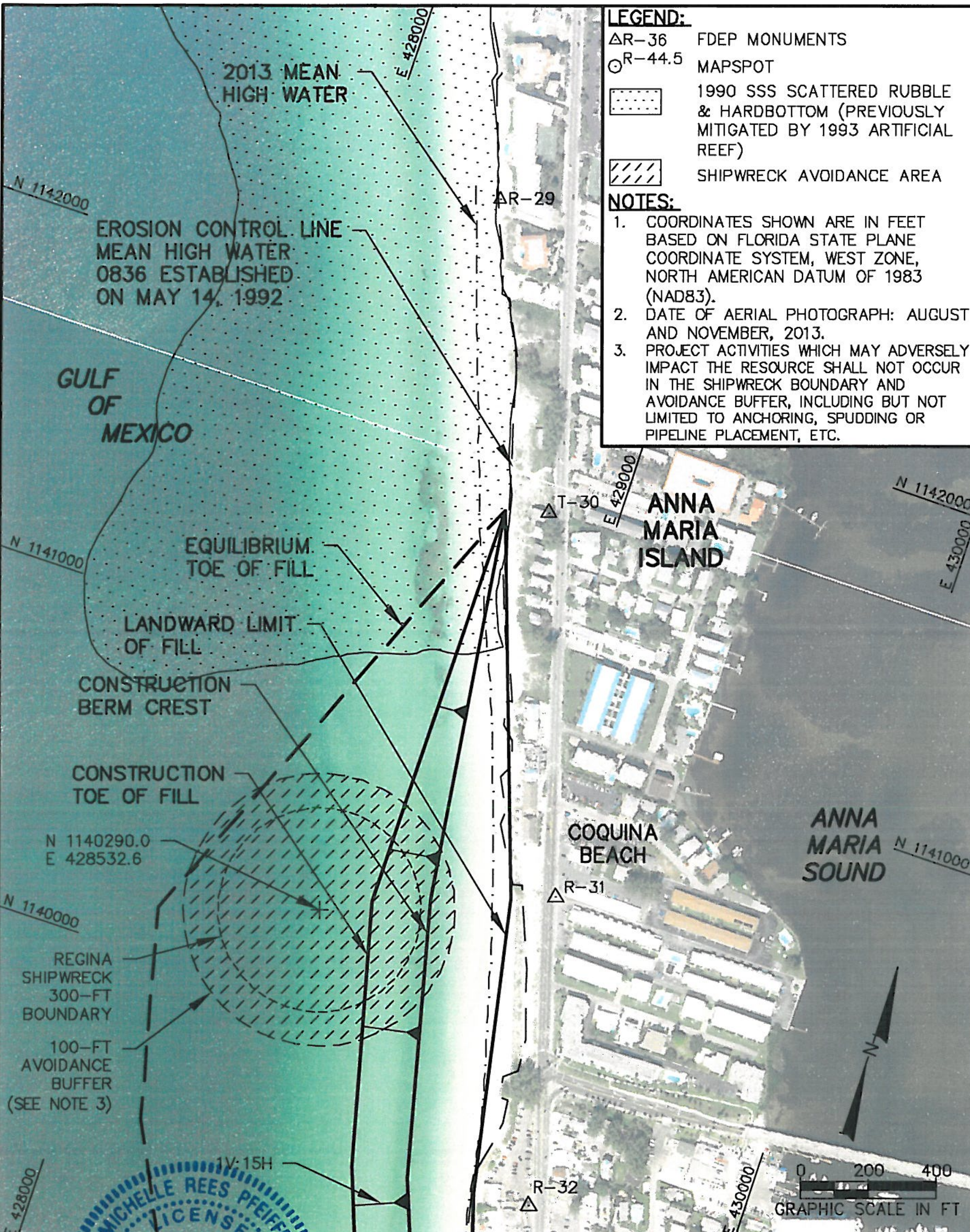
DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 1



MATCHLINE SEE SHEET 3

LEGEND:

- △R-36 FDEP MONUMENTS
- ⊙R-44.5 MAPSPOT
- 1990 SSS SCATTERED RUBBLE & HARDBOTTOM (PREVIOUSLY MITIGATED BY 1993 ARTIFICIAL REEF)
- SHIPWRECK AVOIDANCE AREA

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST AND NOVEMBER, 2013.
3. PROJECT ACTIVITIES WHICH MAY ADVERSELY IMPACT THE RESOURCE SHALL NOT OCCUR IN THE SHIPWRECK BOUNDARY AND AVOIDANCE BUFFER, INCLUDING BUT NOT LIMITED TO ANCHORING, SPUDDING OR PIPELINE PLACEMENT, ETC.

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
PLAN VIEW

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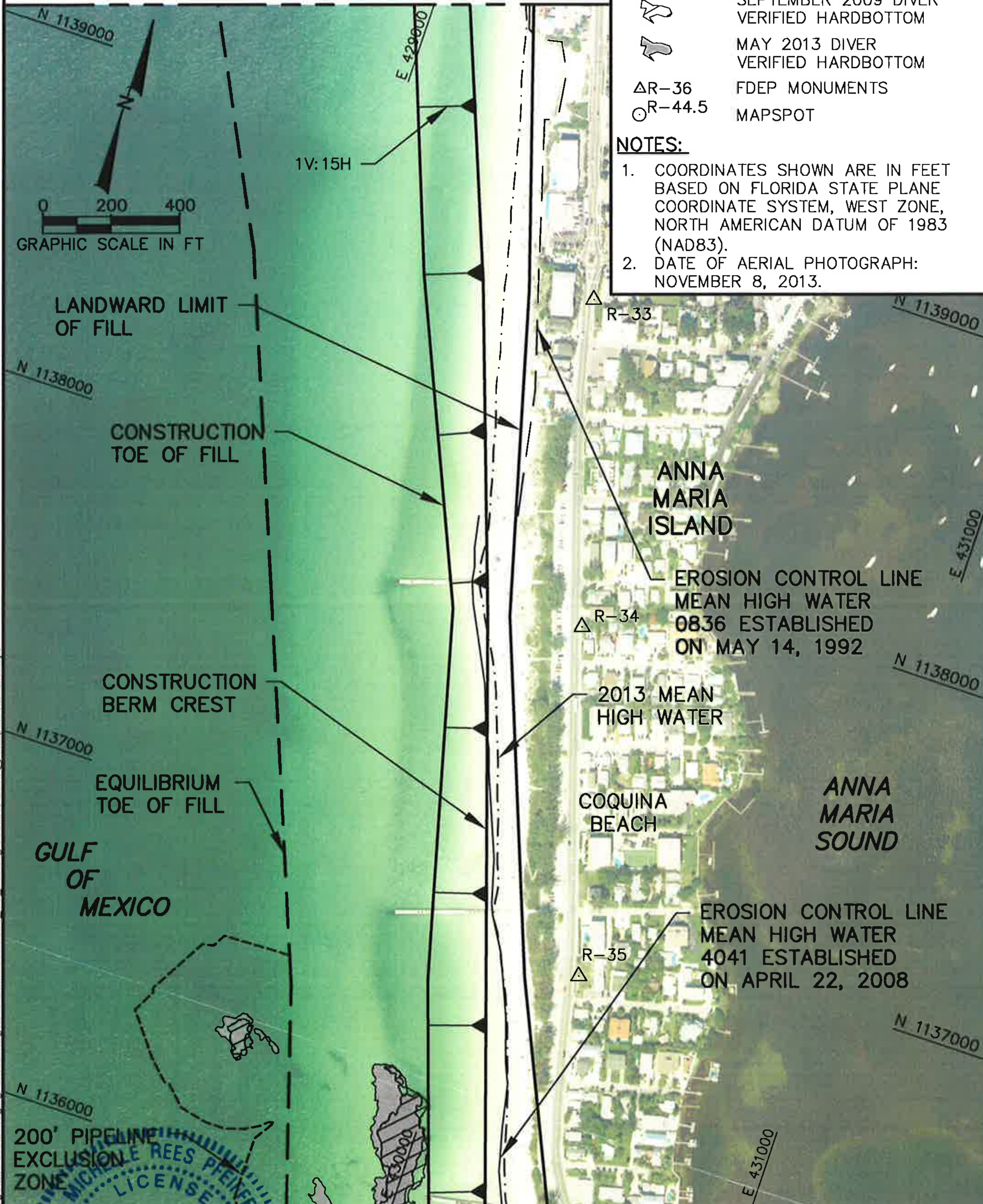
MATCHLINE SEE SHEET 2



LEGEND:

SEPTEMBER 2009 DIVER VERIFIED HARDBOTTOM

MAY 2013 DIVER VERIFIED HARDBOTTOM

△R-36 FDEP MONUMENTS

⊙R-44.5 MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: NOVEMBER 8, 2013.

MATCHLINE SEE SHEET 4

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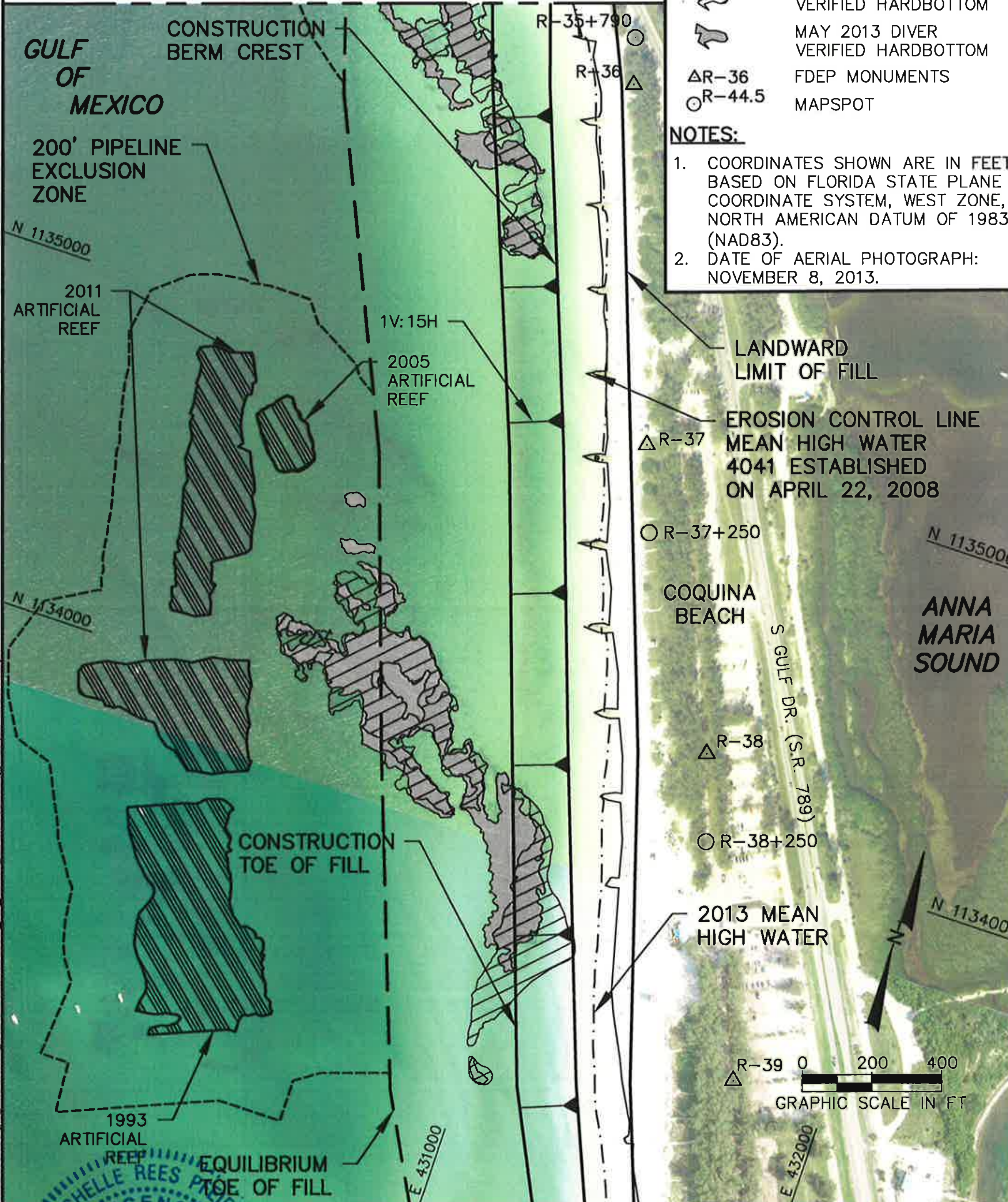
MATCHLINE SEE SHEET 3



MATCHLINE SEE SHEET 5

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LEGEND:

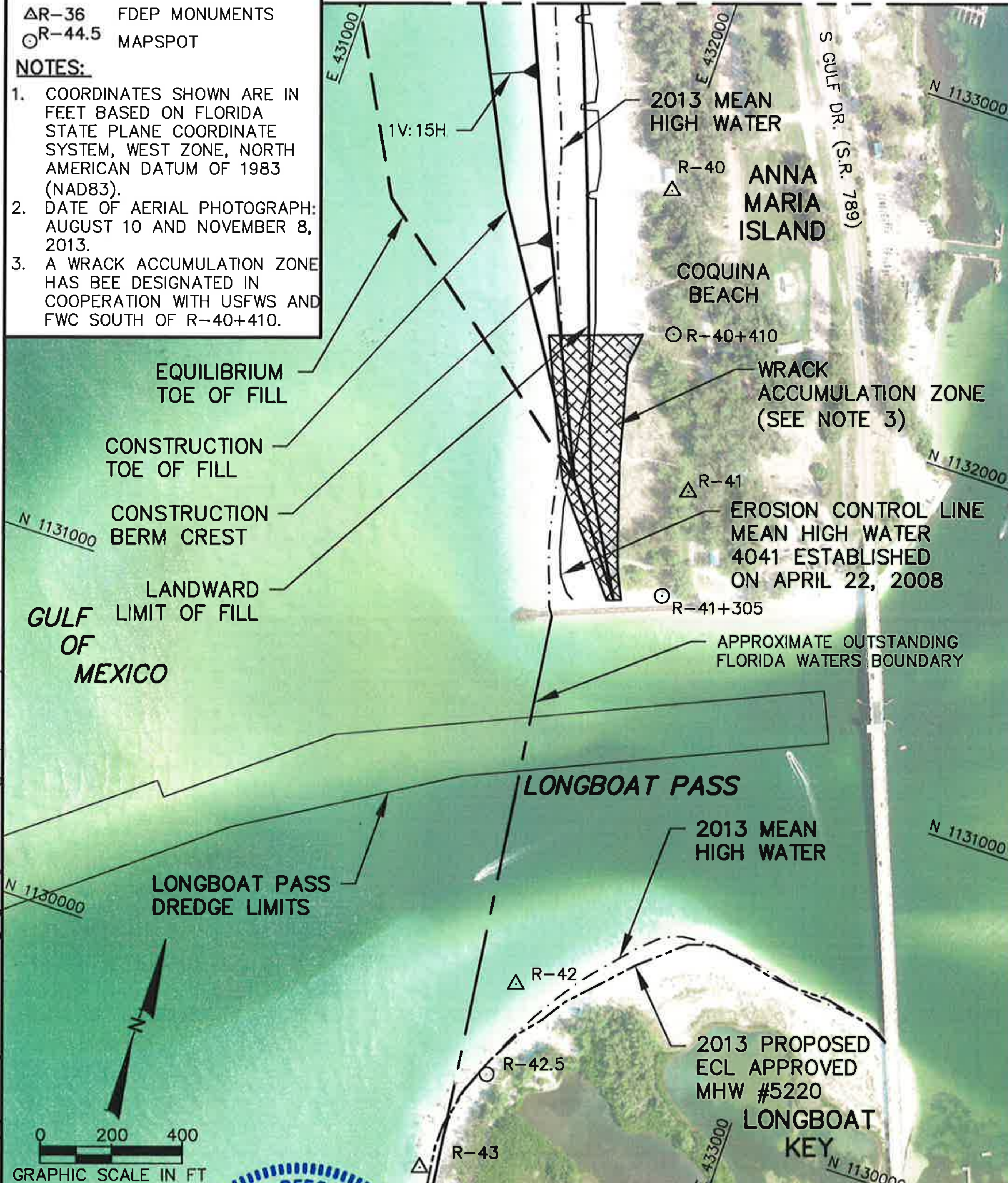
△R-36 FDEP MONUMENTS

⊙R-44.5 MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST 10 AND NOVEMBER 8, 2013.
3. A WRACK ACCUMULATION ZONE HAS BEE DESIGNATED IN COOPERATION WITH USFWS AND FWC SOUTH OF R-40+410.

MATCHLINE SEE SHEET 4



MATCHLINE SEE SHEET 6

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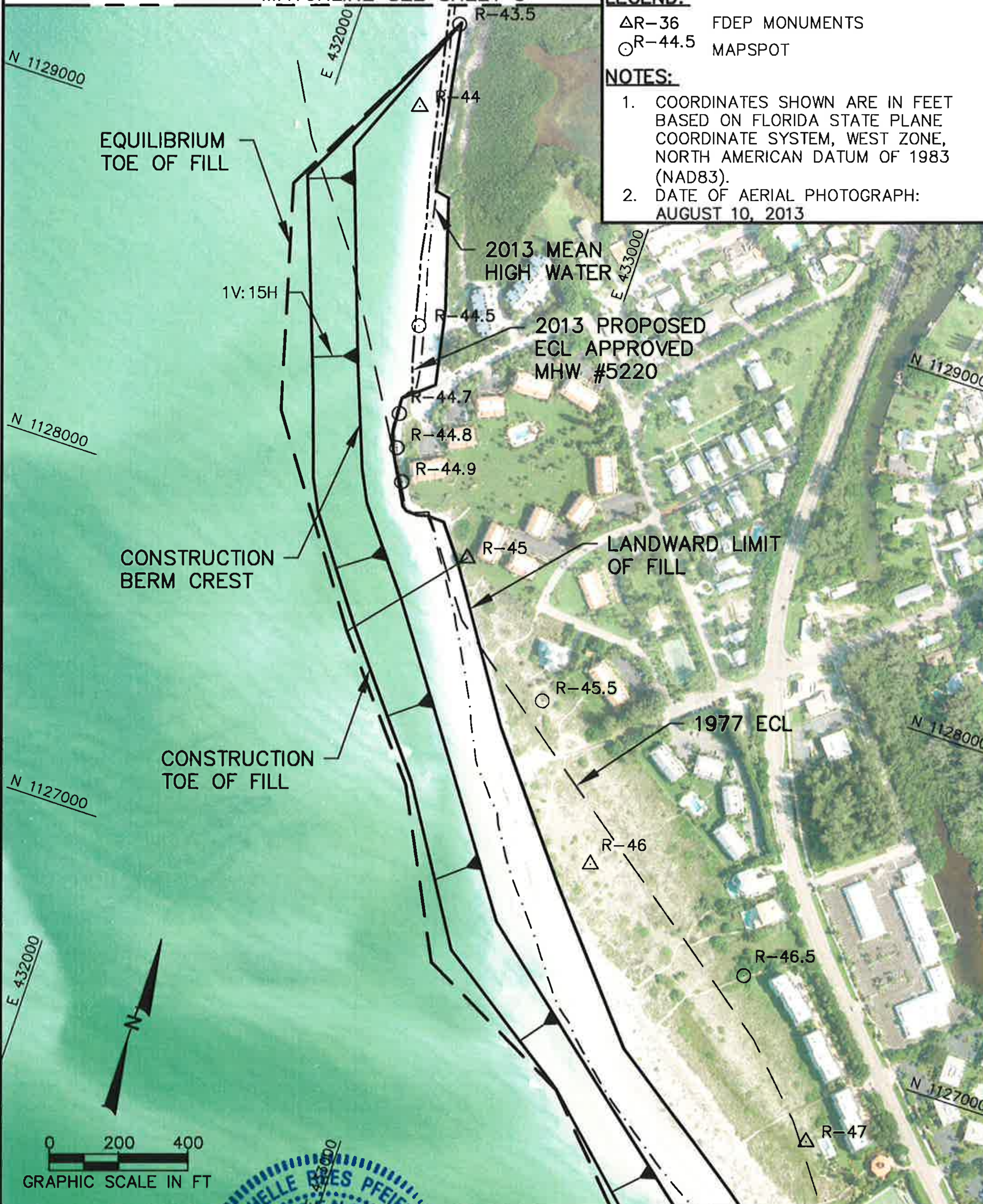
COMM NO.: 151033

SHEET: 5

MATCHLINE SEE SHEET 5



MATCHLINE SEE SHEET 7

LEGEND:

△R-36 FDEP MONUMENTS

○R-44.5 MAPSPOT

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST 10, 2013

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
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Michelle Rees Pfeiffer 10/6/14

MICHELLE REES PFEIFFER P.E. NO. 76209 DATE

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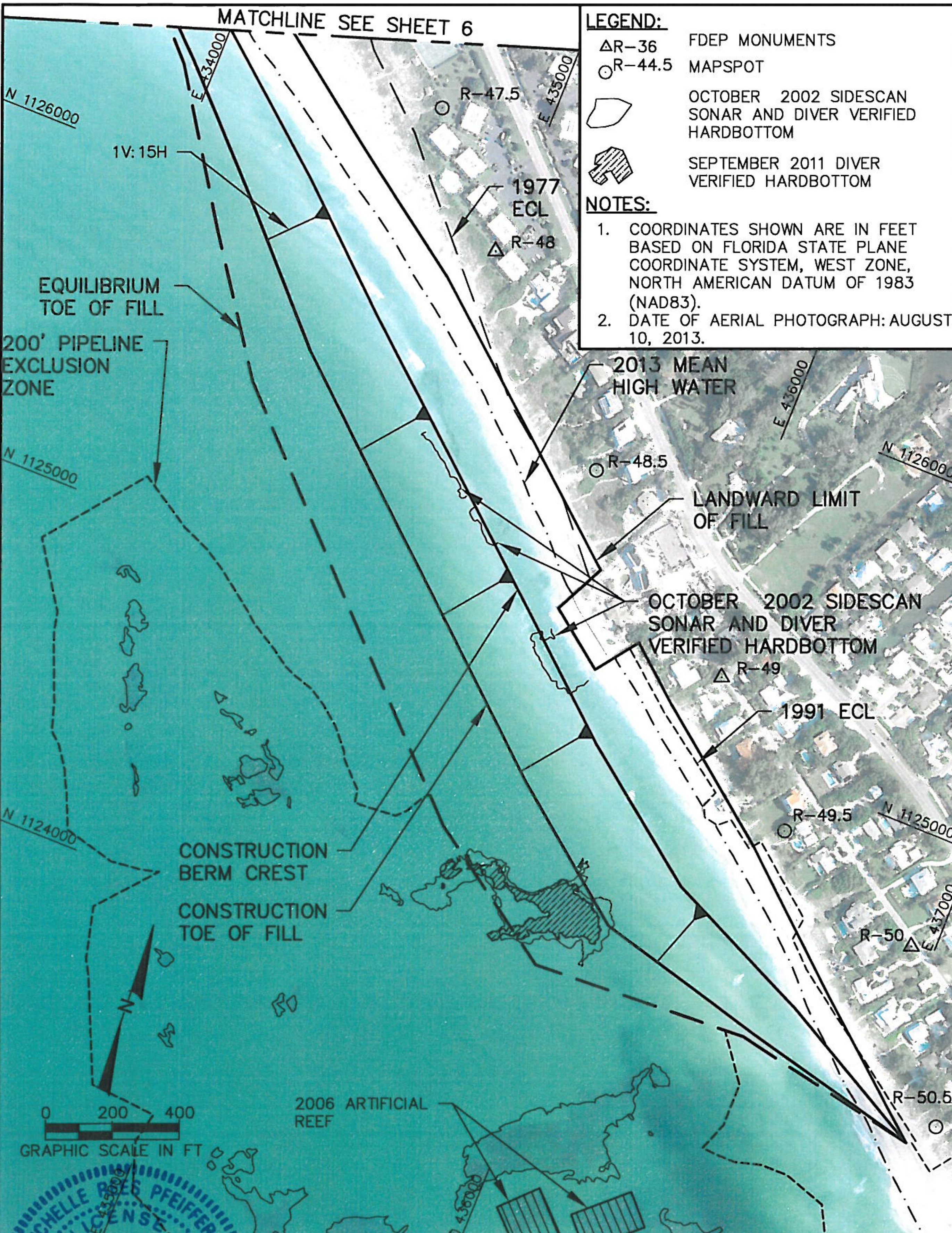

LEGEND:

- R-36 — FDEP MONUMENTS
- R-44.5 — MAPSPOT
- OCTOBER 2002 SIDESCAN SONAR AND DIVER VERIFIED HARDBOTTOM
- SEPTEMBER 2011 DIVER VERIFIED HARDBOTTOM

NOTES:

1. COORDINATES SHOWN ARE IN FEET BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83).
2. DATE OF AERIAL PHOTOGRAPH: AUGUST 10, 2013.

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
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REVISIONS		
DATE	BY	DESCRIPTION

DATE:	2/25/14
BY:	GK
COMM NO.:	151033
SHEET:	7

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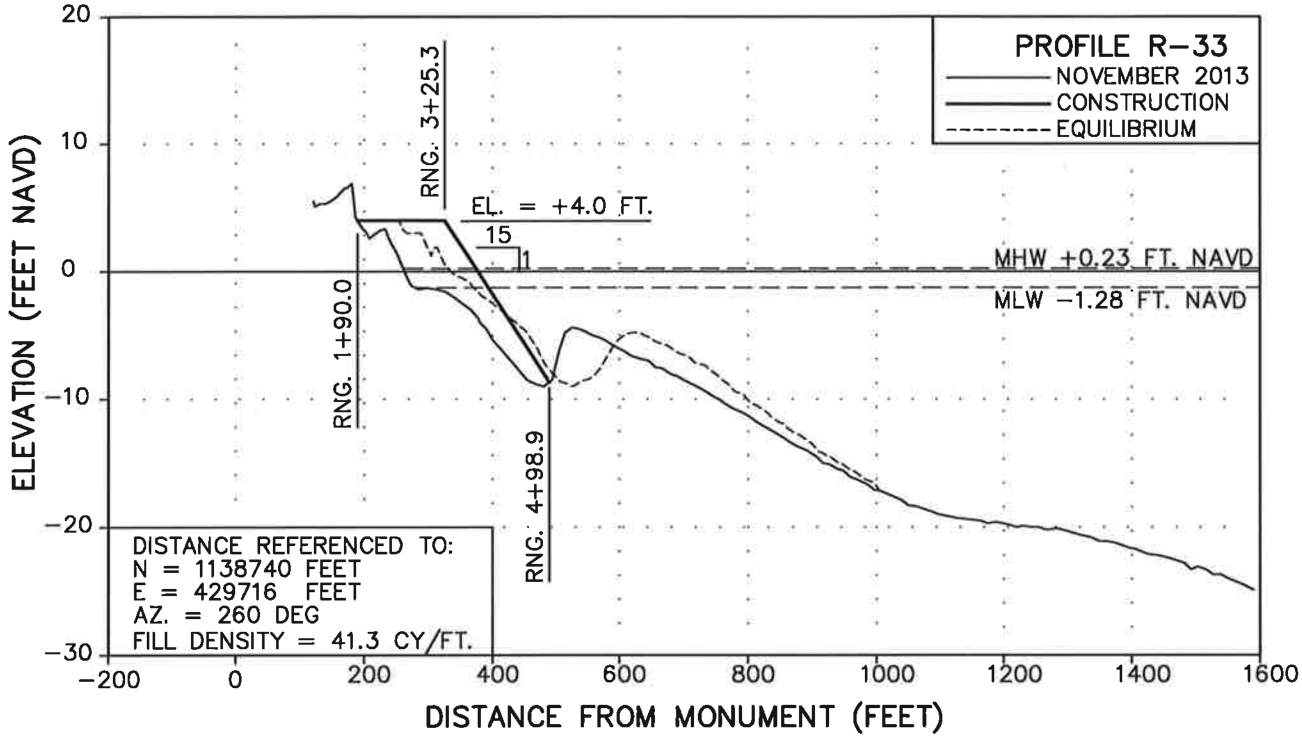

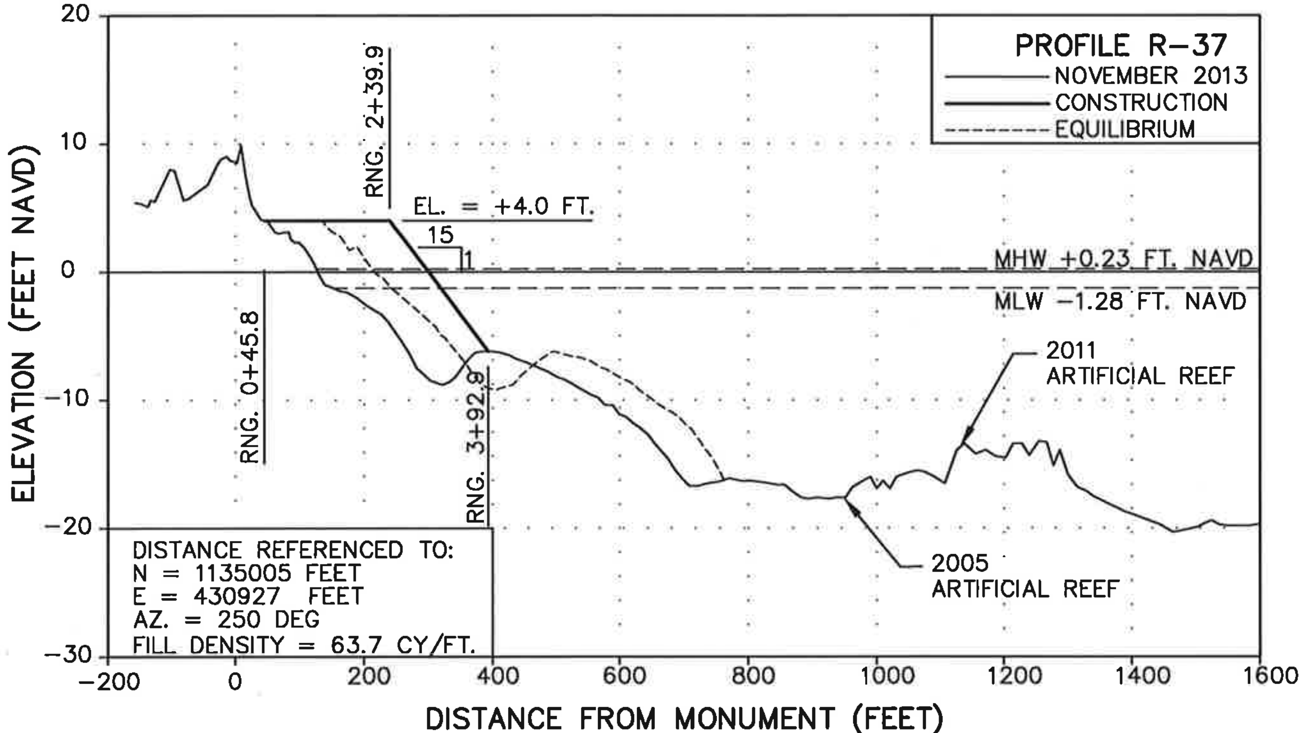

NOTE:

1. MEAN HIGH WATER (MHW) AND MEAN LOW WATER (MLW) ELEVATIONS PUBLISHED IN NAVD 88, FROM LAND BOUNDARY INFORMATION SYSTEM (LABINS) BASED ON EPOCH 1983–2001 TIDE INTERPOLATION POINT IDENTIFICATION NUMBER 200904.
2. THE FILL DENSITIES LISTED HEREIN ARE BASED ON THE CONDITION OF THE BEACH AT THE TIME OF THE SURVEY SHOWN ON THE CROSS-SECTIONS.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer 10/6/14

MICHELLE REES PFEIFFER P.E. NO. 76209 DATE

MICHELLE REES PFEIFFER LICENSE No 76209 STATE OF FLORIDA PROFESSIONAL ENGINEER

REVISIONS

DATE	BY	DESCRIPTION
9/17/14	HN	REVISION PER RAI#1

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
COVER SHEET

COASTAL PLANNING & ENGINEERING, INC.

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DATE: 2/25/14
BY: GK
COMM NO.: 151033
SHEET: 8

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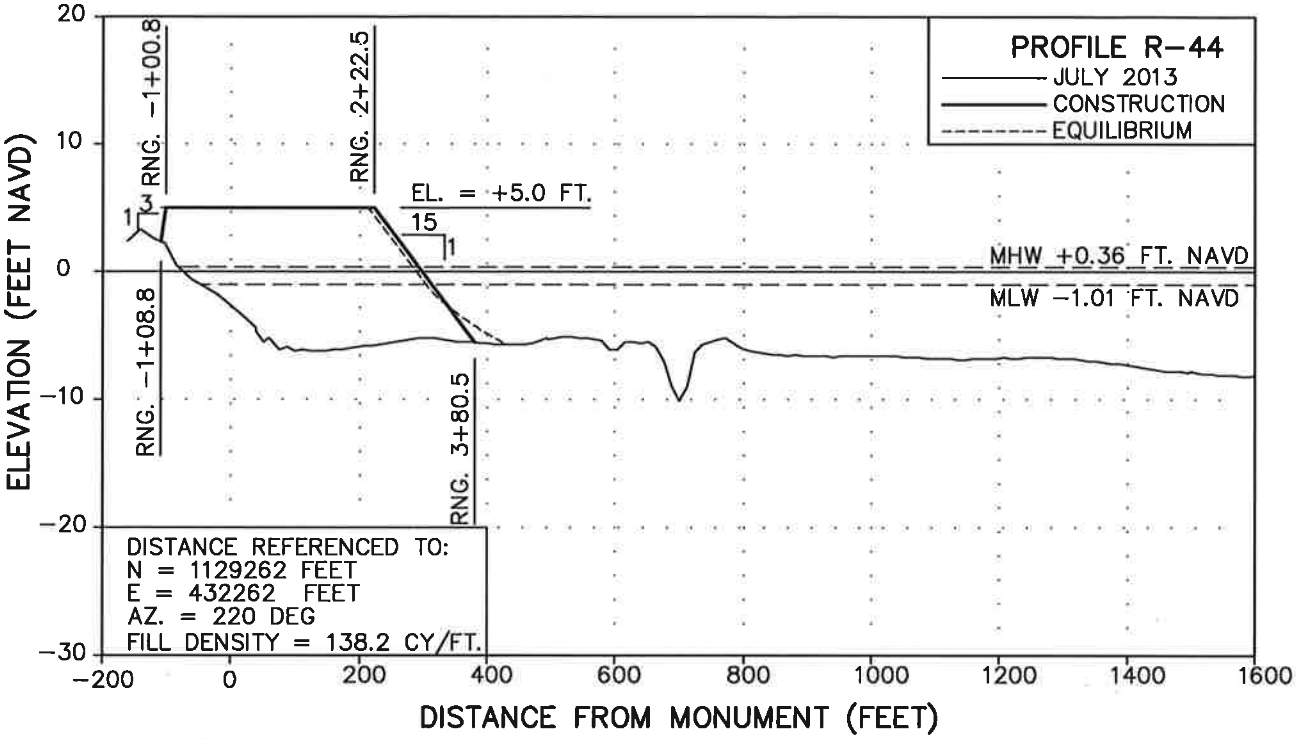

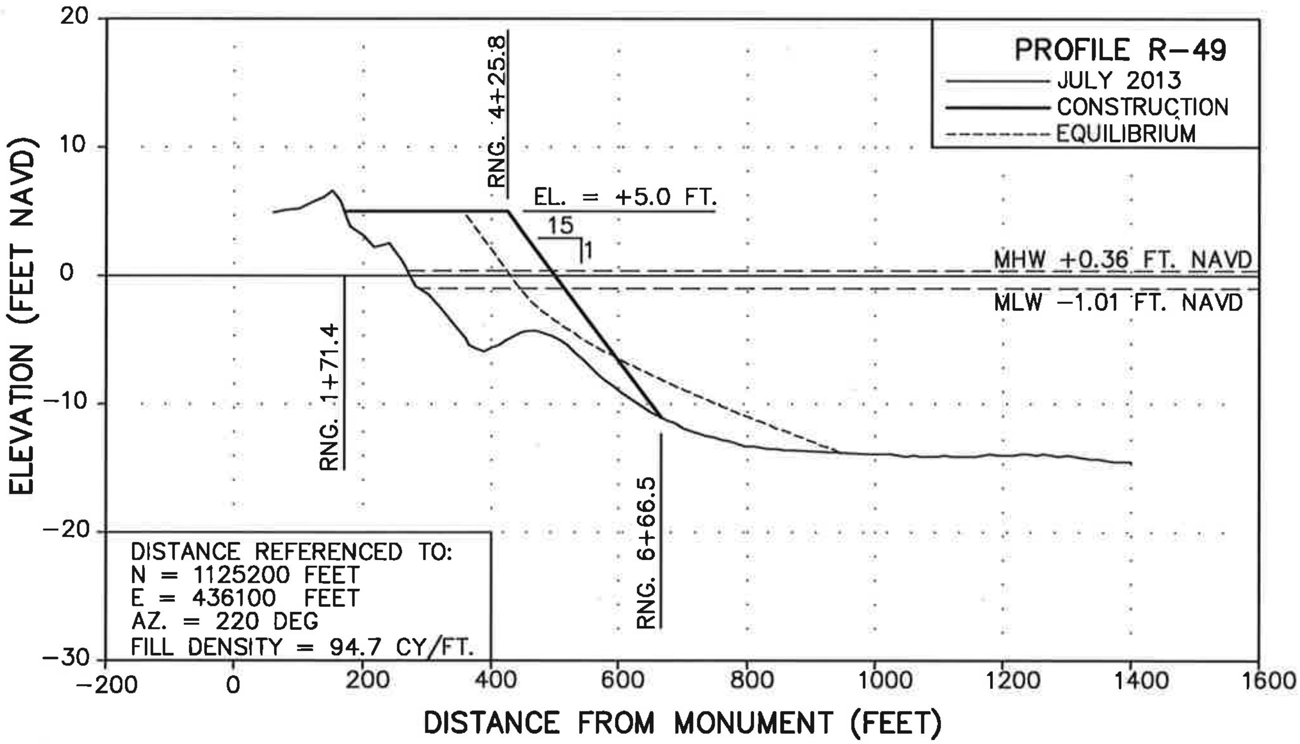

NOTE:

1. MEAN HIGH WATER (MHW) ELEVATION WAS PROVIDED BY W. LAMAR EVERS, P.S.M. ON FEBRUARY 19,2013 FROM THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION.
2. THE FILL DENSITIES LISTED HEREIN ARE BASED ON THE CONDITION OF THE BEACH AT THE TIME OF THE SURVEY SHOWN ON THE CROSS-SECTIONS.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER P.E. NO. 76209

MICHELLE REES PFEIFFER LICENSE No 76209 STATE OF FLORIDA PROFESSIONAL ENGINEER

10/6/14

DATE

REVISIONS		
DATE	BY	DESCRIPTION
9/17/14	HN	REVISION PER RAI#1

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
COVER SHEET

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www.CBI.com

DATE: 2/25/14

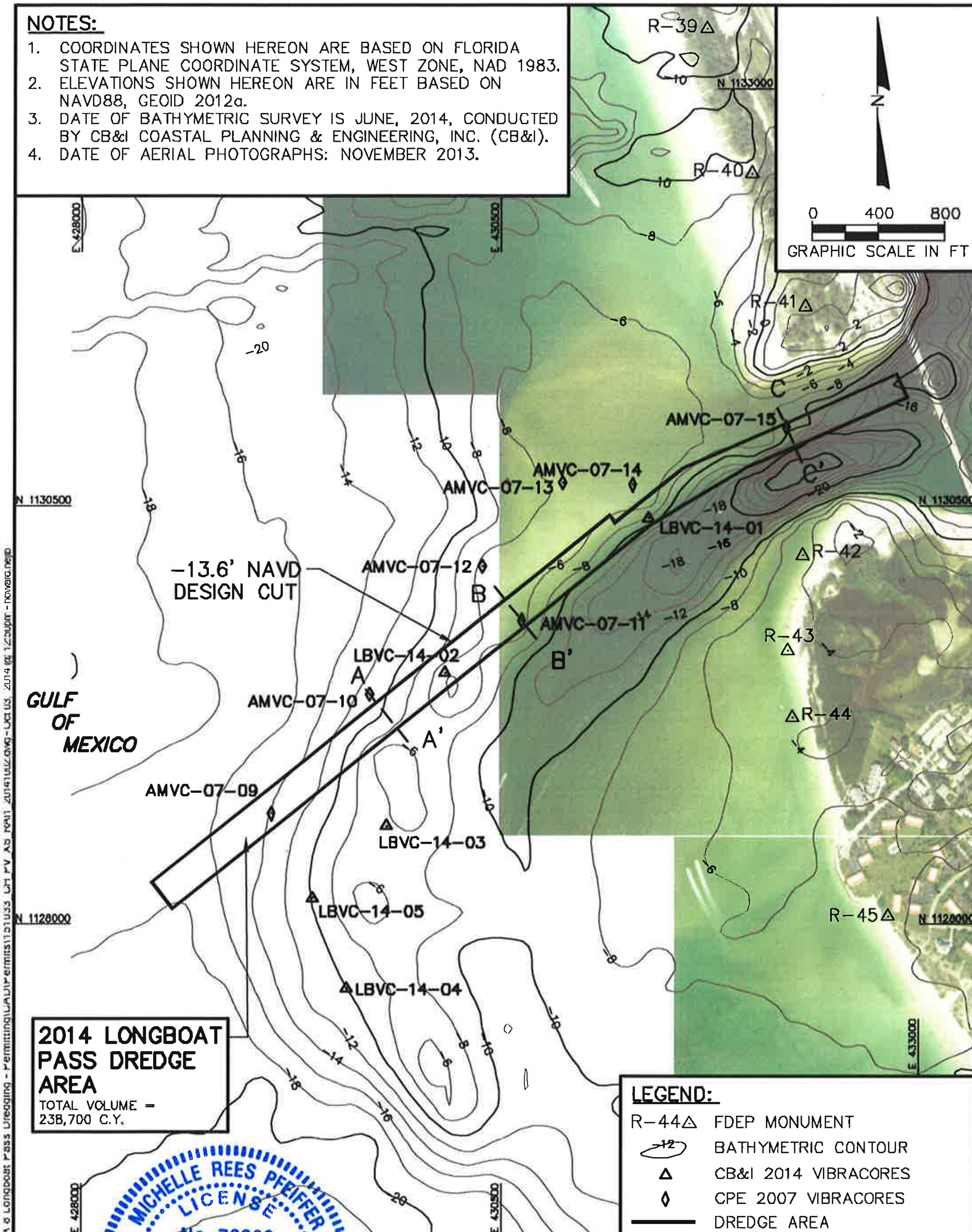
BY: GK

COMM NO.: 151033

SHEET: 9

NOTES:

1. COORDINATES SHOWN HEREON ARE BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD 1983.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NAVD88, GEOID 2012a.
3. DATE OF BATHYMETRIC SURVEY IS JUNE, 2014, CONDUCTED BY CB&I COASTAL PLANNING & ENGINEERING, INC. (CB&I).
4. DATE OF AERIAL PHOTOGRAPHS: NOVEMBER 2013.



LEGEND:

R-44△	FDEP MONUMENT
-12	BATHYMETRIC CONTOUR
△	CB&I 2014 VIBRACORES
◊	CPE 2007 VIBRACORES
—	DREDGE AREA

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
2014 LONGBOAT PASS DREDGE AREA PLAN VIEW

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
www.CBI.com

PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL #8035

DATE: 2/25/14
BY: KM
COMM NO.: 151033
SHEET: 10

REVISIONS

DATE	BY	DESCRIPTION
080514	KM	UPDATE BA PLAN/XSECTS RAI#1
100314	HN	UPDATE BA PLAN /XSECTS

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

MICHELLE REES PFEIFFER LICENSE No 76209 STATE OF FLORIDA PROFESSIONAL ENGINEER

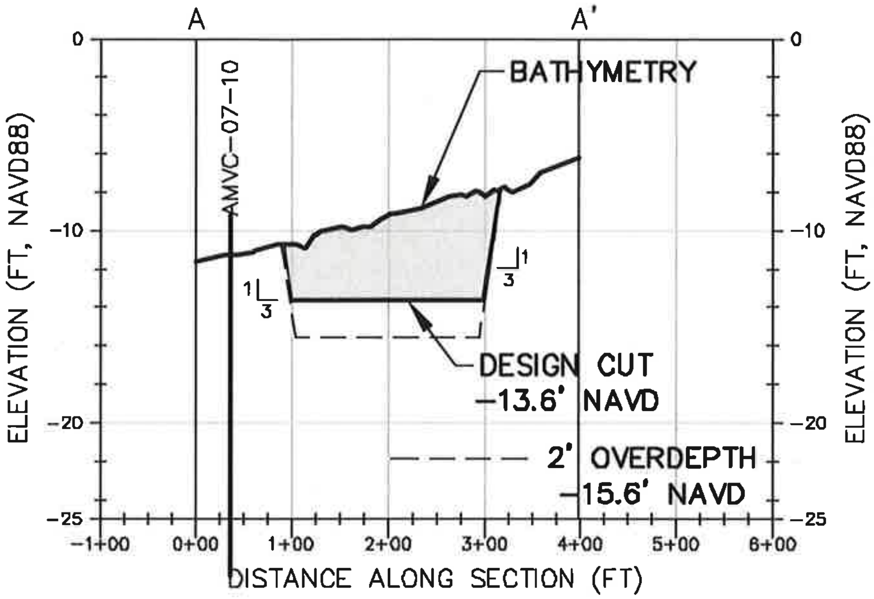
Michelle Rees Pfeiffer

MICHELLE REES PFEIFFER, P.E. NO. 76209

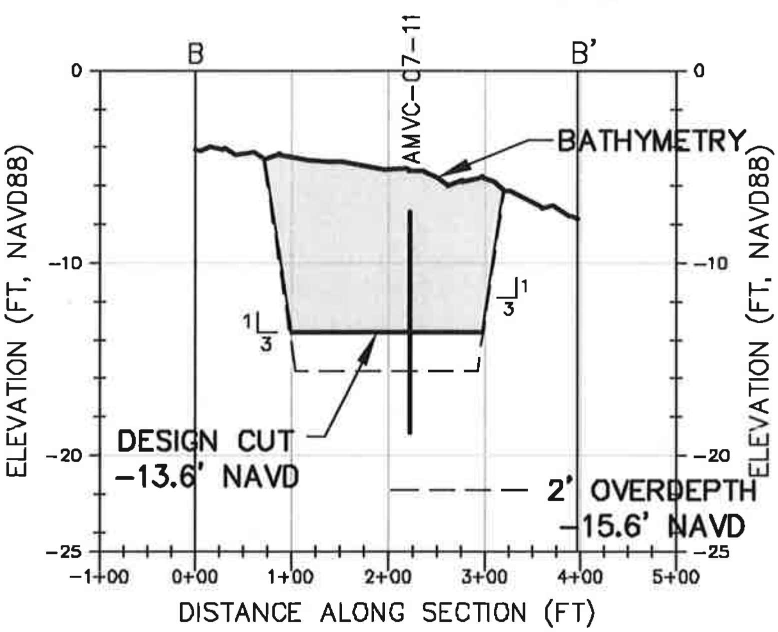
10/6/14

DATE

CROSS SECTION A–A'



CROSS SECTION B–B'



HORIZONTAL SCALE

0 100 200

GRAPHIC SCALE IN FT

VERTICAL SCALE

0 5 10

GRAPHIC SCALE IN FT

NOTES:

1. SEE SHEET 10 FOR LOCATION OF CROSS SECTION LINE.
2. ELEVATIONS SHOWN HEREON ARE IN FEET BASED ON NAVD88, GEOID 2012a.
3. DATE OF BATHYMETRIC SURVEY IS JUNE, 2014, CONDUCTED BY CB&I COASTAL PLANNING & ENGINEERING, INC. (CB&I).
4. CORES MAY NOT FALL DIRECTLY ON CROSS SECTION LINE, BUT ARE LOCATED SUFFICIENTLY CLOSE TO REPRESENT SIMILAR MATERIAL.
5. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. MATERIAL MAY VARY.

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

MICHELLE REES PFEIFFER P.E. NO. 76209

10/10/14
DATE

MICHELLE REES PFEIFFER No 76209 STATE OF FLORIDA PROFESSIONAL ENGINEER

REVISIONS		
DATE	BY	DESCRIPTION
080514	KM	UPDATE BA PLAN/XSECTS RAI#1
100314	HN	UPDATE BA PLAN/XSECTS

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
2014 LONGBOAT PASS DREDGE AREA CROSS SECTIONS A-A' AND B-B'

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
www.CBI.com
PH. (561) 391-8102
FAX (561) 391-9116
C.O.A. FL 8402

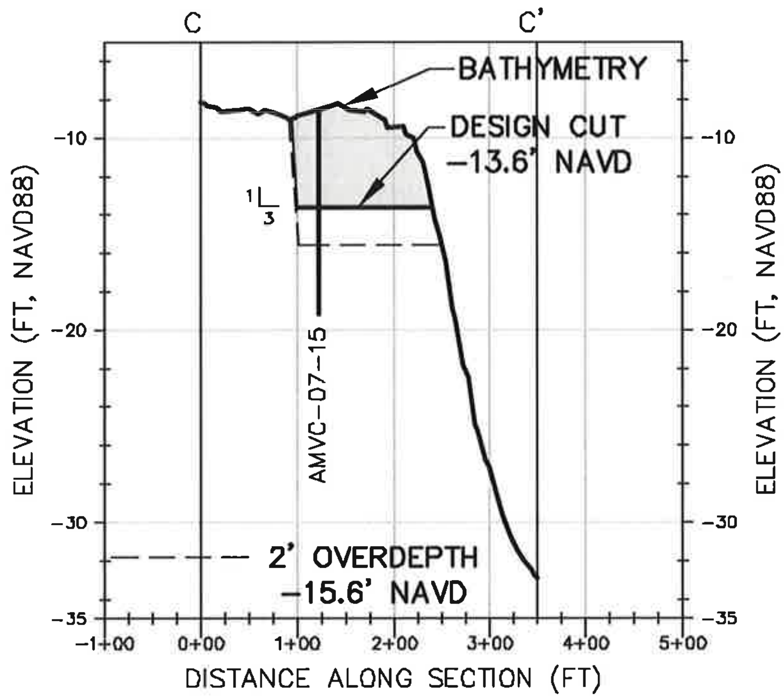
DATE: 2/25/14

BY: KM

COMM NO.: 151033

SHEET: 11

CROSS SECTION C–C'



NOTES:

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5. WIDTH OF LAYERS IS REPRESENTATIVE ONLY. MATERIAL MAY VARY.

HORIZONTAL SCALE

0 100 200

GRAPHIC SCALE IN FT

VERTICAL SCALE

0 5 10

GRAPHIC SCALE IN FT

NOT FOR CONSTRUCTION
FOR REGULATORY REVIEW ONLY

Michelle Rees Pfeiffer 10/6/14

MICHELLE REES PFEIFFER P.E. NO. 76209 DATE

STATE OF FLORIDA PROFESSIONAL ENGINEER No 76209

REVISIONS

DATE	BY	DESCRIPTION
080514	KM	UPDATE BA PLAN/XSECTS RAI#1
100314	HN	UPDATE BA PLAN/XSECTS

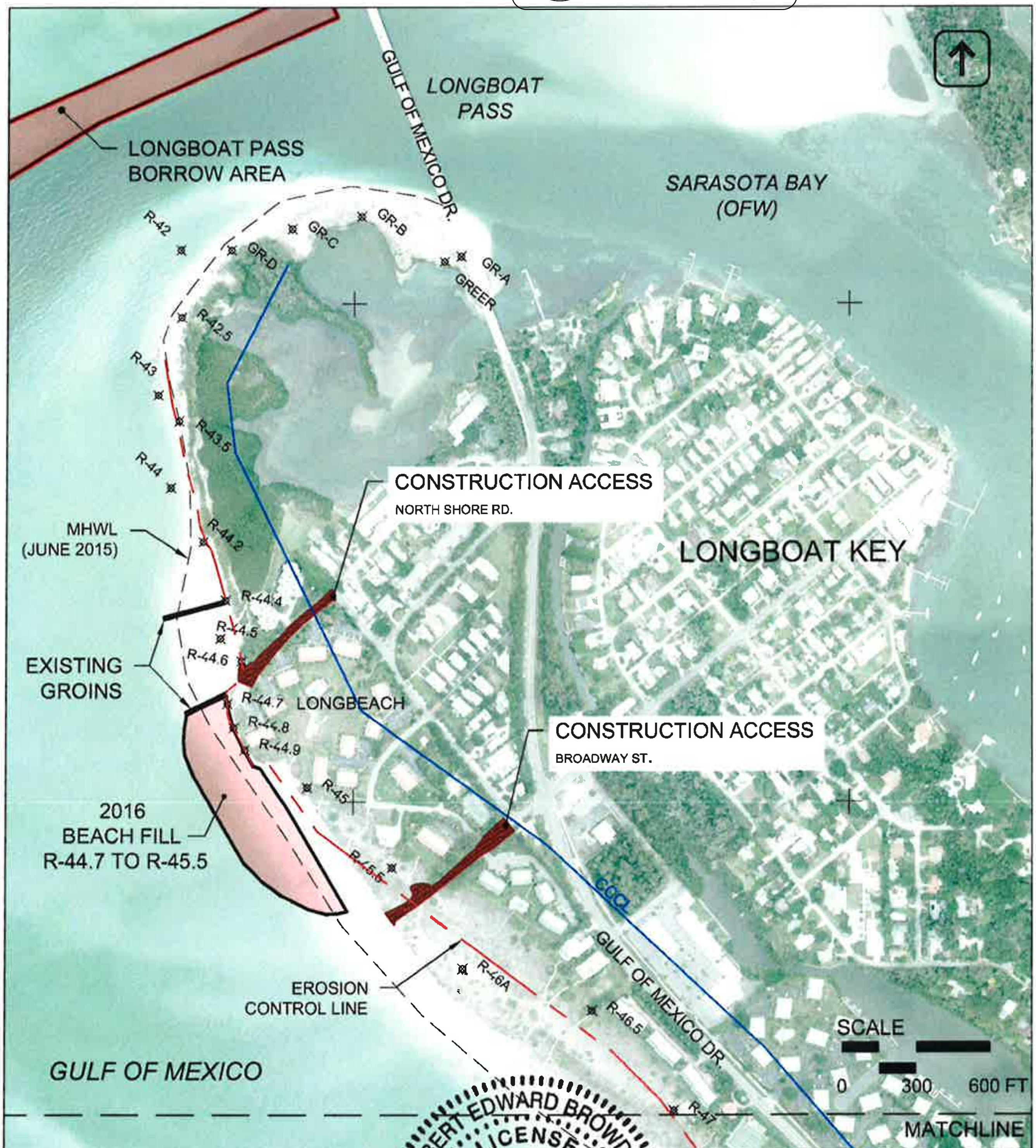
LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT
MANATEE COUNTY, FLORIDA
2014 LONGBOAT PASS DREDGE AREA CROSS SECTION C-C'

COASTAL PLANNING & ENGINEERING, INC.
A CB&I COMPANY
2481 N.W. BOCA RATON BOULEVARD
BOCA RATON, FLORIDA 33431
www.CBI.com
PH. (561) 391-8102
FAX (561) 391-9116

DATE: 2/25/14
BY: KM
COMM NO.: 151033
SHEET: 12

APPROVED
Permit Drawings
Permit #: 0298107-007-JN
Approval: July 15, 2016
Beaches Inlets and Ports Program

MANATEE COUNTY, FL



NOTES:
1) ACCESS CORRIDOR FOOTPRINT IS APPROXIMATE AND IS INTENDED FOR GENERAL INFORMATION PURPOSES ONLY.
2) IMPACTS TO SIGNIFICANT DUNE VEGETATION TO BE MINIMIZED OR AVOIDED.
3) R-45: FDEP SURVEY MONUMENT (MANATEE COUNTY).
4) JOINT COASTAL PERMIT 0298107-004
5) DA PERMIT SAJ-2014-00606

ALBERT EDWARD BROWDER LICENSE No. 57403 STATE OF FLORIDA PROFESSIONAL ENGINEER

15 Jul '16

Sect: 15,22 Township: 35 S Range: 16 E

Latitude: 27° 26.11' N Longitude: 82° 41.30' W

NOT FOR CONSTRUCTION
FOR INFORMATION ONLY

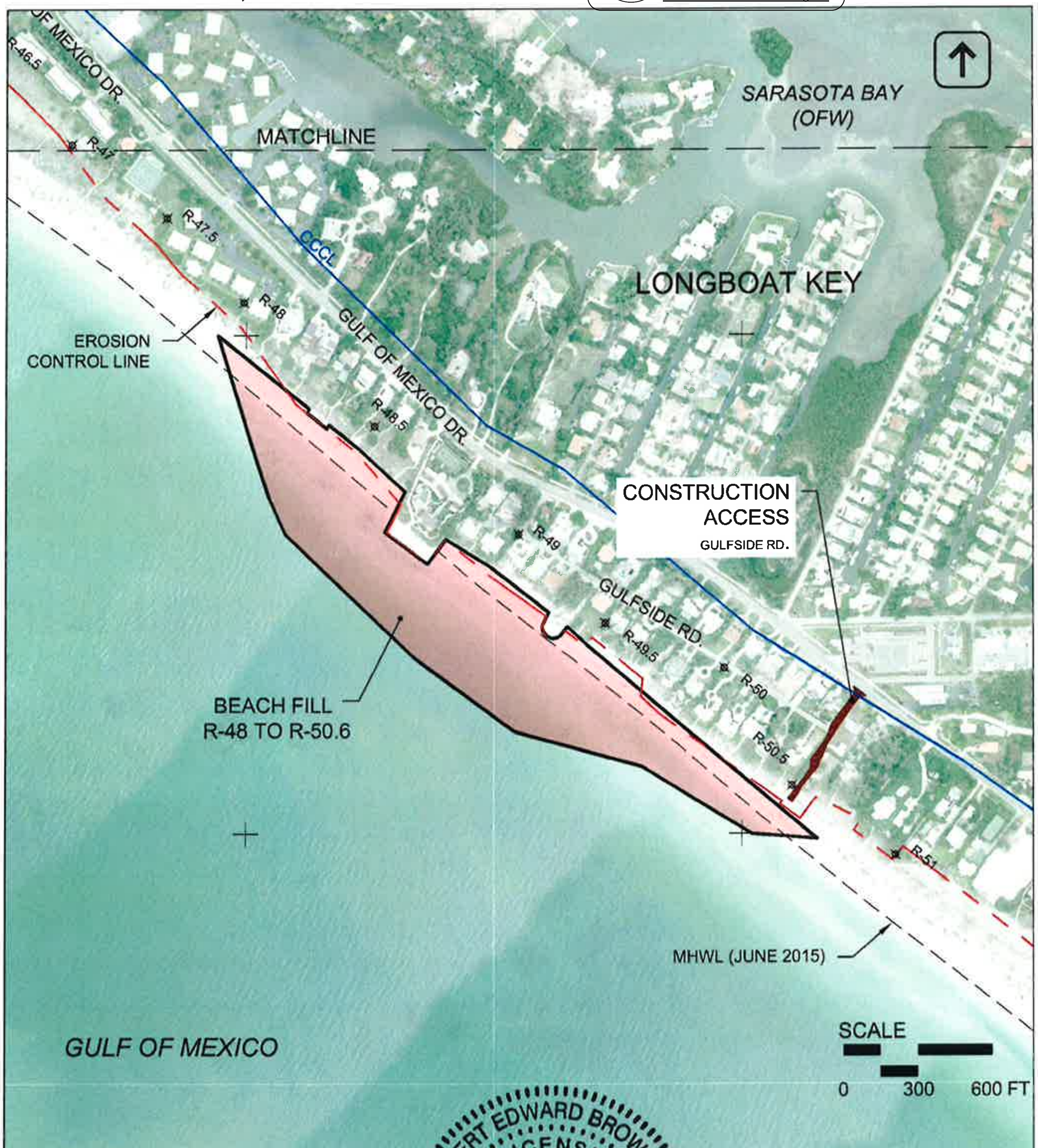
olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

LONGBOAT PASS MAINTENANCE DREDGING AND BENEFICIAL SEDIMENT USE PROJECT-PERMIT MODIFICATION

LONGBOAT KEY ACCESS CORRIDORS

DATE:	APPR	REVISION	
			DATE: 07/15/16
			DRAWN BY: ML
			SHEET 13

MANATEE COUNTY, FL



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3) R-45: FDEP SURVEY MONUMENT (MANATEE COUNTY).
4) JOINT COASTAL PERMIT 0298107-004
5) DA PERMIT SAJ-2014-00606

ALBERT EDWARD BROWDER
LICENSE
No. 57403
STATE OF FLORIDA
PROFESSIONAL ENGINEER

15 Jul, 16

Sect: 22,23 Township: 35 S Range: 16 E

Latitude: 27° 25.48' N Longitude: 82° 40.50' W

NOT FOR CONSTRUCTION
FOR INFORMATION ONLY

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

LONGBOAT PASS MAINTENANCE
DREDGING AND BENEFICIAL SEDIMENT
USE PROJECT-PERMIT MODIFICATION

LONGBOAT KEY
ACCESS CORRIDORS

DATE:	APPR	REVISION

DATE: 07/15/16

DRAWN BY: ML

SHEET 14

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 2:
FDEP WATER QUALITY CERTIFICATION/
JOINT COASTAL PERMIT (INC. PERMIT MOD.)

37 PAGES

JCP #0298107-009-JN
SAJ-2014-00606 (SP-MEP)

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

CONSOLIDATED ADMINISTRATIVE MODIFICATION TO A JOINT COASTAL PERMIT AND INTENT TO GRANT SOVEREIGN SUBMERGED LANDS AUTHORIZATION

CO-PERMITTEES:
Manatee County
Parks and Natural Resources
Attn: Charlie Hunsicker
5502 33rd Avenue Drive West
Bradenton, FL 34209

and

Town of Longboat Key
Attn: Juan Florensa
600 General Harris Street
Longboat Key, FL 34228

AGENT:
Olsen and Associates Inc.
Attn: Albert Browder, Ph.D., P.E.
2618 Herschel Street
Jacksonville FL 32204

PERMIT INFORMATION:
Permit Modification Number: 0298107-009-JN

Permit Number:0298107-004-JC

Project Name: Longboat Pass Navigational Maintenance Dredging and Beach Nourishment

County: Manatee

Issuance Date: March 19, 2015

Expiration Date: March 19, 2030

REGULATORY AUTHORIZATION:

This administrative modification to Permit No. 0298107-004-JC is issued under the authority of Chapter 161 which includes consideration of the provisions contained in Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity. **This administrative modification, hereafter referred to as Permit No. 0298107-009-JN, supersedes Permit No. 0298107-004-JC.**

PROJECT DESCRIPTION:

The project is to maintain Longboat Pass at its current specifications, and to place beach-compatible sand from the dredging on the beach, north and south of the inlet. Longboat Pass will be maintained at a design dredge depth of -13.6 feet North American Vertical Datum (NAVD), with a maximum allowable overdepth of -15.6 feet NAVD, using a hydraulic cutterhead dredge. The fill template will have a variable berm width at an elevation of 5 feet NAVD, and a foreshore slope of 1:15 (vertical:horizontal). Following the initial placement, the maintenance schedule and volume of material to be dredged will be determined based on physical monitoring data. Construction access corridors through the dunes are authorized at three locations, as shown on the permit drawings.

The activity includes consideration of an application for a 15-year sovereign submerged lands public easement containing 1,559,367.13 square feet or 35.80 acres, more or less.

PROJECT LOCATION:

The beach nourishment segments are located on Anna Maria Island north of the inlet, between Department Reference Monuments R-30 and 305 feet south of R-41, Sections 4, 9 and 10, Township 35 South, Range 16 East; and on Longboat Key south of the inlet, between R-43.5 and R-50.5, Sections 15, 22 and 23, Township 35 South, Range 16 East. Both beach nourishment segments are located in the Gulf of Mexico, Class III Waters, in Manatee County.

The maintenance dredging activity is located in Longboat Pass, which extends from Sarasota Bay, Class III Outstanding Florida Waters, to the Gulf of Mexico, Class III Waters, Sections 10 and 15, Township 35 South, Range 16 East, in Manatee County.

PROPRIETARY AUTHORIZATION:

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands held in trust by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Board of Trustees delegated, to the Department, the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. This proprietary authorization has been reviewed in accordance with Chapter 253, F.S., Chapter 18-21 and Section 62-330.075, F.A.C., and the policies of the Board of Trustees.

As staff to the Board of Trustees, the Department has reviewed the activity described above, and has determined that the sand placement activity qualifies for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Section 253.77, F.S., to perform the sand placement activity on the specified sovereign submerged lands.

As staff to the Board of Trustees, the Department has determined that the maintenance dredging activity requires a public easement to use sovereign, submerged lands, pursuant to Section 253.77, F.S. The Department intends to grant the public easement, subject to the conditions outlined in the previously issued *Consolidated Intent to Issue* and in the Recommended Proprietary Action (entitled *Delegation of Authority*).

The final documents required to execute the public easement have been sent to the Department's Division of State Lands and recorded as Easement No 410238553.

COASTAL ZONE MANAGEMENT:

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

WATER QUALITY CERTIFICATION:

This permit also constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341.

OTHER PERMITS:

Authorization from the Department does not relieve you from the responsibility of obtaining other permits (Federal, State or local) that may be required for the project.

AGENCY ACTION:

The above named Permittees are hereby authorized to construct the work that is outlined in the project description and project location of this permit and as shown on the approved permit drawings, plans and other documents attached hereto. This agency action is based on the information submitted to the Department as part of the permit application, and adherence with the final details of that proposal shall be a requirement of the permit. **This permit and authorization to use sovereign submerged lands are subject to the General Conditions, General Consent Conditions and Specific Conditions, which are a binding part of this permit and authorization.** Both the Permittees and their Contractors are responsible for reading and understanding this permit (including the permit conditions and the approved permit drawings) prior to commencing the authorized activities, and for ensuring that the work is conducted in conformance with all the terms, conditions and drawings.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the project description, permit drawings, plans and specifications approved as a part of this permit, and all conditions and requirements of this permit. The Permittee shall notify the Department in writing of any anticipated deviation from the permit prior to implementation so that the Department can determine whether a modification of the permit is required pursuant to Rule 62B-49.008, F.A.C.

2. If, for any reason, the Permittee does not comply with any condition or limitation specified in this permit, the Permittee shall immediately provide the Department and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; and, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits that may be required by federal, state, local or special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project that are not addressed in this permit.

4. Pursuant to Sections 253.77 and 373.422, F.S., prior to conducting any works or other activities on state-owned submerged lands, or other lands of the state, title to which is vested in the Board of Trustees, the Permittee must receive all necessary approvals and authorizations under Chapters 253 and 258, F.S. Written authorization that requires formal execution by the Board of Trustees shall not be considered received until it has been fully executed.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under Section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the Permittee or create in the Permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the Permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The Permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The Permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

9. At least 48 hours prior to commencement of activity authorized by this permit, the Permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the Permittee and the contractor, if one is to be used, have read the general and specific conditions of the permit and understand them.

10. If any prehistoric or historic artifacts, such as pottery or ceramics, stone tools or metal implements, shipwreck remains or anchors, dugout canoes or other physical remains that could be associated with Native American cultures, or early Colonial or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the immediate vicinity of such discoveries. The Permittee, or other designee, shall contact the Florida Department of State, Division of Historical Resources, Compliance and Review Section at (850)245-6333 or (800)847-7278, as well as the appropriate permitting agency office. Project activities shall not resume without verbal and/or written authorization from the Division of Historical Resources. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, F.S.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the Permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specifications, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on as-built drawings electronically submitted to the Department, by email at JCPCompliance@dep.state.fl.us.

GENERAL CONSENT CONDITIONS:

1. Authorizations are valid only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use shall constitute a violation. Violation of the authorization shall result in suspension or revocation of the grantee's use of the sovereignty submerged land unless cured to the satisfaction of the Board.

2. Authorizations convey no title to sovereignty submerged land or water column, nor do they constitute recognition or acknowledgment of any other person's title to such land or water.

3. Authorizations may be modified, suspended or revoked in accordance with their terms or the remedies provided in Sections 253.04 and 258.46, F.S., or Chapter 18-14, F.A.C.

4. Structures or activities shall be constructed and used to avoid or minimize adverse impacts to sovereignty submerged lands and resources.

5. Construction, use or operation of the structure or activity shall not adversely affect any species that is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004 and 68A-27.005, F.A.C.

6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity shall be modified in accordance with the court's decision.

7. Structures or activities shall not create a navigational hazard.

8. Structures shall be maintained in a functional condition and shall be repaired or removed if they become dilapidated to such an extent that they are no longer functional. This shall not be construed to prohibit the repair or replacement subject to the provisions of Rule 18-21.005, F.A.C., within one year, of a structure damaged in a discrete event such as a storm, flood, accident or fire.

9. Structures or activities shall be constructed, operated and maintained solely for water dependent purposes, or for non-water dependent activities authorized under paragraph 18-21.004(1)(f), F.A.C., or any other applicable law.

SPECIFIC CONDITIONS:

1. All reports or notices relating to this permit shall be electronically submitted to the Department's JCP Compliance Officer (e-mail address: JCP Compliance@dep.state.fl.us) unless otherwise specified in the specific conditions of this permit. All submittals shall clearly indicate the project name (Longboat Pass Navigation Maintenance Dredging and Beach Nourishment) and the permit number (0298107-009-JN~~4-JC~~).

2. The Permittee shall not store or stockpile tools, equipment, materials, etc., within littoral zones or elsewhere within surface waters of the state without prior written approval from the Department. Storage, stockpiling or access of equipment on, in, over or through beds of submerged aquatic vegetation, wetlands or hardbottom is prohibited unless it occurs within a work area or ingress/egress corridor that is specifically approved by this permit.

Anchoring or spudding of vessels and barges within beds of aquatic vegetation or hardbottom is also prohibited.

3. The Permittee shall not conduct project operations or store project-related equipment in, on or over dunes, or otherwise impact dune vegetation, outside the approved staging, beach access and dune restoration areas designated in the permit drawings.

   If the Permittee intends to use any of the approved construction access corridors through the dunes for any given nourishment event, they shall conduct a pre-construction survey of the dune topography and vegetation at the access site(s). Within 60 days following the completion of the beach nourishment event, the Permittee shall restore impacted dunes to their pre-construction topography and shall replant the dunes to match the pre-construction baseline survey, according to the following requirements:

   a. Dune vegetation planting may occur during the marine turtle nesting season under the following conditions.

      i. Early morning nesting surveys shall be conducted daily in the area of the dune vegetation planting. The contractor shall not initiate work until daily notice has been received from the marine turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that the construction activity does not occur in any location prior to completion of the necessary marine turtle protection measures. Nesting surveys and nest marking shall only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to Chapter 68E-1, F.A.C. Please contact FWC's Marine Turtle Management Program in Tequesta at MTP@myfwc.com for information on the marine turtle permit holder in the project area.

      ii. Nests deposited within the project area and access areas shall be left in place and marked for avoidance. The marine turtle permit holder shall install an on-beach marker at the nest site and a second marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch shall be determined and nests shall be marked. A series of stakes and highly-visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area, nor shall any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity.

iii. All dune planting activities shall be conducted by hand and only during daylight hours.

iv. Heavy equipment shall not be used on, or seaward of, the dunes for planting purposes. A lightweight (all-terrain type) vehicle, with tire pressures of 10 psi or less may be used for this purpose.

v. If a marine turtle nest is disturbed or uncovered during planting activity, the Permittee shall cease all work and immediately contact the person(s) responsible for marine turtle conservation measures within the project area. If a nest(s) cannot be safely avoided during construction, all activity within the affected project area shall be delayed until complete hatching and emergence of the nest.

b. The Permittee shall use clean, beach-compatible sand to restore any impacted dunes. The dunes shall be restored so that they are continuous with the natural dune features in the area and match the pre-construction baseline survey. Side slopes shall match the slopes of natural dunes in the area or shall be equal to or less than the angle of repose for the proposed fill material, and in no case shall it exceed a 1:3 (vertical:horizontal) slope. The crest elevation of the restored dune shall be set at the crest elevation of natural dunes in the area.

c. The Permittee shall plant the restored dune with native salt-tolerant vegetation as documented in the pre-construction baseline survey. A minimum of three different species of native salt-tolerant vegetation shall be planted, and any dune grasses shall be planted at a minimum of 70 percent coverage. Planting materials shall be appropriate to the region of the planting site. Dune restoration plants shall be spaced throughout the designated area in staggered rows, at a maximum distance of 18 inches on center for 2-inch plugs, or up to 36 inches on center for gallon size planting units. Grasses shall be planted at least 6 inches deep. The Permittee shall fertilize and water-in the planting units at the time of installation, and shall only irrigate and fertilize as necessary until the plants are established and meet the survival criteria below, for a minimum of 90 days.

d. Irrigation systems, if proposed, shall be entrenched 1 to 3 inches below grade so as not to pose a barrier to marine turtle hatchlings and to allow for easy removal. Irrigation piping shall avoid all marked nests by a minimum of ten (10) feet. The irrigation system shall be designed and maintained so that watering of the unplanted sandy beach does not occur. In the event a marine turtle nest is deposited within the newly established dune planting area, the Permittee shall modify the irrigation system so that watering within 10 feet of the nest does not occur. Daily inspection of the irrigation system shall be conducted by the Permittee to ensure compliance with this condition.

e. Irrigation systems and other structures placed during plant installation and initial cultivation shall be removed within thirty days from the submittal of the final project certification, but only after the Department has acknowledged planting success.

f. The dune restoration area shall be protected from foot traffic or other encroachments. Signs, rope and post/bollard barriers with weighted surface anchors or sand fencing shall be constructed to prevent trampling of vegetation and erosion of the restored dune feature.

g. Within 180 days after planting, the Permittee shall achieve the following success criteria: at least 80 percent of the planting units shall have survived, and 80 percent of the planted area shall be covered with native salt-tolerant species. Gaps in the shore parallel coverage shall be replanted. The Permittee shall replant all deficient areas and maintain the plantings until the above success criteria are met at least 30 days after replanting.

h. Within 30 days of project completion, and prior to submitting the final certification of project completion, the Permittee shall submit (to the Department's JCP Compliance Officer for approval) an as-built plan prepared and certified by an appropriate registered professional, such as a licensed landscape architect or engineer, showing that dune restoration has been completed in full accordance with these specific permit conditions and the approved planting plan. This submittal shall include a statement indicating the success of the dune revegetation as determined by the criteria in Specific Condition 3.g., above.

4. ~~***Notice to Proceed Requirements***~~ <u>***Pre-Construction Submittals***</u>***.*** ~~No work shall be conducted under this permit until the Permittees have received a written Notice to Proceed (NTP) from the Department for each event. At least 30 days prior to the requested date of issuance of the NTP, the Permittees shall submit a written request for a NTP and the following items for review and approval by the Department:~~ <u>For each construction event under this permit, no work shall commence until the Permittee has satisfactorily submitted all information specified in this condition. At least 30 days prior to the commencement of construction, the Permittee shall submit the following items for review by the Department. Unless otherwise notified by the Department within 15 days of receipt of all information specified below, the Permittee shall assume the submittals are satisfactory:</u>

a. An electronic copy of detailed ***Final Construction Plans and Specifications*** for all authorized activities. The plans and specifications must be consistent with the Project Description of this permit and the attached permit drawings, and shall also be certified by a professional engineer (P.E.), who is registered in the State of Florida. The Permittee shall point out any deviations from the project description or the approved permit drawings. Any significant changes shall require a permit modification. The plans and specifications shall include a description of the dredging and construction methods to be utilized, an anticipated construction schedule, the anticipated volume of beach-compatible sand to be placed on the beach, and a drawing that shows all work spaces (e.g., anchoring areas, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project;

b. ***Biological Opinion.*** In accordance with Florida Statute 161.041 (5), no construction that could result in take of threatened and marine turtles shall begin until the federal incidental take authorization is issued in accordance with the federal Endangered Species Act. All terms and conditions and conservation measures in the applicable federal incidental take authorization shall be incorporated into this permit through modification if not addressed in the existing conditions listed below;

c. Documentation that the ***Public Easement*** has been executed and recorded to the satisfaction of the Department;

d. ***Turbidity Monitoring Qualifications.*** Construction at the project site shall be monitored closely by an experienced, independent third party to assure that turbidity levels do not exceed the compliance standards established in this permit. Also, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when fill material is discharged on the beach. This individual shall have authority to alter construction techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit. The names and qualifications of those individuals performing these functions along, with 24-hour contact information shall be submitted for approval;

e. A ***Scope of Work*** for the turbidity monitoring to ensure that the right equipment is available to conduct the monitoring correctly, at the correct location (i.e., wherever the densest portion of the turbidity plume crosses the edge of the mixing zone), and under any conditions. In addition to the equipment needed to collect water samples and measure turbidity, the equipment needed to access the correct sampling site shall be listed. This might include boats, jet skis, floatation devices, wet suits, SCUBA gear, etc.

f. ***Biological monitoring qualifications*** shall be submitted to the JCP Compliance Officer for review and approval. If additional monitoring team(s) are subcontracted, or new staff is added to the monitoring team, proposed changes and qualifications shall be submitted to the JCP Compliance Officer for review at least 30 days prior to the sampling event. The Permittee's selected biological monitoring firm is fully responsible for training of new staff members and subcontractors, as well as the QA/QC verification of their work;

g. ~~A detailed~~ Any updates and changes to the current***Approved Biological Monitoring Plan*** required in Specific Condition 26. This shall include all transect location data, monitoring specifications, as well as monitoring and reporting timelines, subject to review and approval by the Department. The baseline survey shall also be completed and submitted to the Department prior to the ~~issuance of the NTP~~ pre-construction meeting;

h. ~~A detailed~~ Any updates and changes to the current ***Approved Physical Monitoring Plan***. This item is only required if a modification to the monitoring protocol outlined in Specific Condition 25 is requested, which can be submitted for review and approval at any time. Once a physical monitoring plan becomes available for this project, it shall be submitted ~~during all subsequent NTP requests~~ as a pre-construction submittal; and~~.~~

i. ***Dune restoration and vegetation planting plans***, with details including, but not limited to, location, total area, sand volume, sand source, vegetation type (both common and scientific name), size, spacing, quantity, as well as cross-sections of the dune.

5. ***Pre-Construction Conference.*** The Permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with the Permittee's contractors, the engineer of record, those responsible for turbidity monitoring and the JCP Compliance Officer (or designated alternate). In order to ensure that appropriate representatives are available, at least twenty-one (21) days prior to the intended commencement date for the permitted construction, the Permittee is advised to contact the Department, and the other agency representatives listed below:

JCP Compliance Officer
e-mail: JCPCompliance@dep.state.fl.us

FWC Imperiled Species Management Section
~~Florida Fish & Wildlife Conservation Commission~~
~~620 South Meridian Street~~
~~Tallahassee, Florida 32399-1600~~
~~phone: (850) 922-4330~~
~~fax: (850) 921-4369 or~~ e-mail: marineturtle@myfwc.com

The Permittee is also advised to schedule the pre-construction conference at least a week prior to the intended construction commencement date. At least seven (7) days in advance of the pre-construction conference, the Permittee shall provide written notification, advising the participants (listed above) of the agreed-upon date, time and location of the meeting, and also provide a meeting agenda and a teleconference number.

6. When discharging slurried sand onto the beach from a pipeline, the Permittee shall employ best management practices (BMPs) to reduce turbidity. At a minimum, these BMPs shall include the following:

   a. Use of a shore-parallel sand dike to promote settlement of suspended sediment on the beach before return water from the dredged discharge reenters the Gulf of Mexico; and

   b. A minimum setback of 50 feet from open water, or at the landward end of the beach berm (without disturbing the dune), whichever is less, for the pipeline discharge location.

7. **Cultural Resources.** A 100-foot buffer shall be maintained between the Regina Shipwreck (Site 8MA1235, 600-feet in diameter) and construction activities that include, but are not limited to, anchoring, dredging, spudding, pipeline placement, excavation, etc. This permit only authorizes beach placement activities ~~that~~ to occur within the buffer and location of the Regina Shipwreck. Should any additional archaeological materials or features be encountered outside or within the 100-foot buffer, the Permittee shall immediately notify the Department of State, Division of Historical Resources (DHR) at 850-245-6333 of the discovery and shift impacts away from that location until the DHR can determine the significance of the discovery.

8. Sediment quality shall be assessed as outlined in the Sediment Quality Assurance/ Quality Control (QA/QC) Plan dated October 3, 2014. Any occurrences of placement of material not in compliance with the Sediment QA/QC Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. Sediment testing results shall be submitted to the Department within 90 days following the completion of beach placement. The Sediment QA/QC Plan includes the following:

   a. If during construction, the Permittee or Engineer determines that the beach fill material does not comply with the sediment compliance specifications, measures shall be taken to avoid further placement of noncompliant fill and the sediment inspection results shall be reported to the Department.

   b. The Permittee shall submit post-construction sediment testing results and an analysis report as outlined in the Sediment QA/QC Plan to the Department within 90 days following beach placement. The sediment testing results shall be certified by a Professional Engineer (P.E.) or Professional Geologist (P.G.) from the testing laboratory. A summary table of the sediment samples and test results for the sediment compliance parameters as outlined in Table 1 of the Sediment QA/QC Plan shall accompany the complete set of laboratory testing results. A statement explaining how the placed fill material compares to the sediment analysis and volume calculations from the geotechnical investigation shall be included in the sediment testing results report.

c. A post-remediation report containing the site map, sediment analysis and volume of noncompliant fill material removed and replaced shall be submitted to the Department within 7 days following completion of remediation activities.

Fish and Wildlife Protection Conditions

9. The pre-construction conference held between the contractors, the engineer and staff representative of the Department (see Specific Condition 5 above) shall also include the Marine Turtle Monitor/permit holder, Bird Monitors and staff representatives of the Florida Fish and Conservation Commission (FWC). The purpose of this portion of the meeting is to ensure that the Permittee/Contractor fully understands the wildlife protection measures and site-specific measures that need to be taken before, during and after construction. This meeting may be combined with the pre-construction conference required in Specific Condition 5 above.

   a. The Permittee/Contractor's Environmental Plan (EPP) shall include details of monitoring for nesting marine turtles and nesting seabirds and shorebirds onsite during construction. The EPP shall be submitted for review and comment to the FWC prior to the pre-construction conference.

   b. The EPP and notification of the pre-construction conference shall be sent to the FWC at least 10 business days before the date of that meeting per the information in the attached FWC contact information exhibit, and also by email to MarineTurtle@myfwc.com.

10. **In-water Activity.** The following conditions shall be followed for all in-water activity:

   a. All personnel associated with the project shall be instructed about the presence of marine turtles and manatees, and the need to avoid collisions with (and injury to) these protected marine species. The Permittee/Contractor shall advise all construction personnel that there are civil and criminal penalties for harming, harassing or killing manatees or marine turtles, which are protected under the Endangered Species Act, the Marine Mammal Protection Act, the Marine Turtle Protection Act and the Florida Manatee Sanctuary Act.

   b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

   c. Siltation or turbidity barriers, if used, shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers shall not impede manatee or marine turtle movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of marine turtles and manatees. All in-water activities, including vessel operations, shall be shut down if a marine turtle or manatee comes within 50 feet of the activity. Activities shall not resume until the animal(s) has moved beyond a 50-foot radius of the project operation, or until 30 minutes elapses if the animal(s) has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving

e. Any collision with or injury to a marine turtle or manatee shall be reported immediately to the FWC Hotline at 1-888-404-3922, and to FWC at ImperiledSpecies@myFWC.com. Any collision with and/or injury to a marine turtle shall also be reported immediately to the Sea Turtle Stranding and Salvage Network (STSSN) at SeaTurtleStranding@myfwc.com.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs shall be removed by the Permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC shall be used. One sign that reads *Caution: Boaters: Watch for Manatees* shall be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations shall be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to FWC at ImperiledSpecies@myFWC.com.

11. **Hopper Dredging**. In the event a hopper dredge is utilized, the following requirements shall be met:

a. Handling of captured sea turtles captured during hopper dredging activities shall be conducted only by persons with prior experience and training in these activities and who is duly authorized to conduct such activities through a valid Marine Turtle Permit issued by the FWC, pursuant to Chapter 68E-1, F.A.C.

b. The standard operating procedure shall be that dredging pumps are disengaged by the operator, or the draghead bypass valve shall be open and in use when the dragheads are not firmly on the bottom to minimize impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations.

c. A state-of-the-art rigid deflector draghead shall be used on all hopper dredges at all times of the year.

d. The STSSN Coordinator shall be notified at 1-904-573-3930 or via e-mail at Allen.Foley@myfwc.com at the start-up and completion of hopper dredging operations. In the event of capturing or recovering sea turtles or sea turtle parts, the STSSN shall be contacted at seaturtlestranding@myfwc.com.

12. **Trawling**. If relocation trawling or non-capture trawling is required, it shall be implemented in accordance with the applicable NMFS Biological Opinion and Incidental Take authorization.

a. Any activity involving the use of nets to harass and/or to capture and handle marine turtles in Florida waters requires a Marine Turtle Permit from FWC.

b. The Permittee or their contractor shall e-mail (MTP@MyFWC.com) weekly reports to the Imperiled Species Management Section on Friday of each week that trawling is conducted in Florida waters. These weekly reports shall include the species and number of turtles captured in Florida waters, general health and release information. A summary (using FWC provided Excel spreadsheet) of all trawling activity (including non-capture trawling), all turtles captured in Florida waters (including all measurements), the latitude and longitude (in decimal degrees) of captures and tow start-stop points and times for the start-stop points of the tows (including those tows on which no turtles are captured) shall be submitted to MTP@myfwc.com by January 15 of the following year or at the end of the project.

13. **Beach Related Activities.**

a. *Beach Driving.* All vehicles shall be operated in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed <6 mph and run at or below the high-tide line. All personnel associated with the project shall be instructed about the potential presence of shorebirds and marine turtles and the need to avoid take of (including disturbance to) these protected species.

b. *Beach Maintenance.* All derelict concrete, metal, coastal armoring material and other debris shall be removed from the beach prior to any material placement to the maximum extent practicable. If debris removal activities will take place during shorebird or sea turtle nesting seasons, the work shall be conducted during daylight hours only and shall not commence until completion of daily shorebird or sea turtle surveys each day. If flightless shorebird young are present within or adjacent to the work zone or equipment travel corridor, a Shorebird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young. It is the Permittee/Contractor's responsibility to ensure no chicks are in the path of the moving vehicle and no tracks capable of trapping flightless chicks result. All excavations and temporary alteration of beach topography shall be filled or leveled to the natural beach profile prior to 9:00 p.m. each day. The beach surface shall be inspected subsequent to completion of the project and all tracks or impressions due to the project or movement of heavy equipment across the beach shall be removed.

c. *Equipment Storage and Placement*. Staging areas for construction equipment shall be located off the beach, if off-beach staging areas are available. Nighttime storage of construction equipment not in use shall be located off the beach to minimize disturbance to shorebird and marine turtle nesting and hatching activities. In addition, all construction pipes that are placed on the beach shall be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune. Temporary storage of pipes shall be located off the beach to the maximum extent possible. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible, those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

14. **Shorebird Protection Conditions**. **S**horebird surveys shall be conducted by trained, dedicated individuals (Bird Monitor) with proven shorebird identification skills and avian survey experience.

a. *Selection of Bird Monitors*. A list of Bird Monitors with their contact information, summary of qualifications including bird identification skills and avian survey experience shall be provided to the FWC. This information will be submitted to the FWC Regional Biologist (see Exhibit 1) prior to any construction or shorebird surveys for review and consultation. Bird Monitors shall meet the following minimum qualifications.

i. Ability to identify all species of beach-nesting birds that nest in the project area by sight and sound.

ii. Ability to identify breeding/territorial behaviors and find nests of shorebirds and seabirds that occur in the project area.

iii. Ability to identify habitats preferred by shorebirds and seabirds nesting in the project area.

iv. Completed full introductory course training (online or webinar) on the *Breeding Bird Protocol for Florida's Seabirds and Shorebirds*, including training in data entry.

v. Familiar with FWC beach driving guidelines: www.myfwc.com/conservation/you-conserve/wildlife/beach-driving.

vi. Annually completes refresher course training (online or webinar) for the *Breeding Bird Protocol for Florida's Seabirds and Shorebirds*, including training in data entry.

vii. Previously participated in beach-nesting bird surveys associated with FWC, Audubon or FWS in Florida (please provide references).

viii. Experience posting beach-nesting bird sites, consistent with Florida Shorebird Alliance (FSD) Guidelines (http://flshorebirdalliance.org/resources/instructions-manuals.aspx).

ix. Registered contributor to the Florida Shorebird Database.

b. The Bird Monitor(s) shall review and become familiar with the general information on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org). They shall use the data collection protocol and implement data entry procedures as outlined on that website. An outline of data to be collected, including downloadable field data sheets, is available on the website.

c. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this project: February 15 – September 1.

d. Surveys during the breeding season shall begin on the first day of the breeding season or 10 days before any site work begins, whichever is later. Surveys shall be conducted through August 31 or until all breeding activity has concluded, whichever is later.

e. During the breeding season, the Bird Monitor(s) shall survey all potential beach-nesting bird habitats that may be affected by construction or pre-construction activities. The Bird Monitor(s) shall establish one or more shorebird survey routes in the FSD website to cover these areas.

f. During the pre-construction and construction phases of the project, the Bird Monitor(s) shall complete surveys on a daily basis to detect breeding activity and the presence of flightless chicks before (1) equipment is moved to the area, (2) vehicles are operated in the area or (3) any other activities occur that have the potential to disrupt breeding behavior or cause harm to the birds or their eggs or young. Once construction is completed and all personnel and equipment have been removed from the beach, surveys may be conducted at weekly intervals.

g. The Bird Monitor(s) shall survey the project area by walking and looking for evidence of (1) shorebirds exhibiting breeding behavior, (2) shorebird chicks or (3) shorebird juveniles, as outlined in the FSD's *Breeding Bird Protocol for Shorebirds and Seabirds*. The Bird Monitor(s) shall use binoculars for these surveys.

h. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed <6 mph at or below the high tide line. The Bird Monitor(s) shall stop at no greater than 200-meter intervals to look for breeding activity.

i. Once the Bird Monitor(s) confirms that birds are breeding, as evidenced by the presence of a scrape, eggs or young, the Bird Monitor(s) shall notify the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) within 24 hours. The Bird Monitor(s) shall report all breeding activity to the FSD website within one week of data collection.

15. **Shorebird Buffer Zones and Travel Corridors**. The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where shorebirds have been engaged in breeding behavior, including territory defense. The FWC considers a 300-foot-wide buffer to be adequate based on published studies; however, a smaller, site-specific buffer may be established if approved by the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit). All sources of human disturbance (including pedestrians, pets and vehicles) shall be prohibited in the buffer zone.

a. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall widen the buffer zone immediately to a sufficient size to protect breeding birds.

b. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access shall not be blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species

Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

c. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked with posts, twine and signs stating: “Do Not Enter, Important Nesting Area” or similar language. The signs shall include the name and a phone number of the entity responsible for posting. Posts shall not be higher than 3 feet once installed. “Symbolic fencing” (i.e., twine, string or rope) shall be placed between all posts and shall be clearly visible to pedestrians. In areas where marine turtles nest, the ropes shall be at least 2.5 feet above the ground. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these pathways shall be clearly marked. The Bird Monitor(s) shall ensure that the posting is maintained in good repair until breeding is completed or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

d. The Bird Monitor(s) shall ensure that no construction activities, pedestrians, moving vehicles or stockpiled equipment occur within the buffer area.

e. The Bird Monitor(s) shall designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may go past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

f. If flightless shorebird young are present within or adjacent to the equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young. It is the Permittee/Contractor’s responsibility to ensure no chicks are in the path of the moving vehicle and no tracks capable of trapping flightless chicks result.

g. The FWC recommends that some activity in the travel corridor is maintained on a daily basis in order to discourage birds from nesting within the travel corridor. These activities shall not be allowed to disturb shorebirds nesting on site or interfere with sea turtle nesting, especially if the corridors are established before construction has started.

h. *Notification.* If the Bird Monitor(s) find that shorebirds are breeding within the project area, he or she shall ensure that an informational bulletin board is placed and maintained in the construction staging area. This bulletin board shall display a location map of the construction site, depict the location(s) of the bird breeding areas and include a clearly visible warning stating: “NESTING BIRDS ARE

PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE AND FEDERAL MIGRATORY BIRD ACTS”.

16. **Marine Turtle Nest Surveys and Relocation Conditions.**

a. For sand placement during marine turtle nesting season: (April 15 – November 15), daily early morning surveys shall be conducted and eggs shall be relocated per the requirements below until completion of sand placement. (Note: marine turtle monitors shall not enter posted shorebird buffer areas to conduct monitoring or to relocate nests, unless otherwise authorized to do so by FWC staff). Monitoring and reporting shall continue throughout the nesting season and shall be conducted according to Post-Construction Monitoring and Reporting Marine Turtle Protection Conditions included in this document.

b. *Turtle Monitors.* Nesting surveys and egg relocations shall only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to Chapter 68E-1, F.A.C. Please contact FWC’s Marine Turtle Management Program in Tequesta at MTP@myfwc.com for information on the permit holder in the project area. It is the responsibility of the Permittee to ensure that nesting surveys are completed by the authorized Marine Turtle Permit Holder. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (in all time zones).

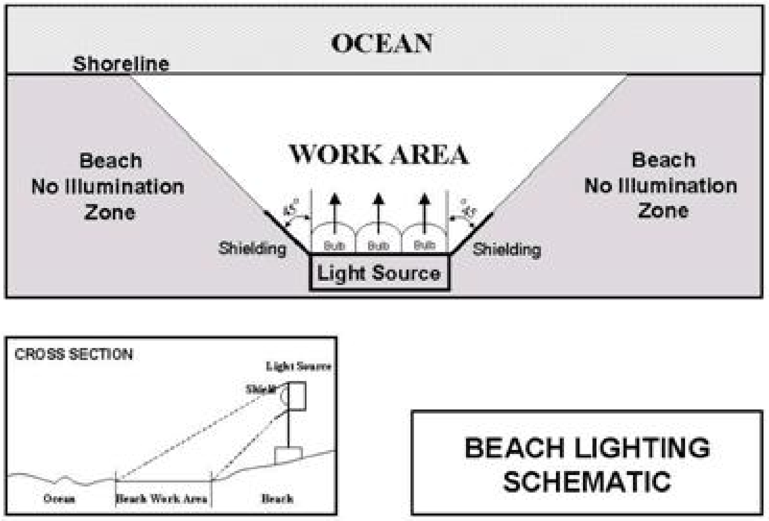
c. Nesting surveys shall be initiated 65 days prior to sand placement activities or by the beginning of marine turtle nesting season (April 15 – November 15), whichever is later. Nesting surveys shall continue daily through the end of the project, or November 15, or until two weeks after the last crawl in the project area, whichever is earlier. If nests are laid in areas where they may be affected by sand placement activities, eggs shall be relocated per the requirements listed in these conditions. Monitoring shall resume for subsequent nesting seasons according to Post-construction Monitoring and Reporting Marine Turtle Protection Conditions included in this document.

d. Only those nests in the area where sand placement will occur shall be relocated. Nest relocation shall not occur upon completion of sand placement. Nests requiring relocation shall be moved no later than 9:00 a.m., the morning following deposition to a nearby self-release beach site in a secure setting, where artificial lighting would not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides, known to routinely experience severe erosion and egg loss or subject to artificial lighting. Nest relocations in association with construction activities shall cease when sand placement activities no longer threaten nests.

e. Nests deposited within areas where construction activities have ceased, will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in place. The turtle permit holder shall install an on-beach marker at the nest site and/or a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity shall occur within this area, nor shall any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure that nest markers remain in place and the nest has not been disturbed by the project activity.

17. **Marine Turtle or Nest Encounters**. Upon locating a dead or injured sea turtle adult, hatchling or egg that may have been harmed or destroyed as a direct or indirect result of the project, the Permittee shall notify FWC Wildlife Alert at 1-888-404-FWCC (3922). Care shall be taken in handling injured marine turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis. In the event a sea turtle nest is excavated during construction activities, but not as part of the authorized nest relocation process outlined in these specific conditions, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

18. **Project Lighting**. Direct lighting of the beach and nearshore waters during the marine turtle nesting season (April 15 – November 15) shall be limited to the immediate construction area and shall comply with safety requirements. Lighting on offshore or onshore equipment shall be minimized through reduction, shielding, lowering and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, EM 385-1-1 and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order to avoid misdirection of sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (see Figure below).



BEACH LIGHTING SCHEMATIC

19. **Fill Restrictions**. During the sea turtle nesting season (April 15 – November 15), the contractor shall not extend the beach fill more than 500 feet along the shoreline between dusk and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle monitor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500-foot length limitation is not feasible for the project, an agreed upon distance shall be established during the pre-construction conference. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor shall be allowed to proceed with the placement of fill during daylight hours until dusk, at which time the 500-foot length limitation shall apply.

20. **Compaction Sampling**. Sand compaction shall be monitored in the area of sand placement immediately after completion of each beach placement event and prior to April 15th for three (3) subsequent years, and shall be monitored in accordance with a protocol agreed to by the FWC and the Permittee. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach. At a minimum, the protocol provided under a. and b. below shall be followed. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the following date listed above. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then the Permittee shall consult with the FWC to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling shall not be required.

a. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to depths of 6, 12 and 18 inches three times (i.e., three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 18 values for each transect line, and the final 6 averaged compaction values.

c. No compaction sampling shall occur within 300 feet of any shorebird nest.

d. Any vehicles operated on the beach in association with compaction surveys shall operate in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

21. **Tilling Requirements**. If tilling is required, as specified above, the area shall be tilled to a depth of 24 inches. All tilling activity shall be completed prior to the marine turtle nesting season. If tilling occurs during shorebird nesting season, shorebird surveys prior to tilling shall be required per the Shorebird Conditions included within this document. It is the responsibility of the contractors (and ultimately the Permittee) to avoid tilling, scarp removal or dune vegetation planting in areas where nesting birds are present. Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling. If the project is completed during the marine turtle nesting season, tilling shall not be performed in areas where nests have been left in place or relocated. If compaction measurements are taken, a report on the results of the compaction monitoring shall be submitted electronically to FWC at marineturtle@myfwc.com prior to any tilling actions being taken.

a. No tilling shall occur within 300 feet of any shorebird nest.

b. If flightless shorebird young are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young.

c. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling.

d. Tilling shall occur landward of the wrack line and all vegetated areas three (3) square feet or greater shall be avoided, and a three (3) square-foot buffer shall be maintained around the vegetated areas. The slope between the mean high water line and the mean low water line shall be maintained in such a manner as to approximate natural slopes.

e. Any vehicles operated on the beach in association with tilling shall operate in accordance with the FWC's *Best Management Practices for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

22. **Escarpment Surveys**. Visual surveys for escarpments along the project area shall be made immediately after completion of sand placement and during March 15 to April 15 for three (3) subsequent years if placed sand still remains on the beach. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by April 15. Any escarpment removal shall be reported by location. If the project is completed during the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Permittee shall contact FWC immediately if subsequent reformation of escarpments occurs during the nesting and hatching season and the escarpments interfere with sea turtle nesting or exceed 18 inches in height for a distance of 100 feet. The FWC would then determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the FWC shall provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronically to marineturtle@myfwc.com along with the annual summary as described below. If escarpment removal occurs during shorebird breeding season, shorebirds surveys shall be required per the Shorebird Conditions included within this document prior to removal. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach).

a. No heavy equipment shall operate within 300 feet of any shorebird nest.

b. If flightless shorebird young are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that equipment does not operate within 300 feet of the flightless young.

c. Any vehicles operated on the beach in association with escarpment surveys or removal shall operate in accordance with the FWC's *Best Management Practices* *for Operating Vehicles on the Beach* (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/).

23. **Post-construction Conditions, Monitoring and Reporting Conditions.**

a. Shorebirds: If beach cleaning will occur on the nourished beach, a minimum of 30% of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

b. Marine Turtles: Reports on all marine turtle nesting activity shall be provided for the initial marine turtle nesting season (April 15 – November 15) and for up to two additional nesting seasons as follows:

i. For the remainder of the nesting season immediately following construction, and the following year, the number and type of emergences (nests or false crawls) shall be reported per species in accordance with Table 1 below. An additional year of nesting surveys may be required if nesting success for any species on the nourished beach is less than 40%.

ii. For the remainder of the nesting season immediately following construction, reproductive success shall be reported per species in accordance with Table 1 below. Reproductive success shall be reported for all loggerhead, Kemp's ridley, green and leatherback nests.

iii. In the event that the reproductive success documented by species meets or exceeds required criteria (outlined in Table 1 below) for each species, monitoring for reproductive success shall be recommended, but not required for the second year post-construction.

iv. Monitoring of nesting activity in the seasons following construction shall include daily surveys and any additional measures authorized by the FWC. Summaries shall include all crawl activity, nesting success rates, hatching success of all relocated nests, hatching success of a representative sampling of nests left in place (if any) by species, project name and applicable project permit numbers and dates of construction.

v. Lighting Surveys. Two lighting surveys shall be conducted of all artificial lighting visible from the nourished berm. The first survey shall be conducted between May 1 and May 15 of the first nesting season following construction or immediately after placement if construction is not completed until after May 15, and a second survey between July 15 and August 1. The survey shall be conducted by the Permittee and shall be conducted to include a landward view from the seaward most extent of the new beach profile. The survey shall follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation. For each light source visible, the Permittee shall document that the property owner(s) have been notified of the problem light and have been provided with recommendations for correcting the light. Recommendations must be in accordance with the Florida Model Lighting Ordinance for Marine Turtle Protection (Chapter 62B-55, F.A.C.) and local lighting restrictions. A report summarizing all lights visible shall be submitted to FWC Imperiled Species Management Section at marineturtle@myfwc.com and **copied to** JCPCompliance@dep.state.fl.us by the 1st of the month following survey. A summary report documenting what corrective actions have been taken shall also be submitted by December 15 of that year. After the annual report is completed, a meeting shall be set up with the Permittee or local sponsor, county or municipality and FWC to discuss the survey report as well as any documented sea turtle disorientations in or adjacent to the project area.

24. Data shall be reported for the nourished areas in accordance with the Table 1 below and shall include number of nests lost to erosion or washed out. Summaries of nesting activity shall be submitted in electronic format (Excel spreadsheets) to the FWC Imperiled Species Management Section at marineturtle@myfwc.com and **copied to** JCPCompliance@dep.state.fl.us. All summaries shall be submitted by January 15 of the following year. The FWC Excel spreadsheet is available upon request from marineturtle@myfwc.com.

Table 1. Marine Turtle Monitoring for Beach Placement of Material

Metric	Duration	Variable	Criterion
Nesting Success	Year of construction and one year post construction if placed sand remains on beach. Up to three years if variable does not meet criterion. [1 and 2]	Number of nests and non-nesting emergences by day by species	40% or greater
Hatching Success	Year of construction. Additional one to two years post construction if placed sand remains on beach and variable does not meet criterion. [1 and 2]	Number of hatchlings by species to completely escape egg	Average of 60% or greater (data must include washed out nests)
Emergence Success	Year of construction. Additional one to two years post construction if placed sand remains on beach and variable does not meet success criterion. [1 and 2]	Number of hatchlings by species to emerge from nest onto beach	Average must not be significantly different than the average hatching success

Disorientation	Year of construction and one to three years post construction if placed sand remains on beach. [1 and 2]	Number of nests and individuals that misorient or disorient	
Lighting Surveys	Two surveys the year following construction, one survey between May 1 and May 15 and second survey between July 15 and August 1.[1 and 2]	Number, location and photographs of lights visible from the nourished berm, corrective actions and notifications made	100% reduction in lights visible from nourished berm within one to two month period
Compaction	Not required if the beach is tilled prior to nesting season each year placed sand remains on beach.	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for up to three years, each year that placed sand remains on the beach.[2]	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

Notes: [1]Not required for maintenance dredging.
[2]Not required if dredged sand is placed in the nearshore swash or littoral zones only.

MONITORING REQUIRED:

Physical Monitoring

25. The Permittee shall comply with the following conditions intended to monitor the performance of the coastal construction and determine its effects on the coastal system. Changes to the approved protocols listed under this section can be revised at any later time by written request of the Permittee and with the written approval of the Department. However, submission of a physical monitoring plan shall be required to address such changes.

    a. Bathymetric surveys of the Longboat Pass channel and shoal complex shall be conducted within 90 days prior to commencement of construction of each dredging event; surveys of the Longboat Pass channel and immediately-adjacent shoal platform shall be conducted within 60 days following completion of construction of each dredging event.

       Survey grid lines across the channel shall be spaced to provide sufficient detail for accurate volumetric calculations, but spaced no more than 500 feet apart, and shall extend a minimum of 500 feet beyond the boundaries of the shoal complex. Bathymetric surveys of the entire shoal complex, including any attachment bars, shall be conducted. In all other aspects, work activities and deliverables shall be consistent with the Department's *Monitoring Standards for Beach Erosion Control Projects, Section 01200.*

b. The Permittee shall submit a monitoring report prepared by a qualified professional engineer or coastal geologist registered in the State of Florida and the monitoring data to the Department within 90 days following completion of the post-construction survey.

The report shall summarize and discuss the data, the performance of the project, and its effects on the inlet system and adjacent beaches. Results shall be analyzed for patterns, trends, or changes between project construction activities. The report shall incorporate topographic and bathymetric beach and offshore profile survey data as applicable from the monitoring programs for the Anna Maria Island and Longboat Key beach nourishment projects. The report shall specifically include:

i. Updated sediment budget for Longboat Pass;

ii. The annual average bypassing volume to be placed on the adjacent eroding beaches;

iii. Computations, tables and graphic illustrations of bathymetric contours, and volumetric, bathymetric and shoreline position changes for the monitoring area: and,

iv. Other shoreline position, bathymetric contour and volumetric analysis the Permittee or design professional deem useful in assessing, with quantitative measurements, the performance of the project.

c. A digital copy of the monitoring report and a digital file of the survey data shall be submitted to the Division of Water Resource Management in Tallahassee. Failure to submit reports and data in a timely manner constitutes grounds for revocation of the permit. When submitting any monitoring information to the Department, please include a transmittal cover letter clearly labeled with the following at the top of each page: **"This monitoring information is submitted in accordance with the approved monitoring protocol for Permit No. [0298107-009-JN~~4-JC~~] for the monitoring period [XX].**

This permit does not require a physical monitoring plan. However, any requested changes to modify the physical monitoring protocol described in this specific condition shall require the submission of a physical monitoring plan. The physical monitoring plan shall be approved by the Department. In the event that such a plan is drafted, reviewed and approved, the submitted monitoring information shall reference the approved Monitoring Plan for Permit No. [0298107-009-JN~~4-JC~~] for the monitoring period [XX].

Biological Monitoring

26. Biological monitoring of hardbottom resources (including nearshore hardbottom and artificial reefs) shall be conducted to document potential project-related adverse impacts to these resources, and to provide an analysis of the impacts (e.g., construction-related burial or sedimentation). Any damage to unmitigated hardbottom resources, either persistent or temporary, shall require mitigation. Monitoring shall comply with and meet the requirements of the current ~~A~~approved Biological Monitoring Plan. No construction shall occur until the Biological Monitoring Plan has been approved by the Department, and a baseline survey has been completed and submitted to the Department as required in Specific Condition 27a.

27. Nearshore hardbottom and artificial reefs shall be monitored once, prior to the initial construction, immediately following construction, and annually, for three years post-construction, for a total of five (5) monitoring events. Construction shall not begin until baseline (pre-construction) surveys of all resources in and adjacent to the project area (nearshore) have been conducted according to the Biological Monitoring Plan and the results of these surveys have been submitted to the Department.

   a. If less than two (2) years old, the most recent monitoring survey for the 2014 Coquina Beach Restoration Project may be used as the baseline (pre-construction) survey for the Anna Maria Island beach placement area. A new baseline survey shall be completed for the Longboat Key placement area prior to construction. In either case, the survey used as the initial survey shall serve as baseline for all subsequent nourishment events under this permit.

   b. Each subsequent nourishment event shall initiate another complete round of post-construction monitoring, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).

   c. In some cases, the dredged sand may be placed alternately between the Anna Maria and Longboat Key shorelines, and on some occasions the sand may be split between the two shorelines during the same dredge/fill event. Regardless of whether both beach sections (Anna Maria Island and Longboat Key) are nourished together or independent of one another, each nourishment event shall initiate another complete round of post-construction monitoring for the areas that are nourished, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).

   d. The Anna Maria Island and Longboat Key biological monitoring shall be conducted and reported on independently. All surveys shall be conducted in compliance with the current ~~A~~approved Biological Monitoring Plan, and monitoring progress shall be reported weekly until the completion of each survey, at which point the JCP Compliance Officer shall be notified that the survey is complete.

28. The Permittee shall require the biological monitoring company to submit raw data, as collected in the field and as entered into spreadsheets for analysis (Microsoft Excel file format), simultaneously to the Department, contractor and Permittee no later than 45 days after completing each survey, beginning with the pre-construction monitoring survey. Final reports shall be due to the Department no later than 90 days after completing the survey.

29. The Permittee shall authorize direct communication between the biological monitoring personnel and the Department with regard to biological data collection, methodology, field sampling logistics and data discussed in reports. Biological monitoring personnel shall assess biological monitoring results independently and without consultation beyond the approved biological monitoring personnel. Any issues involving changes to the biological monitoring or mitigation plan or changes to the permit conditions shall involve coordination with the Permittee. This condition does not authorize the Department to change the scope of the biological monitoring without coordinating with the Permittee.

30. **Water Quality Monitoring.** Turbidity shall be monitored as follows:

Units: Nephelometric Turbidity Units (NTUs).

Frequency: Three times daily, at least four (4) hours apart, during all dredging and beach placement operations. Sampling shall be conducted **while the highest project-related turbidity levels are crossing the edge of the mixing zone**. Since the turbidity levels can be related to pumping rates, the dredge pumping rates shall be recorded, and provided to the Department upon request. The compliance samples and the corresponding background samples shall be collected at approximately the same time, i.e., background ~~one~~ shall immediately follow the compliance ~~other~~.

Location: Background: At surface and mid-depth, clearly outside the influence of any artificially generated turbidity plume or the influence of an outgoing inlet plume, coincidental with compliance measurements.

Dredge Site: Samples shall be collected at surface and mid-depth, at least 500 meters upcurrent from the dredge site and clearly outside the influence of any turbidity generated by the project.

Beach Site: Samples shall be collected at surface and mid-depth, at a point approximately 500 meters upcurrent from any portion of the beach that has been, or is being, filled during the current construction event, at the same distance offshore as the compliance station, clearly outside of any turbidity plume generated by the project.

Compliance: Three times daily at least four (4) hours apart during dredging and beach placement operations, at surface and mid-depth, while the densest turbidity plume is crossing the edge of the mixing zone. **Note**: If the plume flows parallel to the shoreline, the densest portion of the plume may be close to shore, in shallow water, and may cross the edge of the mixing zone polygon less than 150 meters offshore. In that case, it may be necessary to access the sampling location from the shore, in water that is too shallow for a boat.

Dredge Site: Samples shall be collected 150 meters down-current from the dredge head in the downcurrent direction **and** from any other source of turbidity generated by the dredge, in the densest portion of any visible turbidity plume. If no plume is visible, follow the likely direction of flow.

Beach Site: Samples shall be collected where the densest portion of the turbidity plume crosses the edge of the mixing zone, which measures up to 150 meters downcurrent and up to 1,000 meters alongshore from the point where the return water from the dredged discharge reenters the Gulf of Mexico.

Intermediate: Required when using a mixing zone that exceeds 150 meters in size. Within the approved mixing zone, samples shall be collected along the densest portion of the turbidity plume (or in the direction of flow if no plume is visible), at 150 meters, 250 meters, 500 meters and 750 meters downcurrent from the point of discharge into the Gulf of Mexico (if those points are located inside the mixing zone), at surface and mid-depth. The data generated by this intermediate monitoring shall be used to adjust the size of the mixing zone for future events, not for compliance.

Calibration: The instruments used to measure turbidity shall be fully calibrated with primary standards within one month of the commencement of the project, and at least once a month throughout the project. Calibration with secondary standards shall be verified each morning prior to use, after each time the instrument is turned on, and after field sampling using two secondary turbidity “standards” that bracket the anticipated turbidity samples. If the post-sampling calibration value deviates more than 8% from the previous calibration value, results shall be reported as estimated and a description of the problem shall be included in the field notes.

The monitoring requirements for the type of activity and location of the sampling site shall be reflected on the monitoring report forms.

Analysis of turbidity samples shall be performed in compliance with DEP-SOP-001/01 FT 1600 Field Measurement of Turbidity:
http://publicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/ft1600.pdf

If the turbidity monitoring protocol specified above prevents the collection of accurate data, the person in charge of the turbidity monitoring shall contact the JCP Compliance Officer to establish a more appropriate protocol. Once approved in writing by the Department, the new protocol shall be implemented through an administrative permit modification.

31. The compliance locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the compliance sites are greater than 29 NTUs above the corresponding background turbidity levels, or 7.5 NTUs above background within the OFW, construction activities shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels.

Any project-associated turbidity source other than dredging or beach placement (e.g., scow or pipeline leakage) shall be monitored as close to the source as possible. If the turbidity level exceeds 29 NTUs above background, or 7.5 NTUs above background within OFW, the construction activities related to the exceedance shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. This turbidity monitoring shall continue every hour until background turbidity levels are restored or until otherwise directed by the Department. The Permittee shall notify the Department's JCP Compliance Officer, by separate email to the JCP Compliance Officer, of such an event within 24 hours of the time the Permittee first becomes aware of the discharge. The subject line of the email shall state "OTHER PROJECT-ASSOCIATED DISCHARGE, TURBIDITY EXCEEDANCE".

When reporting a turbidity exceedance, the following information shall also be included:

a. the Project Name;

b. the Permit Number;

c. location and level (NTUs above background) of the turbidity exceedance;

d. the time and date that the exceedance occurred; and

e. the time and date that construction ceased.

Prior to re-commencing the construction, a report shall be emailed to the Department's JCP Compliance Officer with the same information that was included in the "Exceedance Report", plus the following information:

a. turbidity monitoring data collected during the shutdown documenting the decline in turbidity levels and achievement of acceptable levels;

b. corrective measures that were taken; and

c. cause of the exceedance.

32. **Turbidity Reports:** All turbidity monitoring data shall be submitted within one week of analysis. The data shall be presented in tabular format, indicating the measured turbidity levels at the compliance sites for each depth, the corresponding background levels at each depth and the number of NTUs over background at each depth. Any exceedances of the turbidity standard (29 NTUs above background, or 7.5 NTUs above background within the OFW) shall be highlighted in the table. In addition to the raw and processed data, the reports shall also contain the following information:

a. time of day samples were taken;

b. dates of sampling and analysis;

c. GPS location of sample; <u>*When possible, coordinates should be provided in decimal degrees with a 5 decimal level of precision (i.e., 0.000001). Please also indicate the datum;*</u>

d. depth of water body;

e. depth of each sample;

f. antecedent weather conditions, including wind direction and velocity;

g. tidal stage and direction of flow;

h. water temperature;

i. a <u>geo-referenced</u> map, overlaid on an aerial photograph, indicating the sampling locations <u>(background and compliance)</u>, dredging and discharge locations, <u>the visible plume pattern,</u> and direction of flow. <u>The map shall also include the boundaries of any benthic resources and the OFW, where applicable.</u> A sample map shall reviewed and approved by the Department prior to construction;

j. a statement describing the methods used in collection, handling, storage and analysis of the samples;

k. a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection, calibration of the meter, accuracy of the data and precision of the GPS measurements;

l. When samples cannot be collected, an explanation shall be included in the report. If unable to collect samples due to severe weather conditions, include a copy of a current report from a reliable, independent source, such as an online weather service.

Monitoring reports shall be submitted by email to the Division in Tallahassee (attn: JCP Compliance Officer). In the subject line of the reports, include the Project Name, Permit Number and the dates of the monitoring interval. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the Department's JCP Compliance Officer, on the cover page to the submittal and at the top of each page, please state: "This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0298107-009-JN~~4-JC~~, for the Longboat Pass Navigational Maintenance Dredging and Beach Nourishment Project."

33. If the Permittee is unable to complete two maintenance events within the 15-year life of the permit, the Permittee may request (prior to the expiration date of the permit), and the Department shall grant, an extension of the permit expiration date in order to allow completion of the second maintenance event. The extension would be documented through an administrative modification.

NOTICE OF RIGHTS

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rules 28-106.201 and 28-106.301, F.A.C., a petition for an administrative hearing must contain the following information:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name, address, and telephone number of the petitioner; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;

(c) A statement of when and how the petitioner received notice of the agency decision;

(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;

(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;

(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and

(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition
In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant and persons entitled to written notice under Section 120.60(3), F.S., must be filed within **14** days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within **14** days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

Extension of Time
Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative

hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, or via electronic correspondence at Agency_Clerk@dep.state.fl.us, before the deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation
Mediation is not available in this proceeding.

FLAWAC Review
The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review
Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Florida Rules of Appellate Procedure 9.110 and 9.190 with the Clerk of the Department in the Office of General Counsel (Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000) and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice must be filed within 30 days from the date this action is filed with the Clerk of the Department.

EXECUTION AND CLERKING:

Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

____
Gregory W. Garis
Program Administrator
Beaches Inlets and Ports Program
Office of Resiliency and Coastal Protection

Attachments: Approved Permit Drawings (12 pages, signed October 6, 2014; 2 pages signed July 15, 2016)
Sediment QA/QC Plan (dated October 3, 2014)Dune Restoration and Vegetation Planting Plan (4 pages, revised June 29, 2016)
Biological Monitoring Plan (revised January 30, 2020)

cc: Greg Garis, DEP
Ivana KennyCarmola, DEP
Robert Brantly, DEP
Vincent George, DEP
Luke Davis, FWC
Brendan Biggs, DEP
Jennifer Peterson, DEP
JCPCompliance@dep.state.fl.us
MarineTurtle@MyFWC.com
FWCConservationPlanningServices@myFWC.com
Tampareg@usace.army.mil

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

February 28, 2020

Clerk Date

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Noah Valenstein
Secretary

October 29, 2020

CO-PERMITTEES:
Manatee County
Parks and Natural Resources
Attn: Charlie Hunsicker
5502 33rd Avenue Drive West
Bradenton, FL 34209

and

Town of Longboat Key
Attn: Isaac Brownman
600 General Harris Street
Longboat Key, FL 34228

AGENT:
Coastal Protection Engineering
Attn: Lauren Floyd, MS
5301 N. Federal Hwy, Suite 335
Boca Raton, FL 33487

Permit Modification No. 0298107-010-JN
Permit No. 0298107-009-JN, Manatee County
Longboat Pass Navigational Maintenance Dredging

Dear Messrs. Hunsicker and Brownman:

The Florida Department of Environmental Protection (Department) is issuing an administrative modification to Permit No. 0298107-009-JN to improve consistency in biological monitoring requirements between project areas. As part of this modification, the Department will revise the Biological Monitoring Plan as well as Specific Conditions 26 and 27.

Background
Longboat Key has an extensive permitting history ranging from beach restoration/nourishment to the construction of erosion control structures and the maintenance of navigable depths within the

associated passes. At this particular site, Longboat Pass (Site No. 0298107) permits were issued to WCIND (0298107-002-JC) to create and maintain two (2) sediment impoundment basins, and jointly to the Town of Longboat Key and Manatee County (0298107-004-JC) to maintain navigable depths within Longboat Pass. Only the permitting history of this site (02980107) will be summarized below.

On December 2, 2009, the Department issued a de minimus exemption, File No. **0298107-001-BE**, to the West Coast Inland Navigation District (WCIND), for the collection of 12 vibracores throughout the Longboat Pass flood shoal. Sand samples were collected from three (3) designated areas within the flood shoal to investigate sand quality for future establishment of a sand trap for periodic maintenance dredging

On December 5, 2012, the Department issued Permit No. **0298107-002-JC** and granted Variance No. **0298107-003-BV** to the WCIND. The permit authorized the creation and maintenance of two impoundment basins (Cut 1 and Cut 2) within the flood shoal of Longboat Pass with the disposal of beach quality material on the beach or nearshore area, on the northern end of Longboat Key. The variance from the provisions of Rule 62-4.244(5)(c), F.A.C., temporarily established an expanded mixing zone of 150 meters offshore and 500 meters downcurrent from the beach point of discharge. The project also included the subsequent dredging of sand captured by the basins and placement of the dredged material in one of the placement locations on the north end of Longboat Key (R-44 to R-48) or in the Coquina Beach template (R-36 to R-41 + 500 feet) on Anna Maria Island. Subsequent modifications of this permit include: Modification No. **0298107-005-JN**, to change the maximum allowable turbidity level within the OFW; and Modification No. **0298107-008-JN**, to extend the permit duration until December 5, 2027 and update/revise various conditions.

On March 19, 2015, the Department issued Permit No. **0298107-004-JC** to Manatee County and the Town of Longboat Key to maintain Longboat Pass at its current specifications (a maximum dredge depth of -13.6 feet NAVD), and to place beach-compatible sand from the dredging onto the beaches north and south of the inlet. The fill template contains a variable berm width at an elevation of 5 feet NAVD, and a foreshore slope of 1:15 (vertical:horizontal). Following the initial placement, the maintenance schedule and volume of material to be dredged would be determined based on physical monitoring data.

For additional background, please see the ***CONSOLIDATED NOTICE OF INTENT TO ISSUE JOINT COASTAL PERMIT AND AUTHORIZATION TO USE SOVEREIGN SUBMERGED LANDS*** for Permit No. 0298107-004-JC at the following website:

ftp://ftp.dep.state.fl.us/pub/ENV-PRMT/manatee/issued/0298107_Longboat_Pass/004-JC/Intent/

On August 5, 2015, the Department issued Permit Modification No. **0298107-006-JN** to correct the project description by including a maximum allowable overdepth of -15.6 feet NAVD and to revise the biological monitoring requirement of Specific Condition No. 28.

On August 1, 2016, the Department issued Permit Modification No. **0298107-007-JN** to authorize temporary construction access areas and temporary impacts to the associated dune system where widening of these access areas is necessary. The Department also updated the General Conditions and Specific Condition 16 *'Marine Turtle Nest Surveys and Relocation Condition'*.

On February 28, 2020, the Department issued Permit Modification No. **0298107-009-JN**, which superseded Permit No. 0298107-004-JC, to revise the biological monitoring protocol on the Town's artificial reef modules. The Department used this opportunity to combine all the previous modifications associated with 0298107-004-JC into a clean permit, file no. 0298107-009-JN.

Justification and Staff Assessment

At the request of Department staff and Manatee County, Permit No. 0298107-009-JN will be modified to revise the Biological Monitoring Plan (Plan) dated January 2020. Specific Conditions 26 and 27 will also be revised to increase clarity, bring language in line with current Department standards and requirements of the revised Plan, and to add a table that summarizes surveys, monitoring events, and tasks required by the Plan.

As part of the previous modification of the permit (Modification No. 0298107-009-JN), monitoring for the Longboat Key project area was revised by removing the requirement to collect quantitative community data from mitigative artificial reefs that had met their success criteria from the Plan. To make monitoring of mitigative reefs in the two project areas more consistent, this modification does the same for the Anna Maria Island project area (i.e., removes the requirement to collect quantitative community data from mitigative artificial reefs that have met their success criteria from the Plan). To provide the Department with reasonable assurance that project-related impacts to mitigative reefs would be documented and offset if they occurred, physical monitoring and qualitative biological monitoring of all mitigative reefs adjacent to the Longboat Key and Anna Maria Island project areas is still required by the revised Biological Monitoring Plan (dated October 2020).

Additionally, this modification removes the requirement to monitor nearshore hardbottom adjacent to the Anna Maria Island project area (only) from the Plan. Nearshore hardbottom seaward of the permitted equilibrium toe of fill of the Anna Maria Island project area was impacted (unpermitted) by the 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project and its 2014 Extension (Department Permit No. 0281452-001-JC and Modification No. 0281452-005-JN, respectively). Manatee County has committed to offset the acreage of unpermitted impacts as well as the small amount of remaining unimpacted hardbottom by constructing a mitigative artificial reef. Since all unmitigated natural hardbottom offshore the Anna Maria Island project area is being offset by mitigation, monitoring of these resources will no longer be required by the Plan. The new mitigative artificial reef will be permitted and constructed as part of the next City of Anna Maria Island

Coquina Beach Nourishment Project and the permit for the project will stipulate mitigation success criteria that must be met to ensure impacts have been offset.

Specific conditions of the permit shall be revised as follows (~~strikethroughs~~ are deletions, <u>underlines</u> are additions):

26. <u>**No additional impacts to hardbottom resources are authorized by this permit.**</u> Biological monitoring of hardbottom resources (including nearshore hardbottom and artificial reefs) shall be conducted to document potential project-related adverse impacts to these resources, and to provide an analysis of the impacts (e.g., construction-related burial or sedimentation). Any damage to unmitigated hardbottom resources, either persistent or temporary, shall require mitigation. <u>Impacts and their mitigation may be handled through compliance and enforcement action, and the amount of mitigation may be determined according to the Department's UMAM assessment.</u> Monitoring shall comply with and meet the requirements of the current approved Biological Monitoring Plan. No construction shall occur until the Biological Monitoring Plan has been approved by the Department, and a baseline survey has been completed and submitted to the Department as required in Specific Condition 27a.

27. Nearshore hardbottom <u>(along the Longboat Key project area)</u> and artificial reefs shall be monitored <u>as specified by the approved Plan.</u>~~once, prior to the initial construction, immediately following construction, and annually, for three years post-construction, for a total of five (5) monitoring events.~~ Construction <u>on Longboat Key</u> shall not begin until baseline (pre-construction) surveys of all resources in and adjacent to the project area (nearshore) have been conducted according to the ~~Biological Monitoring~~ Plan and the results of these surveys have been submitted to the Department. <u>Table 2 (below), titled "Longboat Pass Navigational Maintenance Dredging Project Monitoring Summary", summarizes surveys, monitoring events, and tasks required by the Plan; these are described in detail in the Biological Monitoring Plan itself.</u>

   a. <u>When sand dredged from Longboat Pass is placed in the Anna Maria Island fill placement area, post-construction mitigative artificial reef monitoring shall be conducted (see Section 3.0 of the current approved Plan and Table 2 below). The December 2013/January 2014 pre-construction monitoring event for the 2014 Coquina Beach Nourishment Project (Department Permit No. 0281452-001-JC and Modification No. 0281452-005-JN) shall serve as the pre-construction (baseline) for the 1993, 2005, and 2011 Mitigative Artificial Reefs for the Anna Maria Island portion of the project.</u> ~~If less than two (2) years old, the most recent monitoring survey for the 2014 Coquina Beach Restoration Project may be used as the baseline (pre-construction) survey for the Anna Maria Island beach placement area.~~ <u>Each nourishment of the Anna Maria Island project area shall</u>

initiate a complete round of post-construction monitoring, which shall include a total of three (3) annual mitigative artificial reef monitoring events, at years 1, 2, and 3 post-construction.

b. When sand dredged from Longboat Pass is placed in the Longboat Key fill placement area, pre- and post-construction natural hardbottom and mitigative artificial reef monitoring shall be conducted (see Section 4.0 of the current approved Plan and Table 2 below). Only one pre-construction monitoring event shall be required, and this monitoring event ~~A new baseline survey~~ shall ~~be completed~~ ~~for the~~ serve as the baseline for all post-construction monitoring on Longboat Key ~~placement area prior to construction. In either case, the survey used as the initial survey shall serve as baseline for all subsequent nourishment events under this permit~~. Each nourishment of the Longboat Key project area shall initiate a complete round of post-construction nearshore hardbottom and mitigative artificial reef monitoring, which shall include an immediate post-construction monitoring event (within six months of project completion), and three annual post-construction monitoring events (Years 1, 2, and 3).

~~b. Each subsequent nourishment event shall initiate another complete round of post-construction monitoring, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).~~

c. In some cases, ~~the dredged~~ sand dredged from Longboat Pass may be placed alternately between the Anna Maria and Longboat Key shorelines, and on some occasions the sand may be split between the two shorelines during the same dredge/fill event. Regardless of whether both beach sections (Anna Maria Island and Longboat Key) are nourished together or independent of one another, each nourishment event shall initiate ~~another~~ a complete round of post-construction monitoring for the areas that are nourished.~~, which shall include four (4) surveys: one initial post-construction survey (within six months of project completion), and three annual post-construction surveys (Years 1, 2 and 3).~~

d. The Anna Maria Island and Longboat Key biological monitoring shall be conducted and reported on independently. Unless otherwise approved in writing by DEP staff, all monitoring events shall be conducted during summer months (May 1 through September 30), as close as practicable to the date that baseline monitoring was conducted. Standard operating procedures shall be used during each monitoring event to provide consistent and repeatable collection of data. ~~All surveys shall be conducted in compliance with the current approved Biological Monitoring Plan, and~~ ~~m~~Monitoring progress and results shall be reported as required by the Plan (see Section 6.0 of the current approved Plan and Table 2 below). ~~weekly until the completion of each survey, at which point the JCP Compliance Officer shall be notified that the survey is complete.~~

Table 2. Longboat Pass Navigational Maintenance Dredging Project Monitoring Summary

<table>
<tr><th>Project Area</th><th>Survey</th><th>Survey Type</th><th>Monitoring Period</th><th>Deliverables</th></tr>
<tr><td rowspan="3">Anna Maria</td><td rowspan="2">Artificial Reef Physical</td><td>In-situ Delineation</td><td rowspan="3">Post-Construction (N=3 per placement event) Years 1, 2, and 3</td><td>Shapefiles</td></tr>
<tr><td>Line-Intercept (Permanent and Temporary transects)</td><td>Excel spreadsheet, PDF of field sheets</td></tr>
<tr><td>Artificial Reef Video</td><td>Video (Permanent transects only)</td><td>Video</td></tr>
<tr><td rowspan="10">Longboat Key</td><td>Natural Hardbottom within ETOF</td><td>Video (Transects)</td><td rowspan="10">Pre-Construction (N=1): once prior to first fill placement.

Post-Construction (N=4 per fill placement event) Immediately (within 6 months) and years 1, 2, and 3).</td><td>Video</td></tr>
<tr><td rowspan="5">Natural Hardbottom Seaward of ETOF</td><td>In-situ HB Delineation</td><td>Shapefiles</td></tr>
<tr><td>Line-Intercept</td><td rowspan="3">Excel spreadsheets, PDF of field sheets</td></tr>
<tr><td>Interval Sediment Depth</td></tr>
<tr><td>Quadrats (BEAMR)</td></tr>
<tr><td>Video</td><td>Video</td></tr>
<tr><td rowspan="3">Artificial Reef Physical</td><td>In-situ Delineation</td><td>Shapefiles</td></tr>
<tr><td>Line-Intercept (Permanent and Temporary transects)</td><td>Excel spreadsheet, PDF of field sheets</td></tr>
<tr><td>Video (Permanent transects only)</td><td>Video</td></tr>
</table>

The approved plans shall be revised as follows:

The Biological Monitoring Plan (dated January 2020) shall be replaced by the revised Biological Monitoring Plan (dated October 2020).

After thorough review of your application, staff finds that the proposed modification is not expected to adversely affect water quality or change the determination that the project is clearly in the public interest. Staff has also determined that the proposed alteration does not increase the potential for adverse impact on the coastal system, public beach access seaward of the mean high water line or nesting sea turtles and hatchlings and their habitat, and that the proposed alteration does not reduce the design adequacy of the project. Since the proposed modification is not expected to result in any adverse environmental impact or water quality degradation, the **permit is hereby modified** as stated above. By copy of this letter and the attached drawings, we are notifying all necessary parties of the modification.

This letter of approval does not alter the **March 19, 2030** expiration date of the permit. The only Specific Conditions of the permit that are altered by this modification are those stated above. This letter and the attached plan must be attached to the original permit.

This permit is hereby modified unless a sufficient petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, Florida Statutes (F.S.), as provided below. The procedures for petitioning for a hearing are set forth below. Mediation under Section 120.573, F.S., is not available for this proceeding.

NOTICE OF RIGHTS

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, F.S., before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the application.

Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rule 28-106.201, F.A.C., a petition for an administrative hearing must contain the following information:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name, address, any email address, any facsimile number, and telephone number of the petitioner; the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;

(c) A statement of when and how the petitioner received notice of the agency decision;

(d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;

(e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
(f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
(g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

Time Period for Filing a Petition
In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing by the applicant must be filed within 14 days of receipt of this written notice. Petitions filed by any persons other than the applicant, and other than those entitled to written notice under Section 120.60(3), F.S., must be filed within 14 days of publication of the notice or within 14 days of receipt of the written notice, whichever occurs first. Under Section 120.60(3), F.S., however, any person who has asked the Department for notice of agency action may file a petition within 14 days of receipt of such notice, regardless of the date of publication. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

Extension of Time
Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, before the applicable deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

Mediation
Mediation is not available in this proceeding.

FLAWAC Review
The applicant, or any party within the meaning of Section 373.114(1)(a) or 373.4275, F.S., may also seek appellate review of this order before the Land and Water Adjudicatory Commission under Section 373.114(1) or 373.4275, F.S. Requests for review before the Land and Water Adjudicatory Commission must be filed with the Secretary of the Commission and served on the Department within 20 days from the date when this order is filed with the Clerk of the Department.

Judicial Review
Once this decision becomes final, any party to this action has the right to seek judicial review pursuant to Section 120.68, F.S., by filing a Notice of Appeal pursuant to Rules 9.110 and 9.190, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, M.S. 35, Tallahassee, Florida 32399-3000; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this action is filed with the Clerk of the Department.

When there has been no publication of notice of agency action or notice of proposed agency action as prescribed in Rule 62-110.106, F.A.C., a person may request a copy of the agency action. The Department shall upon receipt of such a request, if agency action has occurred, promptly provide the person with notice. The Department does not require notice of this agency action to be published. However, the applicant may elect to publish notice as prescribed in Rule 62-110.106, F.A.C., which constitutes notice to the public and establishes a time period for submittal of any petition.

If you have any questions regarding this matter, please contact Karina Kronsis by email at Karina.Kronsis@dep.state.fl.us or by telephone at (850) 245-7545.

EXECUTION AND CLERKING:

Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Gregory W. Garis
Program Administrator
Beaches, Inlets and Ports Program
Office of Resilience and Coastal Protection

Attachments: Revised Biological Monitoring Plan (Approved October 2020)

CERTIFICATE OF SERVICE
The undersigned duly designated deputy clerk hereby certifies that this permit and all copies were sent on the filing date below to the following listed persons:

cc: Greg Garis, DEP
Ivana KennyCarmola, DEP
Robert Brantly, DEP
Vincent George, DEP
Luke Davis, FWC
Brendan Biggs, DEP
Jennifer Hinton, DEP
JCPCompliance@dep.state.fl.us
MarineTurtle@MyFWC.com
FWCConservationPlanningServices@myFWC.com
Tampareg@usace.army.mil

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to Section 120.52, F. S., with the designated Department Clerk, receipt of which is hereby acknowledged.

October 29, 2020

Clerk **Date**

APPENDIX A - PERMITS

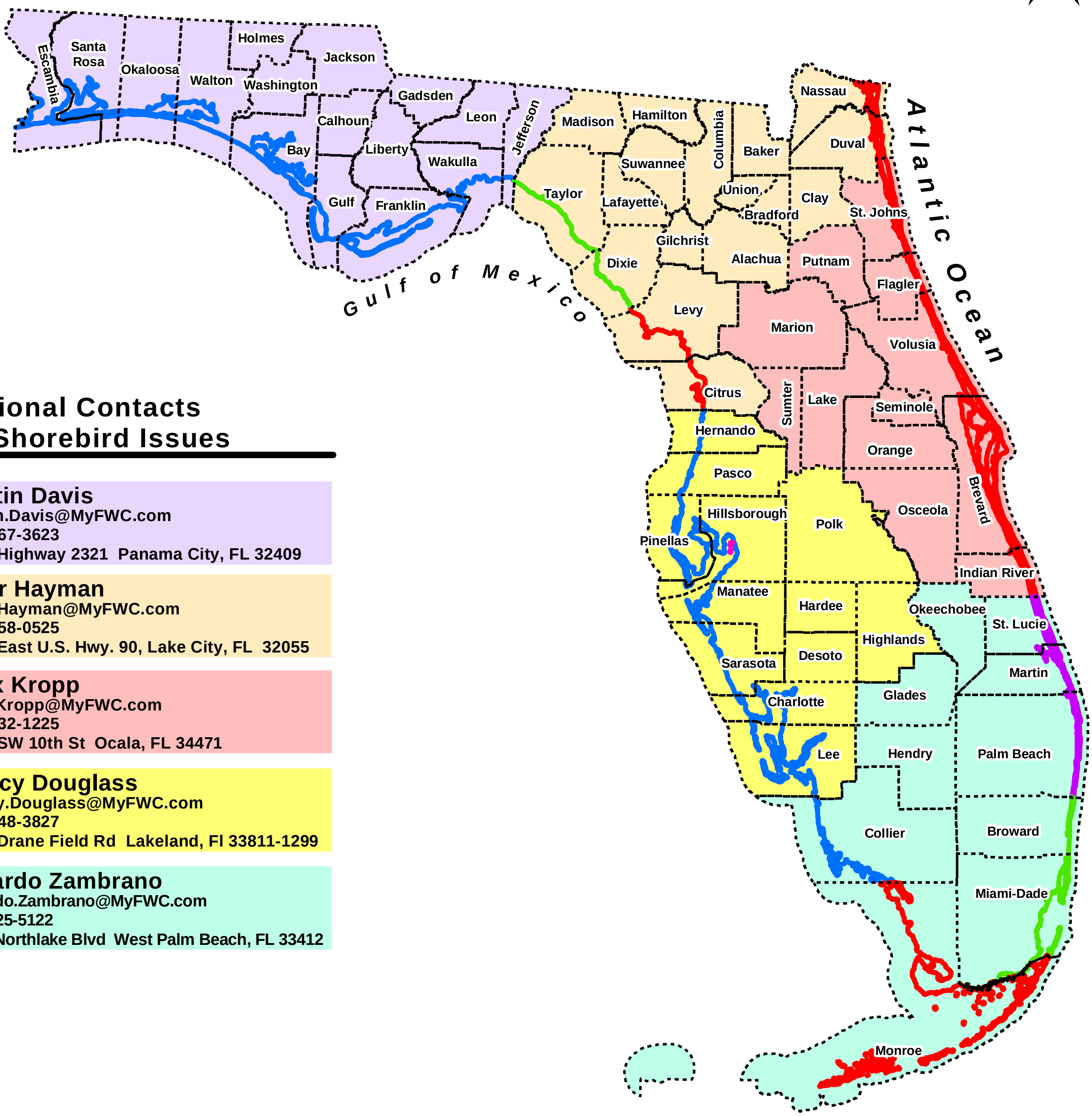
USACE PERMIT ATTACHMENT 2A:
FWC REGIONAL BIOLOGIST CONTACT INFORMATION

1 PAGE

JCP #0298107-004-JC

Shorebird Breeding Seasons and Regional Shorebird Contacts

N



Regional Contacts for Shorebird Issues

Justin Davis
Justin.Davis@MyFWC.com
850-767-3623
3911 Highway 2321 Panama City, FL 32409

Blair Hayman
Blair.Hayman@MyFWC.com
386-758-0525
3377 East U.S. Hwy. 90, Lake City, FL 32055

Alex Kropp
Alex.Kropp@MyFWC.com
352-732-1225
1239 SW 10th St Ocala, FL 34471

Nancy Douglass
Nancy.Douglass@MyFWC.com
863-648-3827
3900 Drane Field Rd Lakeland, Fl 33811-1299

Ricardo Zambrano
Ricardo.Zambrano@MyFWC.com
561-625-5122
8535 Northlake Blvd West Palm Beach, FL 33412

Shorebird Breeding Season

- February 15 - September 1
- Spoil Islands Hillsborough Bay March 1 - September 1
- March 15 - September 1
- April 1 - September 1
- Spoil Islands & Estuaries March 15 - September 1
  Coastal Beaches April 1 - September 1

Florida Fish and Wildlife Conservation Commission
MyFWC.com
620 South Meridian Street
Tallahassee, Florida 32399-1600

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 2B:
DUNE REPAIR PLAN
(REVISED - JULY 2016)

4 PAGES

JCP #0298107-009-JN

APPROVED
Dune Restoration & Planting Plan
Permit #: 0298107-007-JN
Approval: July 29, 2016
Beaches Inlets and Ports Program

Construction Access
Dune Restoration and Vegetation Planting Plan
IFB #16-045 New Pass / Longboat Pass
Dredging and Beach Nourishment Project
Town of Longboat Key, FL

FDEP JCP 0039755-003-JC and Permit Modification 0039755-004-JN (New Pass)
(Specific Condition 4i)
FDEP JCP 0298107-004-JC and Permit Modification 0298107-007-JN (Longboat Pass)
(Specific Condition 4i)

29 July 2016

INTRODUCTION

The Town of Longboat Key, FL, presently maintains over ten miles of engineered beaches along the Gulf of Mexico shoreline along Longboat Key in Manatee and Sarasota Counties, FL. Chronic erosion conditions along the northern and southern portions of the island have created the need to renourish the shoreline to provide protection against further dune erosion, improve lateral beach access alongshore, and enhance recreational beach space. To address these issues, the Town proposes to renourish three segments of Longboat Key, nominally between FDEP monuments R-44.7 and R-45.5 and R-48 and R-50.5 on the northern portion of the island in Manatee County and between R-23 and R-28 on the southern portion of the island in Sarasota County. The project will excavate approximately 205,000 cy from Longboat Pass for placement on the northern segments and approximately 200,000 cy from New Pass for placement on the southern segment. The project is expected to commence sand placement in early August 2016.

Four construction access points have been identified along the length of the fill segments: three on the northern shoreline of Longboat Key and one on the southern shoreline. These access corridors are a mixture of Town-owned and private leased areas. In the Town-owned northern access points, minimal (if any) clearing and/or widening will be necessary. The southern access for the New Pass project is at the L'Ambiance condominium. Clearing and widening will be required through the vegetated dunes to allow light-duty equipment access to the beach.

RESPONSIBILITY FOR DUNE RESHAPING AND REVEGETATION

Pursuant to the terms and conditions of the above-referenced permits, the Town will require the Contractor to document the pre-construction condition of the access corridors via videotape. The Town and Engineer will verify the pre-construction conditions, and in conjunction with the Contractor, will mark the areas where sand must be graded or leveled and areas where vegetation is expected to be damaged or removed. The delineation of these boundaries shall remain in place during the construction period. Following construction, the Contractor shall be responsible for restoring these areas to their pre-construction condition, as verified by the Town and Engineer. Consistent with the terms and conditions of the above-referenced permits, restoration shall occur under the following technical requirements.

TECHNICAL REQUIREMENTS

1.0 Sand Replacement Where required, the Contractor shall place clean, beach-compatible sand to restore the access to its pre-construction topography. Sand for this purpose shall be derived from the borrow area(s) and shall not be excavated from the existing beach or adjacent dune areas. In areas where high relief dunes must be impacted to create the access corridor, the dunes shall be reconstructed in a stable fashion in their pre-construction location and continuous with the natural dune features in the area. Side slopes shall match the slope of natural dunes in the area or shall be equal to or less than the angle of repose for the proposed fill material, and in no case shall it exceed a 1:3 (vertical:horizontal) slope. The crest elevation of the restored dune shall be set at the crest elevation of natural dunes in the area.

2.0 Revegetation

2.1 Within the areas to be repaired and following any required sand placement, the Contractor shall plant the restored access and/or dune areas with a minimum of three different species of native salt-tolerant vegetation, including a minimum of 70 percent coverage by dune grasses. Planting materials shall be appropriate to the region of the planting site. Dune restoration plants shall be spaced throughout the designated area in staggered rows at a maximum distance of 18 inches on center for 2-inch plugs (see **Figure 1**) or up to 36 inches on center for gallon size planting units. Grasses shall be planted at least 6 inches deep. The Contractor shall include a water-retaining gel and fertilizer mixture in all installed plant units, and shall water-in the planting units at the time of installation.

2.2 Survival Criteria: The revegetated areas will achieve the following survival benchmarks 180 days following installation. At least 80 percent of the planting units shall have survived, and 80 percent of the planted area shall be covered with the selected species. Gaps in the shore-parallel coverage shall be replanted. The Town shall replant all deficient areas and maintain the plantings until the above success criteria are met. Irrigation systems and other structures placed during plant installation and initial cultivation shall be removed within thirty days from the submittal of the final project certification, but only after the FDEP has acknowledged planting success.

3.0 Protection of Restored Areas The restored access/dune restoration areas shall be protected from foot traffic or other encroachments. Each area shall be delineated by post and rope and marked with appropriate signage to prevent trampling of vegetation and erosion of the restored areas.

4.0 Endangered Species Protection Work shall be conducted under the terms and conditions of the above-referenced permits. Work areas shall be restricted to the minimum necessary to complete the restoration activities and on-beach travel shall be limited to those areas.

4.1 Shorebirds – For any dune/access revegetation work occurring between February 15 and September 1, work on the beach may not commence each day until approval and clearance has been provided by the Town's designed shorebird monitor.

4.2 Nesting Sea Turtles – For any dune/access revegetation work occurring between April 15 and October 31, work on the beach may not commence each day until approval and clearance has been provided by the Town's designated and permitted marine turtle nesting monitors.

4.3 In the event a marine turtle nest is disturbed or uncovered during the planting activity, the Permittee shall cease all work and immediately contact the person(s) responsible for marine turtle conservation measures within the project area. If a nest(s) cannot be safely avoided during construction, all activity within the affected area shall be delayed until complete hatching and emergence of the nest.

5.0 Specific Access Corridor Restoration Details The following details of restoration are provided in accordance with Specific Condition 4i of the JCP Permit Modification 0039755-004-JN for New Pass and 0298107-007-JN for Longboat Pass. **Figures 2-5** depict each of the access points in plan view and **Figure 6** displays the profile view of the July 2016 conditions in the access corridors that will require restoration and planting.

5.1 New Pass Access - L'Ambiance

a. Location: **Figure 2** depicts the location of the construction access point on the L'Ambiance property.
b. Total area: 1,980 ft^2 (vegetated, approx.)
c. Sand volume required: 0 cubic yards
d. Sand source: See **Item 1.0**. It is anticipated that the Contractor will not have to excavate in the access corridor; thus, fill sand should not be required to restore the area. However, if sand is required, it will be sourced from the New Pass channel borrow area.
e. Vegetation type: Dune grasses, including sea oats (*Uniola paniculata*) and coastal panic grass (*Panicum amarum*) will cover a minimum of seventy percent of the revegetated area. The other thirty percent will be covered by diversity species, including beach elder (*Iva imbricata*), railroad vine (Ipomaea pescaprae), dune sunflower (*Helianthus debilis*), and sea purscane (*Sesuvium portulacastrum*).
f. Size: 2 inch plugs or gallon sized planting units
g. Spacing: 18 inches on center for 2-inch plugs (see **Figure 1**) or up to 36 inches on center for gallon sized planting units
h. Quantity: 900, approx.

5.2 Longboat Pass Access #1 - North Shore Road

a. Location: **Figure 3** depicts the location of the construction access point at North Shore Road. This access is not expected to be used for equipment delivery due to the presence of the seawall, revetment, and concrete groin. Broadway Street is expected to be the primary equipment access.
b. Total area: 0 ft^2 (vegetated, approx.)
c. Sand volume required: 0 cubic yards
d. Sand source: See **Item 1.0**. It is anticipated that the Contractor will not have to excavate in the access corridor; thus, fill sand should not be required to restore the area. However, if sand is required, it will be sourced from the Longboat Pass channel borrow area.
e. Vegetation type: N/A. This access is not currently vegetated and will not require replanting.
f. Size: N/A
g. Spacing: N/A
h. Quantity: 0

5.3 Longboat Pass Access #2 - Broadway Street

a. Location: **Figure 4** depicts the location of the construction access point at Broadway Street.
b. Total area: 550 ft^2 (vegetated, approx.)
c. Sand volume required: 0 cubic yards
d. Sand source: See **Item 1.0**. It is anticipated that the Contractor will not have to excavate in the access corridor; thus, fill sand should not be required to restore the area. However, if sand is required, it will be sourced from the Longboat Pass channel borrow area.
e. Vegetation type: Dune grasses, including sea oats (*Uniola paniculata*) and coastal panic grass (*Panicum amarum*) will cover a minimum of seventy percent of the revegetated area. The other thirty percent will be covered by diversity species,

including beach elder (*Iva imbricata*), railroad vine (Ipomaea pescaprae), dune sunflower (*Helianthus debilis*), and sea purscane (*Sesuvium portulacastrum*).

f. Size: 2 inch plugs or gallon sized planting units

i. Spacing: 18 inches on center for 2-inch plugs (see **Figure 1**) or up to 36 inches on center for gallon sized planting units

g. Quantity: 300, approx.

5.4 Longboat Pass Access #3 - Gulfside Road

a. Location: **Figure 5** depicts the location of the construction access point at Gulfside Road.

b. Total area: 1,600 ft^2 (vegetated, approx.)

c. Sand volume required: 0 cubic yards

d. Sand source: See **Item 1.0**. It is anticipated that the Contractor will not have to excavate in the access corridor; thus, fill sand should not be required to restore the area. However, if sand is required, it will be sourced from the Longboat Pass channel borrow area.

e. Vegetation type: Dune grasses, including sea oats (*Uniola paniculata*) and coastal panic grass (*Panicum amarum*) will cover a minimum of seventy percent of the revegetated area. The other thirty percent will be covered by diversity species, including beach elder (*Iva imbricata*), railroad vine (Ipomaea pescaprae), dune sunflower (*Helianthus debilis*), and sea purscane (*Sesuvium portulacastrum*).

f. Size: 2 inch plugs or gallon sized planting units

j. Spacing: 18 inches on center for 2-inch plugs (see **Figure 1**) or up to 36 inches on center for gallon sized planting units

g. Quantity: 800, approx.

6.0 Notification Within 30 days of project completion, the Permittee shall submit to the Department's JCP Compliance Officer for approval, an as-built plan prepared and certified by the project Engineer showing the dune restoration/ replanting.

SARASOTA COUNTY / MANATEE COUNTY, FL

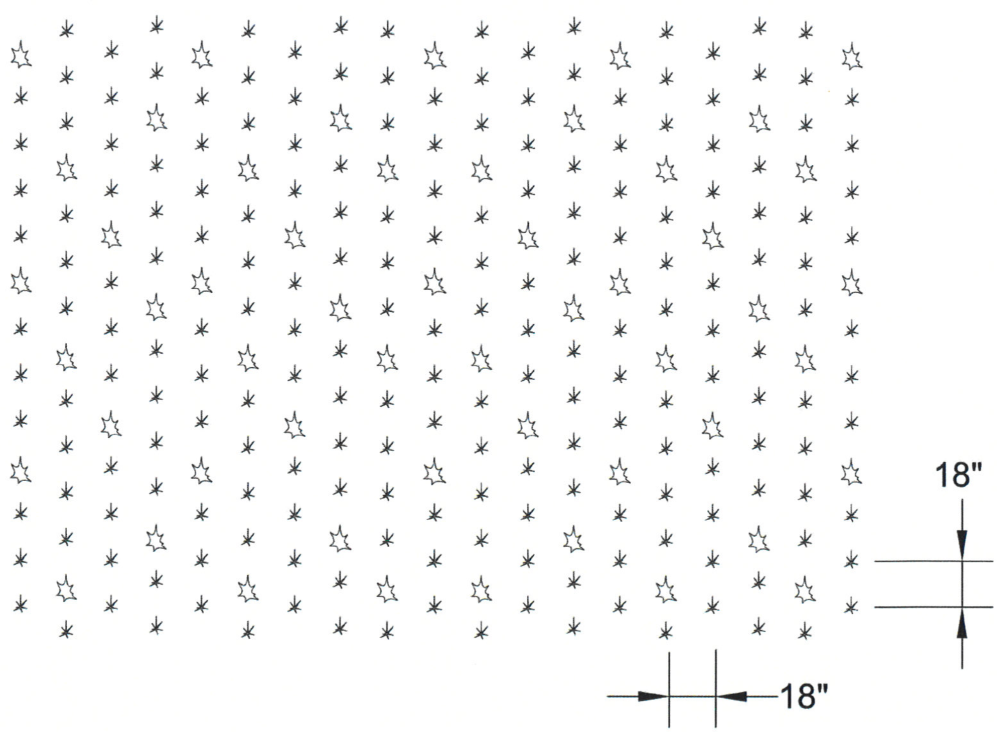
FOUNDATION PLANTING SPECIES DISTRIBUTION

(SPECIES SUBJECT TO CHANGE)

DUNE GRASSES ~ 70%
SEA OATS
(*Uniola paniculata*)
COASTAL PANIC GRASS
(*Panicum amarum*)

DIVERSITY SPECIES~ 30%
BEACH ELDER
(*Iva imbricata*)
RAILROAD VINE
(ipomaea pescaprae)
DUNE SUNFLOWER
(Helianthus debilis)
SEA PURSCANE
(Sesuvium portulacastrum)

TYPICAL PLANTING PATTERN



NOTES:
1) JCP 0039755-003-JC / JCP 0298107-004-JC
2) IMPACTS TO SIGNIFICANT DUNE VEGETATION TO BE MINIMIZED OR AVOIDED.
3) LARGE TREES OR SHRUBS TO BE RELOCATED WHERE FEASIBLE.

NOT FOR CONSTRUCTION
FOR INFORMATION ONLY

olsen associates, inc.
2618 Herschel St.
Jacksonville, FL 32204
(904) 387-6114
(FAX) 384-7368
COA 00003491

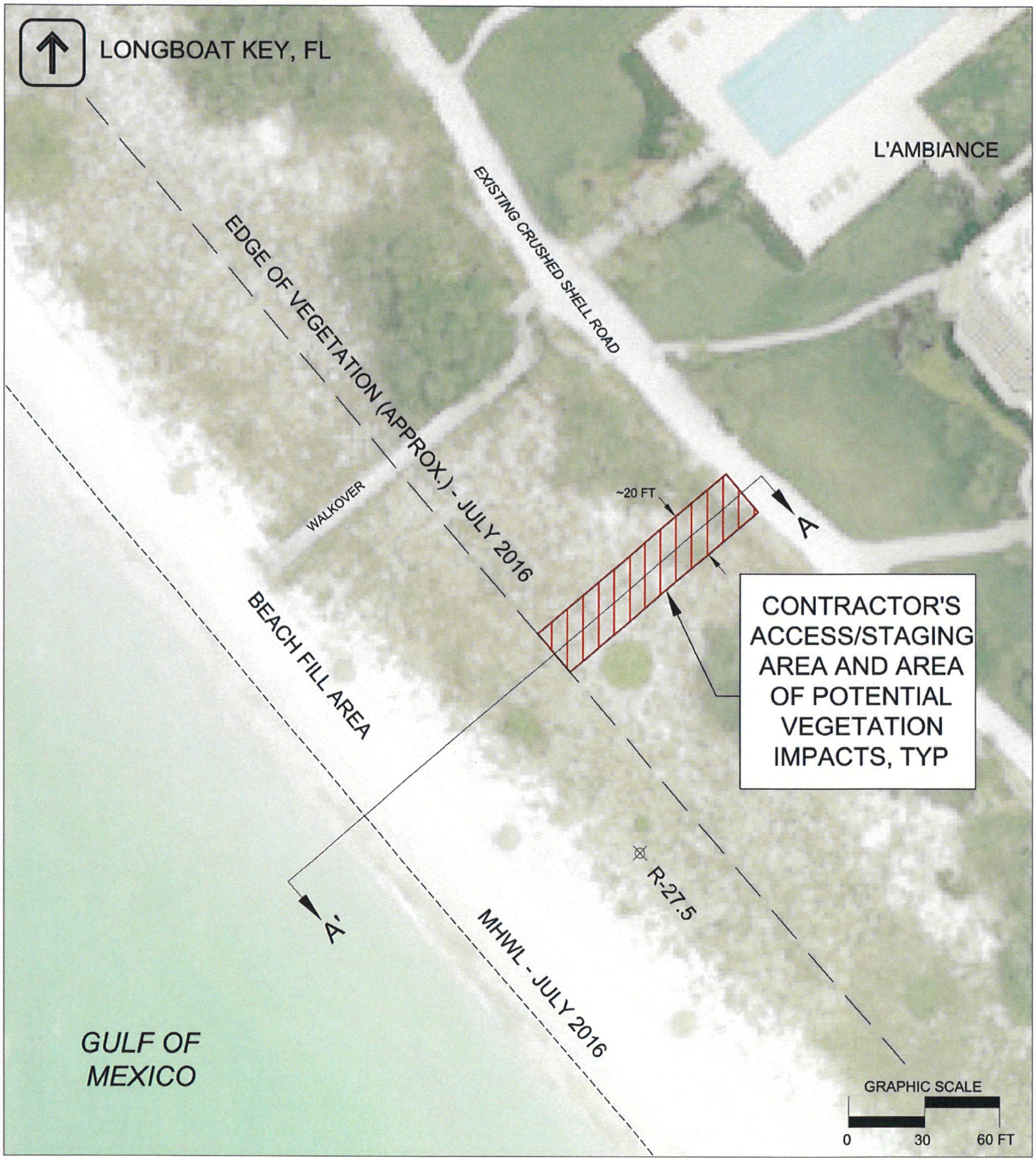
TOWN OF LONGBOAT KEY, FL
DUNE REPAIR/REVEGETATION PLAN

PLANTING SPACING
FIGURE 1

DATE:	APPR	REVISION
6/24/16	AEB	PLANT SYMBOL
7/26/16	AEB	MOVE SECTIONS TO SH 6

DATE: 03/04/16
DRAWN BY: KJE
SHEET 1 OF 6

SARASOTA COUNTY, FL



NOTES:
1) JCP 0039755-003-JC, 039755-004-JN
2) IMPACTS TO SIGNIFICANT DUNE VEGETATION TO BE MINIMIZED OR AVOIDED.
3) AERIAL DATE: 22 JUNE 2015.
4) LARGE TREES OR SHRUBS TO BE RELOCATED WHERE FEASIBLE.
5) SPECIFIC ACCESS CORRIDOR CONDITIONS VARY.

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TOWN OF LONGBOAT KEY, FL
DUNE REPAIR/REVEGETATION PLAN
NEW PASS ACCESS

L'AMBIANCE PLAN VIEW

FIGURE 2

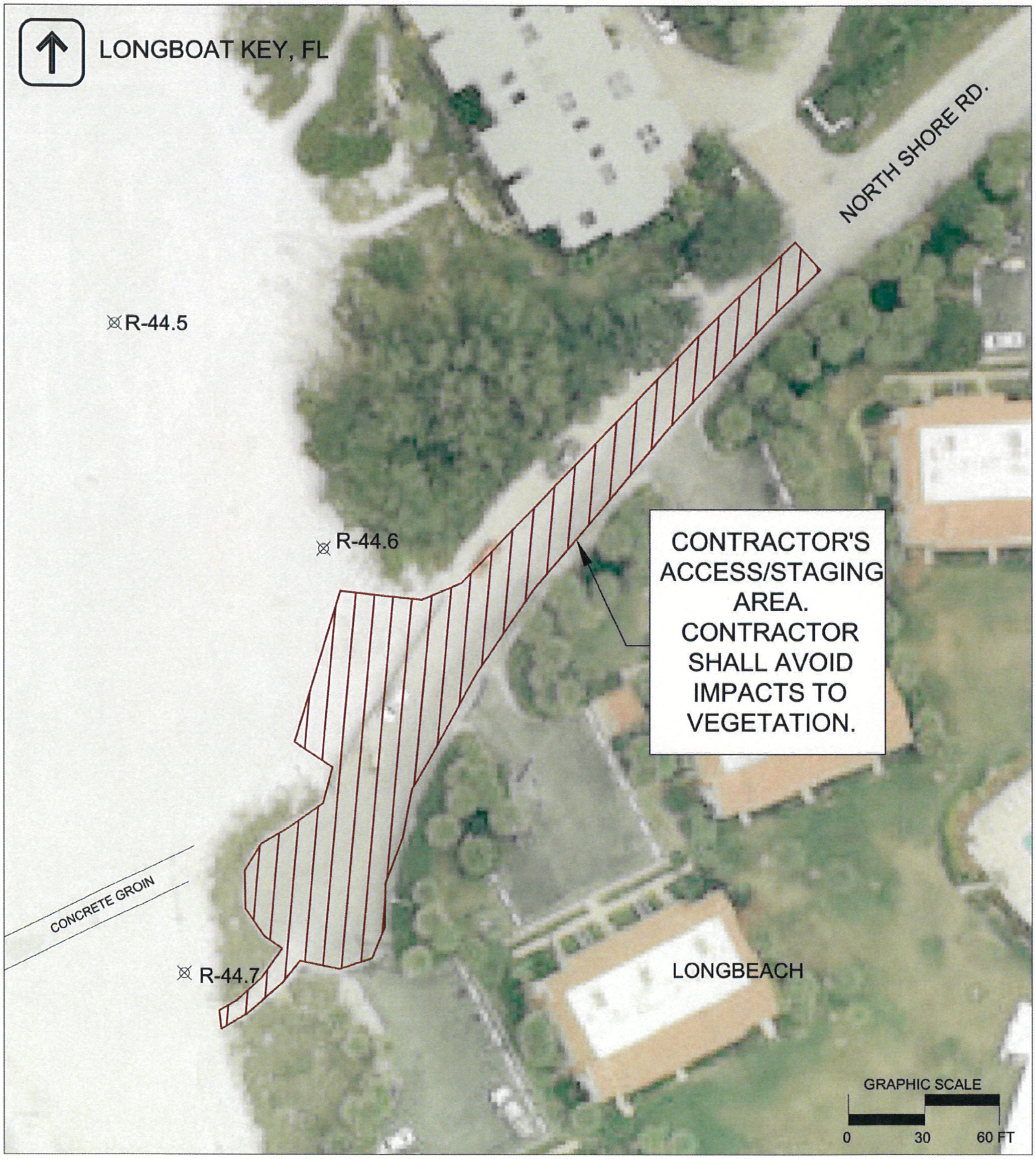
DATE:	APPR	REVISION
7/26/16	AEB	RELOCATE CORRIDOR UPDATE MHWL VEG LINE

DATE: 03/04/16

DRAWN BY: KJE

SHEET 2 OF 6

MANATEE COUNTY, FL



NOTES:
1) JCP 0298107-004-JC, 0298107-007-JN
2) IMPACTS TO SIGNIFICANT DUNE VEGETATION TO BE MINIMIZED OR AVOIDED.
3) AERIAL DATE: 22 JUNE 2015.
4) SPECIFIC ACCESS CORRIDOR CONDITIONS VARY.

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TOWN OF LONGBOAT KEY, FL
DUNE REPAIR/REVEGETATION PLAN
LONGBOAT PASS ACCESS

NORTH SHORE RD. PLAN VIEW

FIGURE 3

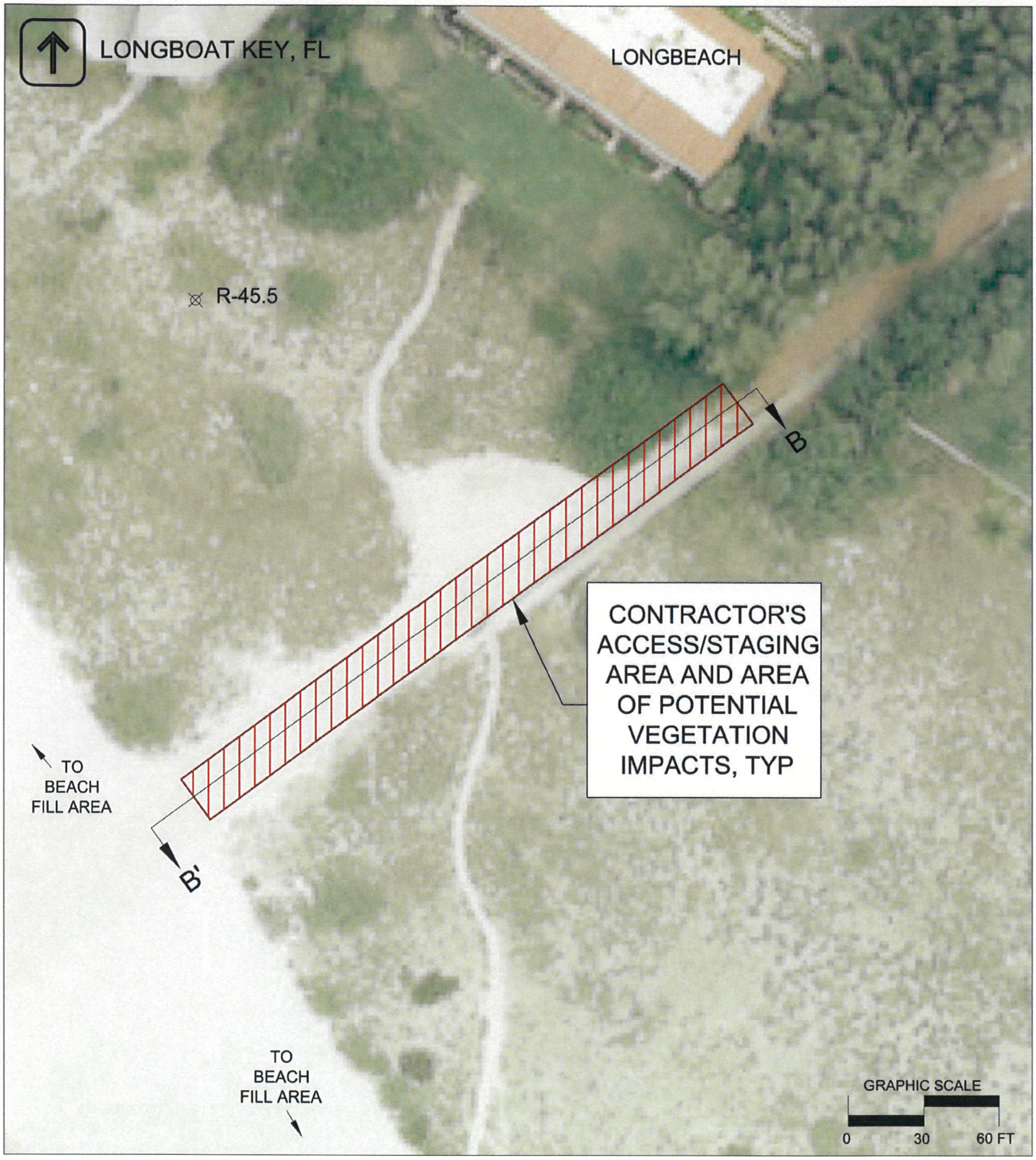
DATE:	APPR	REVISION

DATE: 07/26/16

DRAWN BY: KJE

SHEET 3 OF 6

MANATEE COUNTY, FL



NOTES:
1) JCP 0298107-004-JC, 0298107-007-JN
2) IMPACTS TO SIGNIFICANT DUNE VEGETATION TO BE MINIMIZED OR AVOIDED.
3) AERIAL DATE: 22 JUNE 2015.
4) SPECIFIC ACCESS CORRIDOR CONDITIONS VARY.

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TOWN OF LONGBOAT KEY, FL
DUNE REPAIR/REVEGETATION PLAN
LONGBOAT PASS ACCESS

BROADWAY ST. PLAN VIEW

FIGURE 4

DATE:	APPR	REVISION

DATE: 07/26/16

DRAWN BY: KJE

SHEET 4 OF 6

MANATEE COUNTY, FL

NOTES:
1) JCP 0298107-004-JC, 0298107-007-JN
2) IMPACTS TO SIGNIFICANT DUNE VEGETATION TO BE MINIMIZED OR AVOIDED.
3) AERIAL DATE: 22 JUNE 2015.
4) SPECIFIC ACCESS CORRIDOR CONDITIONS VARY.

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TOWN OF LONGBOAT KEY, FL
DUNE REPAIR/REVEGETATION PLAN
LONGBOAT PASS ACCESS

GULFSIDE RD. PLAN VIEW

FIGURE 5

DATE:	APPR	REVISION

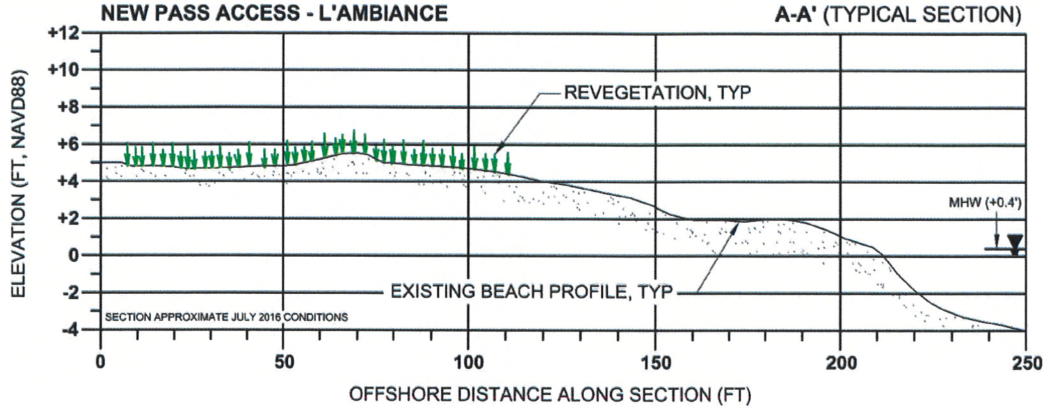
DATE: 07/26/16

DRAWN BY: KJE

SHEET 5 OF 6

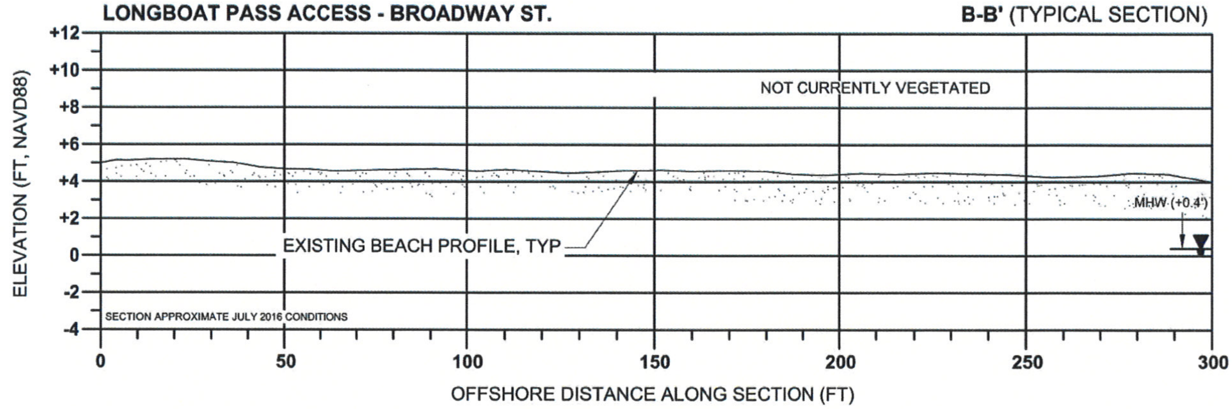
SARASOTA COUNTY / MANATEE COUNTY, FL

NEW PASS ACCESS - L'AMBIANCE A-A' (TYPICAL SECTION)

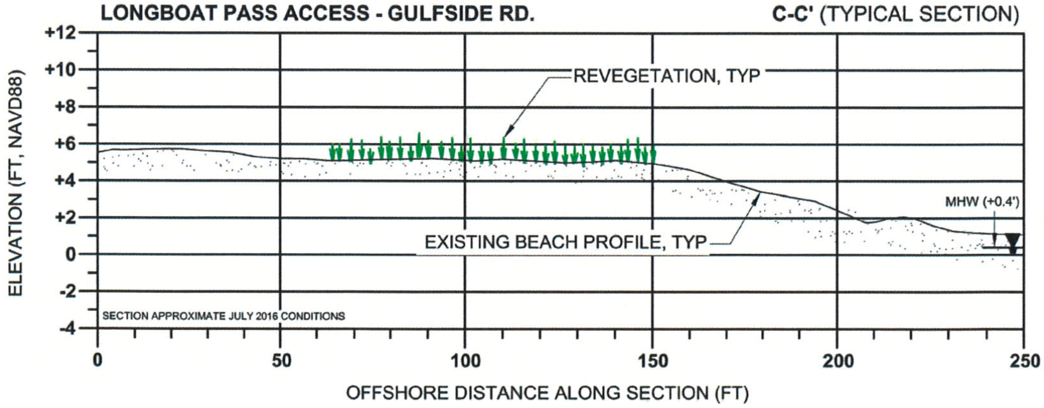


LONGBOAT PASS - NORTH SHORE RD. - NOT VEGETATED, NO DUNES

LONGBOAT PASS ACCESS - BROADWAY ST. B-B' (TYPICAL SECTION)



LONGBOAT PASS ACCESS - GULFSIDE RD. C-C' (TYPICAL SECTION)



NOTES:
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TOWN OF LONGBOAT KEY, FL
DUNE REPAIR/REVEGETATION PLAN

ACCESS SECTIONS

FIGURE 6

DATE:	APPR	REVISION

DATE: 07/26/16

DRAWN BY: KJE

SHEET 6 OF 6

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 3:
AS-BUILT CERTIFICATION FORM

2 PAGES

SAJ-2014-00606 (SP-MEP)

AS-BUILT CERTIFICATION BY PROFESSIONAL ENGINEER

Submit this form and one set of as-built engineering drawings to the U.S. Army Corps of Engineers, Enforcement Section, 10117 Princess Palm Avenue, Suite 120, Tampa, FL, 33610. If you have questions regarding this requirement, please contact the Enforcement Branch at 904-232-3131.

1. Department of the Army Permit Number: **SAJ-2014-02347(SP-MEP)**

2. Permittee Information:

Name: ____

Address: ____

____

3. Project Site Identification (physical location/address):

____

____

____

4. As-Built Certification: I hereby certify that the authorized work, including any mitigation required by Special Conditions to the permit, has been accomplished in accordance with the Department of the Army permit with any deviations noted below. This determination is based upon on-site observation, scheduled, and conducted by me or by a project representative under my direct supervision. I have enclosed one set of as-built engineering drawings.

______________________________	______________________________
Signature of Engineer	Name (*Please type*)
______________________________	______________________________
(FL, PR, or VI) Reg. Number	Company Name
______________________________	____________________ ____________
City	State ZIP

(Affix Seal)

______________________________	______________________________
Date	Telephone Number

Identify any deviations from the approved permit drawings and/or special conditions (attach additional pages if necessary):

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 2B:
DUNE REPAIR PLAN
(REVISED - JULY 2016)

4 PAGES

JCP #0298107-009-JN

United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

RECEIVED
SEP 28 2015
Tampa Regulatory Office

IN REPLY REFER TO:

FWS Log No. . 04EF1000-2015-F-0053

September 24, 2015

Kevin D. O'Kane
Chief, Tampa Permits Section
Jacksonville District Corps of Engineers
10117 Princess Palm Avenue, Suite 120
Tampa, Florida 33610
(Attn: Mark Peterson)

Dear Mr. O'Kane:

This document transmits the U.S. Fish and Wildlife Service's (Service's) Biological Opinion on the proposed Longboat Pass Navigational Maintenance Dredging and Beach Renouishment Project (Longboat Pass Project) Manatee County, Florida (U.S. Army, Corps of Engineers (Corps): SAJ-2014-00606) with regard to its potential effects on the federally-listed (threatened) *rufa* red knot (*Calidris canutus rufa*) (hereafter, red knot). We also address the project's effects on the following: the Northwest Atlantic Ocean distinct population segment (NWAO DPS) of the loggerhead sea turtle (*Caretta caretta*) and its designated terrestrial critical habitat; the green sea turtle (*Chelonia mydas*); the leatherback sea turtle (*Dermochelys coriacea*); the hawksbill sea turtle (*Eretmochelys imbricata*); the Kemp's ridley sea turtle (*Lepidochelys kempii*); the piping plover (*Charadrius melodus*) and its designated critical habitat; and the West Indian (Florida) manatee (*Trichechus manatus latirostris*). The Longboat Pass Project, submitted to the Corps as a permit application by Manatee County (County) and the Town of Longboat Key (Town), would entail periodic maintenance dredging of the Longboat Pass federally-authorized navigation channel and placement of dredged sediment to renourish Manatee County beaches north of the pass on Anna Maria Island and south of the pass on Longboat Key. The Corps requested initiation of formal consultation in a letter to the Service of November 6, 2014, and amended the request in a letter of March 23, 2015. We provide the following in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). We have assigned Service Log Number 04EF1000-2014-F-0052 to this consultation.

This Biological Opinion is based on information provided in your November 6, 2014, and March 23, 2015, letters, and November 5, 2014, Public Notice; the applicants' March 3, 2014, Joint Application for Coastal Permit; emails and letters from CBI Coastal Planning and Engineering, Inc. (CBI), agent for the applicant, responding to Service and Florida Department of Environmental Protection (FDEP) requests for additional information; our additional phone and email correspondence with the Corps, CBI, FDEP, the Florida Fish and Wildlife

Conservation Commission (FWC), and the National Marine Fisheries Service (NMFS); and other sources of information. A complete administrative record of this consultation is on file at the Service's North Florida Ecological Services Office (NFESO).

CONSULTATION HISTORY

Coordination between the Corps and Service regarding the Longboat Pass Project began in February 2014. In a letter to the Service dated November 6, 2014, the Corps requested initiation of formal consultation on five species of listed sea turtle and requested concurrence of a "not likely to adversely affect" determination for the manatee and piping plover. Included with the letter was the Public Notice for the proposed project dated November 5, 2014. In an email to the Corps on November 13, 2014, the Service noted that the red knot was proposed for listing under the Act, that listing was anticipated shortly, that there was a history of the red knot use in the proposed beach renourishment areas, and that post-listing consultation over the red knot would likely be required. In the same email the Service forwarded questions regarding project details. CBI responded to Service questions in an email of November 18, 2014. On January 5, 2015, representatives of the Service, the County, CBI, and Anna Maria Island Turtle Watch and Shorebird Monitoring (AMITWSM) met to discuss the County's measures to conserve listed species on Anna Maria Island, including ongoing education efforts, and their ongoing sea turtle and shorebird surveys. On February 19, 2015, representatives of the Service, the Town, Olsen Engineering, Inc. (Olsen), and the Corps (via phone) met to discuss proposals for 2015-2016 beach renourishment projects on Longboat Key, including the Longboat Pass Project.

Your March 27, 2015, letter revised the Corps' previous request for consultation and requested the following: (1) initiation of consultation for the NWAO DPS of the loggerhead sea turtle and its designated critical habitat, the leatherback sea turtle, the green sea turtle, the hawksbill sea turtle, and the Kemp's ridley sea turtle, with inclusion under the 2015 Statewide Programmatic Biological Opinion (2015-SPBO) (Service 2015); (2) initiation of consultation for the piping plover, with inclusion under the 2013 Piping Plover Programmatic Biological Opinion (P^3BO) (Service 2013); (3) initiation of formal consultation for the red knot; and (4) concurrence with a 'may affect, not likely to adversely affect' determination for the manatee. On March 27, 2015, the Service requested additional information to help complete our analysis of potential impacts to listed species.

In an April 4, 2015, email to the Town, Peter Plage of my staff suggested conservation measures to benefit the red knot, piping plover, and other shorebirds and seabirds that the Town might consider as part of the Longboat Pass Project and other currently proposed beach renourishment projects on Longboat Key. In a May 12, 2015, document prepared by Olsen (2015) the Town responded by proposing series of island-wide conservation measures for shorebirds.

On June 1, 2015, CBI provided additional information, in the form of a report (CBI 2015), to supplement information previously provided in the County and Town's original application, the Corps' Public Notice, and subsequent emails and telephone conversations. This report provided the equivalent of a biological evaluation/assessment for potential project effects on the red knot and other listed species. Upon receipt of the report, the Service had sufficient project information to initiate formal consultation.

Application of the SPBO and P^{3}BO

After review, we have determined that the Longboat Pass Project is appropriate to apply to the 2015-SPBO and to the P^{3}BO. The minimization measures, Reasonable and Prudent Measures (RPMs), and Terms and Conditions (T&Cs) in these Programmatic Biological Opinions that are applicable to the Longboat Pass Project must be followed for the five sea turtle species, loggerhead sea turtle terrestrial critical habitat, and for the piping plover. Only the effects of the Longboat Pass Project on the red knot will be addressed in the following Biological Opinion.

Please note that the Service and the NMFS share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on nesting beaches and NMFS has jurisdiction for sea turtles in the marine environment. Provisions of the 2015-SPBO do not apply to sea turtles in the marine environment such as swimming juvenile and adult sea turtles. The 2015-SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. If applicable, you are required to consult with the NMFS on this project. For further information on compliance with NMFS under the Act, please contact Ms. Rachel Sweeney, Chief of the Interagency Cooperation Branch by e-mail at rachel.sweeney@noaa.gov or by phone at 727-824-5312.

The Longboat Pass Project occurs within the geographic range of the manatee. Based on the County and Town committing to conditions of the 2015-SPBO, including Standard Manatee Conditions for In-Water Work (FWC 2011a) and other measures outlined in the 2015-SPBO that avoid potential impacts to the manatee, we concur with the Corps' determination that the project 'may affect, but is not likely to adversely affect' the manatee.

BIOLOGICAL OPINION

A Biological Opinion is the document that states the opinion of the Service as to whether a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat (50 CFR §402.02). This Biological Opinion addresses the impacts of the Longboat Pass Project on the red knot. It evaluates the effects of the proposed action, interrelated and interdependent actions, and cumulative effects relative to the status of the species to arrive at a Service opinion that the proposed action is or is not likely to jeopardize the species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR§402.02). Only the question of jeopardy to the red knot is addressed in this Biological Opinion, since critical habitat has not been designated for the red knot. Should red knot critical habitat be designated within the action area in the future, reinitiation of consultation will be required prior to any further work under this Corps permit that may affect red knot critical habitat.

DESCRIPTION OF THE PROPOSED ACTION

Longboat Pass is a natural inlet that separates the barrier islands of Anna Maria Island (north) and Longboat Key (south). It connects Sarasota Bay (east) with the Gulf of Mexico (west). The Longboat Pass federal navigation channel has been maintained by the Corps since 1951 and was last dredged in 1997. The channel alignment has gradually migrated south with the authorized channel being replaced by an ebb shoal. Both Anna Maria Island and Longboat Key shorelines have seen substantial erosion and repeated beach renourishment over many years. The north end of Longboat Key, FDEP R-Monument 42 (R-42) to R-46, is a public beach that has experienced a high rate of erosion, especially since 2004. A groin construction project has been recently completed to slow the rate of erosion.

The County and Town propose to periodically maintenance dredge the Longboat Pass federal navigational channel and place dredged sediments along the adjacent Manatee County shorelines of Anna Maria Island and Longboat Key. The dredge footprint would be limited to existing federally authorized navigational channel, which contains approximately 238,700 cubic yards of sand. The channel is anticipated to refill at a rate of approximately 23,750 cubic yards per year. At that rate, maintenance dredging would provide approximately 190,000 cubic yards of sand every eight years. The proposed Longboat Pass Project includes maintenance dredging every four to eight years over the 15-year life of the project. The placement location and extent of beach renourished will vary between maintenance dredging events depending on timing and volume removed from the channel, but dredged material will be placed within either one or both of the two proposed templates, along approximately 2 miles of Anna Maria Island from 12th Street North south to Longboat Pass (R-30 to R-41+305) and along approximately 1.4 miles of Longboat Key, approximately 1000 feet north of North Shore Road south to Gulfside Road (R-43.5 to R-50.5). Under the current plan all of the material dredged during the initial construction, anticipated to occur in 2015, would be deposited on Longboat Key and sediment placement from the second dredging event would be placed on Anna Maria Island. Both the County and the Town have agreed that this schedule of alternating sediment placement will continue until the expiration of the permit. However, sediment placement could be divided and placed along both shorelines simultaneously if appropriate.

The Anna Maria Island template provides for placement of up to 462,000 cubic yards. The Longboat Key template provides for placement of up to 524,000 cubic yards. The templates are larger than the volume estimated in the dredge area in order to provide the flexibility to place the sand in the area of greatest need at the time of maintenance dredging. After the initial placement, the maintenance schedule would be determined based on monitoring data. Other permitted projects providing sand within the proposed template areas may influence timing and location of the sand needed.

The project would be constructed with a hydraulic cutterhead dredge. Sediment would be transported by pipeline as a sand and water slurry to the discharge location on the beach. Bulldozers and other earth moving machinery would be used to position the material in the approved fill template. Dredging would occur 24-hours a day. The anticipated time required to construct would depend on the equipment used to dredge the channel, however, three to five months is anticipated in the event a small dredge is used. No seasonal limitations on construction have been proposed.

Conservation Measures

The County and the Town will follow and implement those minimization measures, RPMs, and the T&Cs of the 2015-SPBO and P^{3}BO that apply to the Longboat Pass Project. Many of these same measures will prove beneficial to the red knot.

On Anna Maria Island, the AMITWSM, under direction from Suzi Fox and under contract with Manatee County, conducts annual shorebird and sea turtle monitoring along Anna Maria Island's Gulf of Mexico (Gulf) beaches. AMITWSM currently completes year-round island-wide shorebird monitoring two times per month following the (FWC Monitoring Protocol for Non-Breeding Shorebirds and Seabirds. In addition, nesting surveys are conducted starting on February 15th each year. AMITWSM also plays an active role in educating the public about shorebird and sea turtle conservation through public tours, literature, visits with local business, and posting educational information on their website. There are also educational signs placed at some beach access points highlighting sea turtles, shorebirds, and wrack protection. Manatee County also maintains a wrack accumulation zone at the southern end of Coquina Beach, extending from R-40+410 to Longboat Pass. No wrack is removed from this area, unless it poses a health or safety risk. Those vehicles used by lifeguards, law enforcement, beach maintenance employees, and turtle monitoring personnel that operate on the beach follow the FWC Beach Driving Best Management Practices. There is an exception for emergency vehicles, which have full access to the entire beach.

On Longboat Key, in support of the Town's overall beach management plan and to develop information to improve the protection of the red knot and piping plover, the Town has developed a set of proposed conservation measures for shorebirds (Olsen 2015). Highlights of the proposed measures follow.

Protection of wrack

The Town will continue to take measures to protect wrack along its beaches and to educate the public, including tourists, private residents, and condominium/hotel managers of the importance of wrack. To discourage beach cleaning that impacts wrack, the Town will contact private property owners who remove the wrack on their beaches to provide information regarding not only the importance of wrack, but also the following desired possibilities:

i. Leaving a designated portion of wrack year round; and

ii. Leaving the wrack from September 1 through May 1.

The Town will publish information on the importance of wrack on the Longboat Key website, along with a link to the FWC site http://myfwc.com/Shorebirds.

Minimization of disturbance

The Town will seek opportunities to educate the beach-going public about shorebird disturbance, as well as wrack protection. Efforts will include the installation of educational signs highlighting the importance of beach habitats to wildlife and explaining the importance of the wrack along the shoreline. The Town will prohibit fireworks, pets, and open fires on beaches of Longboat Key.

Driving on the beach

The Town will minimize vehicular traffic on the beach and seek to balance the need for human health and safety on the beach, including emergency responders, against the potential disturbance of shorebirds. The Town closely regulates beach driving and only allows driving for emergency responders (including lifeguards) and limited all-terrain vehicle (ATV) access for official Town-approved purposes (such as turtle and shorebird monitoring, beach monitoring). Vehicles, including ATVs, traversing the beach that are used by beach lifeguards, beach maintenance employees, turtle watch volunteers, and law enforcement will avoid the soft sand areas in the wrack areas and follow the FWC's Beach Driving Best Management Practices: http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/
Emergency vehicles shall have full access to the beach including the wrack areas.

Coordination

The Town will continue to support efforts to protect shorebirds along the Longboat Key beaches and work cooperatively with the Service, FWC, and local organizations. In conjunction with the monitoring program described below, the Town will establish a primary point of contact for the Town to manage the stewardship of shorebird protection efforts. That individual will provide coordination between the Town, the Service, the FWC, the FDEP, the Corps, and representatives of other groups (Audubon, Save our Shorebirds, etc.).

Monitoring

The Town will implement a year-round shorebird monitoring program along its Gulf shoreline. The program shall identify locations of important foraging and roosting areas, in addition to nesting areas, and will identify optimal piping plover and red knot habitat. This effort may, to the maximum extent practicable, reduce disturbance of wintering shorebirds during project activities. In establishing the monitoring program, guidelines developed in the P^3BO shall be considered.

Prior to the first sand placement event, surveys shall occur three times per month for the first five months of this program along the entire Gulf shoreline of Longboat Key. Surveys shall occur no less than 9 days apart, and shall capture both low tide and high tide events each month. After the completion of five months of pre-construction data, surveys shall continue twice per month through the completion of the first sand placement activities in each shoreline segment.

During construction events occurring between February 1 and August 30, daily surveys for nesting activity shall be conducted in the specific sand placement project areas, beginning February 1 or at least 10 days prior to construction start, whichever is later, and continuing through the end of construction or through August 30, whichever is earlier. The permit conditions provided by the FWC for the protection of nesting and fledged shorebirds shall be adhered to. The two times per month island-wide monitoring described above would continue for the entire shoreline.

Following completion of the last sand placement event planned as part of the current renourishment cycle (to occur by 2016, approximately), island-wide surveys by ATV shall occur twice per month for a period of two years, and terminating at the end of piping plover migration season in May (anticipated to be May 2018).

Reporting

Nesting shorebird reports shall be shared directly with Service and FWC personnel (as desired) and will be submitted in the appropriate format to the Florida Shorebird Database (*https://public.myfwc.com/crossdoi/shorebirds/index.html*), generally on a monthly or more frequent basis. Wintering shorebird reports shall be prepared in EXCEL (typ.) format and shared directly with Service and FWC personnel (as desired), generally on a monthly or more frequent basis. The repositories for shorebird data may change or evolve in the future. The appropriate submittal procedures will be updated periodically.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action. The Service identifies the action area for the Longboat Pass Project to include the Longboat Pass dredge area, the fill placement areas on Anna Maria Island (R-30 to R-41+305) and Longboat Key (R-43.5 to R-50.5), and updrift and downdrift beaches that may be affected. Therefore, the Longboat Pass Project Action Area extends from R-29 on Anna Maria Island south to R-51.5 on Longboat Key and includes approved fill templates, all staging and discharge areas, pipeline corridors, beach access corridors, immediately adjacent nearshore waters, and all emergent shoals and sandbars within the flood-tidal and ebb-tidal deltas of Longboat Pass.

STATUS OF THE SPECIES/CRITICAL HABITAT

Red Knot

Species description

The red knot is a medium-sized shorebird about 9 to 11 inches (in) (23 to 28 centimeters [cm]) in length. The red knot is easily recognized during the breeding season by its distinctive rufous (red) plumage (feathers). The face, prominent stripe above the eye, breast, and upper belly are a rich rufous-red to a brick or salmon red, sometimes with a few scattered light feathers mixed in. The feathers of the lower belly and under the tail are whitish with dark flecks. Upperparts are dark brown with white and rufous feather edges; outer primary feathers are dark brown to black (Davis 1983; Harrington 2001). Females are similar in color to males, though the rufous colors are typically less intense, with more buff or light gray on the dorsal (back) parts (Niles et al. 2008). Red knots have a proportionately small head, small eyes, and short neck, and a black bill that tapers from a stout base to a relatively fine tip. The bill length is not much longer than head length. Legs are short and typically dark gray to black, but sometimes greenish in juveniles or older birds in nonbreeding plumage (Harrington 2001). Nonbreeding plumage is dusky gray above and whitish below. Juveniles resemble nonbreeding adults, but the feathers of the scapulars (shoulders) and wing coverts (small feathers covering base of larger feathers) are edged with white and have narrow, dark bands, giving the upperparts a scalloped appearance (Davis 1983).

There are six recognized subspecies of red knots (*C. canutus*), and on December 11, 2014, the Service listed the *rufa* subspecies of red knot as a threatened species in the Federal Register and afforded protection under the Act (Service 2014). The Service accepts the characterization of *C.c. rufa* as a subspecies because each recognized subspecies is believed to occupy separate breeding areas, in addition to having distinctive morphological traits (*i.e.,* body size and plumage characteristics), migration routes, and annual cycles. The Service has determined that the *rufa* red knot is threatened due to loss of both breeding and nonbreeding habitat; potential for disruption of natural predator cycles on the breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies (mismatches) in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions. Main threats to the *rufa* red knot in the U.S. include: reduced forage base at the Delaware Bay migration stopover; decreased habitat availability from beach erosion, sea level rise, and shoreline stabilization in Delaware Bay; reduction in or elimination of forage due to shoreline stabilization, hardening, dredging, beach replenishment, and beach renourishment in Massachusetts, North Carolina, and Florida; and beach raking which diminishes red knot habitat suitability.

Critical habitat has not been proposed or designated for the red knot at this time; however, critical habitat will be addressed during development of a proposed critical habitat rule for the red knot. That said, important habitat characteristics for the red knot are discussed further in the Life history section below.

Life history

Breeding

Based on estimated survival rates for a stable population, few red knots live for more than about 7 years (Niles et al. 2008). Age of first breeding is uncertain, but for most birds it is probably at least 2 years (Harrington 2001). Red knots generally nest in the Canadian Arctic in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation. Breeding territories are located inland, but near Arctic coasts, and foraging areas are located near nest sites in freshwater wetlands (Harrington 2001; Niles et al. 2008). Breeding occurs in June (Niles et al. 2008), and flocks of red knots sometimes arrive at breeding latitudes before snow-free habitat is available. Upon arrival or as soon as favorable conditions exist, male and female red knots occupy breeding habitat, and territorial displays begin (Harrington 2001). In red knots, pair bonds form soon after arrival on the breeding grounds and remain intact until shortly after the eggs hatch (Niles et al. 2008). Female red knots lay only one clutch (group of eggs) per season, and, as far as is known, do not lay a replacement clutch if the first is lost. The usual clutch size is four eggs, though three-egg clutches have been recorded. The incubation period lasts approximately 22 days from the last egg laid to the last egg hatched, and both sexes participate equally in egg incubation. Young are precocial, leaving the nest within 24 hours of hatching and forage for themselves (Niles et al. 2008). No information is available regarding chick survival rates (Niles et al. 2008). Females are thought to leave the breeding grounds and start moving south soon after the chicks hatch in mid-July. Thereafter, parental care is provided solely by the males, but about 25 days (around August 10) they also abandon the newly fledged juveniles and move south. Not long after, they are followed by the juveniles (Niles et al. 2008).

Breeding success of High Arctic shorebirds such as red knot varies dramatically among years in a somewhat cyclical manner. Two main factors seem to be responsible for this annual variation: weather that affects nesting conditions and food availability and the abundance of Arctic lemmings (*Dicrostonyx torquatus* and *Lemmus sibericus*). Production of shorebird young is sensitive to adverse weather during the breeding season. Red knot chicks grow poorly during cold weather due to higher rates of energy expenditure, shorter foraging periods, and reduced prey availability (Schekkerman et al. 2003; Piersma and Lindström 2004). Growth rate of red knot chicks is very high compared to similarly sized shorebirds nesting in more temperate climates and is strongly correlated with weather-induced and seasonal variation in availability of invertebrate prey (Schekkerman et al. 2003). Second, successful shorebird reproduction occurs almost exclusively during peak lemming years when snowmelt is early (Summers and Underhill 1987; Blomqvist et al. 2002; Piersma and Lindström 2004). Arctic fox (*Alopex lagopus*) and snowy owl (*Nyctea scandiaca*) feed largely on lemmings, which are easily caught when their abundance is high. However, in years when lemming numbers are low, the predators turn to alternative prey, such as shorebird eggs, chicks, and adults. Lemming abundance is often cyclical, and the variation in shorebird production closely follows variations in lemming abundance due to their affected predation rates.

Nonbreeding Birds

Little information is available about red knots that do not travel to the Arctic to breed. Unknown numbers of nonbreeding red knots remain south of the breeding grounds during the breeding season, and many, but not all, of these knots are 1-year-old (*i.e.,* immature) birds (Niles et al. 2008). Nonbreeding knots, usually individuals or small groups, have been reported during June along the U.S. Atlantic and Gulf coasts, with smaller numbers around the Great Lakes and Northern Plains in both the U.S. and Canada (eBird.org 2012). There is also little information on where juvenile red knots spend their winter months (Service and Conserve Wildlife Foundation of New Jersey 2012), and there may be at least partial segregation of juvenile and adult red knots on the wintering grounds. All juveniles of the Tierra del Fuego wintering region are thought to remain in the Southern Hemisphere during their first year of life, possibly moving to northern South America, but their distribution is largely unknown (Niles et al. 2008). Because there is a lack of specific information on juvenile red knots, the Service uses the best available data from adult red knots to draw conclusions about juvenile foraging and habitat use.

Migration

The red knot migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast U.S., the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. Departure from the breeding grounds begins in mid-July and continues through August. Red knots tend to migrate in single-species flocks with departures typically occurring in the few hours before twilight on sunny days. Based on the duration and distance of migratory flight segments estimated from geolocator results, red knots are inferred to migrate during both day and night (Normandeau Associates, Inc. 2011). The size of departing flocks tends to be large (greater than 50 birds) (Niles et al. 2008), and females are thought to leave first followed by males and then juveniles (Harrington 2001; Niles et al. 2008).

Red knots make one of the longest distance migrations known in the animal kingdom, traveling up to 19,000 miles annually, and may undertake long flights that span thousands of miles without stopping. As red knots prepare to depart on long migratory flights, they undergo several physiological changes. Before takeoff, the birds accumulate and store large amounts of fat to fuel migration and undergo substantial changes in metabolic rates. In addition, leg muscles, gizzard (a muscular organ used for grinding food), stomach, intestines, and liver all decrease in size, while pectoral (chest) muscles and heart increase in size. Due to these physiological changes, red knots arriving from lengthy migrations are not able to feed maximally until their digestive systems regenerate, a process that may take several days. Because stopovers are time-constrained, red knots require stopovers rich in easily digested food to achieve adequate weight gain (Piersma et al. 1999; van Gils et al. 2005a, 2005b; Niles et al. 2008;) to fuel the next leg of migratory flight and, upon arrival in the Arctic, will fuel the body transformation to breeding condition (Morrison 2006). At each stopover, the adults gradually replace their red breeding plumage with white and gray, but generally they do not molt their flight or tail feathers until they reach their wintering areas (Morrison and Harrington 1992; Niles et al. 2008).

During both the northbound (spring) and southbound (fall) migrations, red knots use key staging and stopover areas to rest and feed. Major spring stopover areas along the Atlantic coast include Río Gallegos, Península Valdés, and San Antonio Oeste (Patagonia, Argentina); Lagoa do Peixe (eastern Brazil, State of Rio Grande do Sul); Maranhão (northern Brazil); the Virginia barrier islands (U.S.); and Delaware Bay (Delaware and New Jersey, U.S.) (González 2005; Niles et al. 2008; Cohen et al. 2009). Important fall stopover sites include southwest Hudson Bay (including the Nelson River delta), James Bay, the north shore of the St. Lawrence River, the Mingan Archipelago, and the Bay of Fundy in Canada; the coasts of Massachusetts and New Jersey and the mouth of the Altamaha River in Georgia, U.S.; the Caribbean (especially Puerto Rico and the Lesser Antilles); and the northern coast of South America from Brazil to Guyana (Spaans 1978; Morrison and Harrington 1992; Antas and Nascimento 1996; Niles et al. 2008; Schneider and Winn 2010; Niles et al. 2010; Niles 2012b; Newstead et al. 2013). However, large and small groups of red knots, sometimes numbering in the thousands, may occur in suitable habitats all along the Atlantic and Gulf coasts from Argentina to Canada during migration (Niles et al. 2008).

Red knots are restricted to the ocean coasts during winter, and occur primarily along the coasts during migration. However, small numbers of red knots are reported annually across the interior U.S. (*i.e.,* greater than 25 miles from the Gulf or Atlantic Coasts) during spring and fall migration. Such reported sightings are concentrated along the Great Lakes, but multiple reports have been made from nearly every interior State (eBird.org 2012). For example, Texas red knots follow an inland flyway to and from the breeding grounds, using spring and fall stopovers along western Hudson Bay in Canada and in the northern Great Plains (Skagen et al. 1999; Newstead et al. 2013). Some red knots wintering in the southeastern U.S. and the Caribbean migrate north along the U.S. Atlantic coast before flying over land to central Canada from the mid-Atlantic, while others migrate over land directly to the Arctic from the southeastern U.S. coast (Niles et al. 2012a). These eastern red knots typically make a short stop at James Bay in Canada, but may also stop briefly along the Great Lakes, perhaps in response to weather conditions (Morrison and Harrington 1992; Niles et al. 2008). Thus, red knots from different wintering areas appear to employ different migration strategies, including differences in timing, routes, and stopover areas. However, full segregation of migration strategies, routes, or stopover areas does not occur among red knots from different wintering areas.

Wintering

Red knots occupy all known wintering areas from December to February, but may be present in some wintering areas as early as September or as late as May. In the Southern Hemisphere, these months correspond to the austral summer (*i.e.,* summer in the Southern Hemisphere). Wintering areas for the red knot include the Atlantic coasts of Argentina and Chile (particularly the island of Tierra del Fuego that spans both countries), the north coast of Brazil (particularly in the State of Maranhão), the Northwest Gulf of Mexico from the Mexican State of Tamaulipas through Texas (particularly at Laguna Madre) to Louisiana, and the Southeast U.S.

from Florida (particularly the central Gulf coast) to North Carolina (Niles et al. 2008; Newstead et al. 2013). Smaller numbers of red knots winter in the Caribbean, and along the central Gulf coast (Alabama, Mississippi), the mid-Atlantic, and the Northeast U.S. Red knots are also known to winter in Central America and northwest South America, but it is not yet clear if those birds are the *rufa* subspecies. Little information exists on where juvenile red knots spend the winter months (Service and Conserve Wildlife Foundation of New Jersey 2012), and there may be at least partial segregation of juvenile and adult red knots on the wintering grounds.

Examples of red knots changing wintering regions do exist, but are few. Generally red knots are thought to return to the same wintering region each year. Re-sightings of marked birds indicate few or no inter-annual movements of red knots between the Brazil and Tierra del Fuego wintering areas, or between the Southeast and Tierra del Fuego wintering areas (Baker et al. 2005; Harrington 2005a).

<u>Migration and Wintering Habitat</u>

Long-distance migrant shorebirds are highly dependent on the continued existence of quality habitat at a few key staging areas. These areas serve as stepping stones between wintering and breeding areas. Habitats used by red knots in migration and wintering areas are generally coastal marine and estuarine habitats with large areas of exposed intertidal sediments. In many wintering and stopover areas, quality high-tide roosting habitat (*i.e.,* close to feeding areas, protected from predators, with sufficient space during the highest tides, free from excessive human disturbance) is limited. The supra-tidal (above the high tide) sandy habitats of inlets provide important areas for roosting, especially at higher tides when intertidal habitats are inundated (Harrington 2008). In some localized areas, red knots will use artificial habitats that mimic natural conditions, such as nourished beaches, dredged spoil sites, elevated road causeways, or impoundments; however, there is limited information regarding the frequency, regularity, timing, or significance of red knots' use of such artificial habitats.

In South American wintering areas, red knots are found in intertidal marine habitats, especially near coastal inlets, estuaries, and bays. Habitats include sandy beaches, mudflats, mangroves, saltwater and brackish lagoons, and "restinga" formations (an intertidal shelf of densely packed dirt blown by strong, offshore winds) (Harrington 2001; Niles et al. 2008). Red knots were recently observed using rice fields in French Guiana (Niles 2012b) and in Trinidad (eBird.org 2012). In Suriname in the early 1970s, small numbers of red knots were observed on firm and tough clay banks emerging from the eroding coastline and in shallow lagoons, but knots were never found on soft tidal flats (Spaans 1978). Those observations suggest a deviation from the red knot's typical nonbreeding habitats.

In North America, red knots are commonly found along sandy, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons, and peat banks (Harrington 2001; Truitt et al. 2001; Niles et al. 2008; Cohen et al. 2009; Cohen et al. 2010). In Massachusetts, red knots use sandy beaches and tidal mudflats during fall migration. In New York and the coast of New Jersey, red knots use sandy beaches during spring and fall migration (Niles et al. 2008). In Delaware Bay, red knots are found primarily on beaches of sand or peat at the mouths of tidal creeks, along the edge of tidal marshes dominated by salt marsh cordgrass (*Spartina alterniflora*) and saltmeadow cordgrass (*S. patens*), and in salt pannes (shallow, high salinity, mud-bottomed depressions on the marsh surface) and shallow coastal ponds or embayments (Burger et al. 1997; Meyer et al. 1999; Karpanty et al. 2006; Niles et al. 2008; Cohen et al. 2009). In the southeastern U.S., red knots forage along sandy beaches during spring and fall migration from Maryland through Florida. During migration, knots also use tidal mudflats in Maryland and along North Carolina's barrier islands. In addition to the sandy beaches, red knots forage along peat banks for mussel spat in Virginia and along small pockets of peat banks where the beach is eroding in Georgia (Niles et al. 2008). In Florida, the red knots also use mangrove and brackish lagoons. Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides. Red knots also show some fidelity to particular migration staging areas between years (Harrington 2001; Duerr et al. 2011).

Foraging

The red knot is a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp- and crab-like organisms, marine worms, and horseshoe crab (*Limulus polyphemus*) eggs (Harrington 2001; Piersma and van Gils 2011). Mollusk prey are swallowed whole and crushed in the gizzard (Piersma and van Gils 2011). From studies of other subspecies, Zwarts and Blomert (1992) concluded that the red knot cannot ingest prey with a circumference greater than 1.2 in (30 millimeters). Foraging activity is largely dictated by tidal conditions, as the red knot rarely wades in water more than 0.8 to 1.2 in (2 to 3 cm) deep (Harrington 2001). Due to bill morphology, the red knot is limited to foraging on only shallow-buried prey, within the top 0.8 to 1.2 in (2 to 3 cm) of sediment (Zwarts and Blomert 1992; Gerasimov 2009).

On the breeding grounds, the red knot's diet consists mostly of terrestrial invertebrates such as insects (Harrington 2001). In non-breeding habitats, the primary prey of the red knot include blue mussel (*Mytilus edulis*) spat (juveniles); *Donax* and *Darina* clams; snails (*Littorina spp.*), and other mollusks, with polycheate worms, insect larvae, and crustaceans also eaten in some locations. A prominent departure from typical prey items occurs each spring when red knots feed on the eggs of horseshoe crabs, particularly during the key migration stopover within the Delaware Bay of New Jersey and Delaware. Delaware Bay serves as the principal spring migration staging area for the red knot because of the availability of horseshoe crab eggs (Morrison and Harrington 1992; Harrington 1996; Harrington 2001; Clark et al. 2009), which provide a superabundant source of easily digestible food.

Red knots and other shorebirds that are long-distance migrants, must take advantage of seasonally abundant food resources at intermediate stopovers to build up fat reserves for the next nonstop, long distance flight (Clark et al. 1993). Although foraging red knots can be found widely distributed in small numbers within suitable habitats during the migration period, birds tend to concentrate in those areas where abundant food resources are consistently available from year to year.

Population dynamics

Localized and regional red knot surveys have been conducted across the subspecies' range with widely differing levels of geographic, temporal, and methodological consistency. Available population surveys are available in the November 2014 Rufa Red Knot Background Information and Threats Assessment (Supplemental Document), available at www.regulations.gov under Docket Number FWS-R5-ES-2013-0097. Some general characterizations of the available data are noted as follows:

* No population information exists for the breeding range because, in breeding habitats, red knots are thinly distributed across a huge and remote area of the Arctic. Despite some localized survey efforts, (*e.g.*, Niles et al. 2008; Bart and Johnston 2012), there are no regional or comprehensive estimates of breeding abundance, density, or productivity (Niles et al. 2008).
* Few regular surveys are conducted in the fall because southbound red knots tend to be less concentrated than during winter or spring.
* Some survey data are available for most wintering and spring stopover areas. For some areas, long-term data sets have been compiled using consistent survey methodology. Because there can be considerable annual fluctuations in red knot counts, longer-term trends are more meaningful. At several key sites, the best available data show that numbers of red knots declined and remain low relative to counts from the 1980s, although the rate of decline appears to have leveled off since the late 2000s.

Inferring long-term population trends from various national or regional datasets derived from volunteer shorebird surveys and other sources, Morrison et al. (2006) and Andres (2009) concluded that red knot numbers declined, probably sharply, in recent decades.

<u>Wintering Areas</u>

Counts in wintering areas are particularly useful in estimating red knot populations and trends because the birds generally remain within a given wintering area for a longer period of time compared to the areas used during migration. This eliminates errors associated with turnover or double-counting that can occur during migration counts.

<u>Argentina and Chile</u>

Aerial surveys of Tierra del Fuego (Chile and Argentina) and the adjacent Patagonian coast to the north (Argentina) have been conducted since 2000, and previously in the early 1980s, by the same observers using consistent methodology (Morrison et al. 2004). This is the best available long-term data set for a wintering area. However, as those are not the only red knot wintering areas, the survey results are best interpreted as one indicator of population trends rather than estimates of the total population.

Counts have been markedly lower in recent years. Comparing the average counts for Tierra del Fuego from 1985 and 2000 with counts from 2010 to 2012, the recent counts are about 75 percent lower than the earlier counts. An independent population estimate, using re-sighting data from Río Grande fitted to binomial models, supports the observation that declines did not begin until after 2000. This same model produced population estimates that were within 5 to 15 percent of the aerial counts from 2001 to 2003, giving confidence in the model results. Declines were even sharper (about 96 percent) along the roughly 1,000 miles of Patagonian coast than in the core area on Tierra del Fuego. Thus, the population appears to have contracted to the core sites, leaving few birds at the "peripheral" Patagonian sites (Committee on the Status of Endangered Wildlife Canada [COSEWIC] 2007). Reflecting the larger downward trend in Patagonia, local winter counts at Península Valdés also show an overall decline in bird numbers from 1994 to 2010 (Western Hemisphere Shorebird Reserve Network [WHSRN] 2012).

Northern South America and Central America

Counts of wintering red knots along the north coast of South America have been sporadic and have varied in geographic coverage. Morrison and Ross (1989) conducted aerial surveys of the entire South American coast in the 1980s. In northern Brazil, red knots were found in three out of four survey segments: North, North-Central, and Northeast. No red knots were observed in the Amazon survey segment of Brazil, which is between North and North-Central (Morrison and Ross 1989). Using the same surveyor team and methods as the 1986 survey, the North-Central segment of Brazil was again surveyed by air in 2011 (Morrison et al. 2012) and results may suggest a decline. These 2011 results require further confirmation; however, redistribution of birds to the west is an unlikely explanation for the lower numbers in 2011, based on recent surveys of Guyana, Suriname, and French Guiana (discussed below) (Morrison et al. 2012).

Covering about 30 percent (by linear miles of coastline) of the North-Central Brazil survey segment, Baker et al. (2005) counted knots in western Maranhão during an aerial survey in February 2005. In a repeat of this survey in December 2006 (winter of 2007), fewer knots were counted (Niles et al. 2008). The shores of Maranhão are complex and highly fragmented making accurate counting more difficult. To allow for this, aerial coverage was more extensive and included not only the ocean shore, but also a variety of back bays and channels (Niles et al. 2008). In December 2007 (winter of 2008), ground surveys were conducted at two sites in the Brazilian State of Ceará, within the Northeast Brazil survey segment (where only 15 red knots had been counted in 1983). Only small numbers of knots (average peak of 8 ± 8.5) were observed at Ilha Grande, but an average peak count of 481 ± 31 red knots was recorded at Cajuais Bank (Carlos et al. 2010).

Morrison and Ross (1989) documented 520 red knots in western Venezuela in 1982. It is not known if the birds observed around the Colombia-Venezuela border were all of the *rufa* subspecies, but recent geolocator results suggest at least some of the winter birds in this area are *C. c. rufa* (Niles et al. 2012a). During the 1980s surveys, no red knots were observed between western Venezuela and the west end of Brazil (the North segment), with no knots recorded in eastern Venezuela, Trinidad, Guyana, Suriname, or French Guiana (Morrison and Ross 1989). With the same survey team and methods from the 1980s, aerial shorebird surveys were recently repeated in Guyana (January 2010), Suriname (December 2008, January 2010, and January 2011), and French Guiana (December 2008 and January 2010) (Morrison et al. 2012). No red knots were detected in 2011, and a negligible number in December 2008 (*i.e.*, winter 2009) and in 2010 (Mizrahi 2011). However, small, isolated groups of wintering red knots may extend along most of the northern coast of South America.

On the southern (Pacific) coast of Panama, Buehler (2002) counted 100 red knots near Panama City and another 100 near Chitré in February 2002. Another researcher surveyed this area and agreed with an estimate of about 200 wintering red knots). It is not known if all the birds observed in Panama were of the *rufa* subspecies, but three marked birds re-sighted in Panama were all banded in known *rufa* red knot areas (Buehler 2002; Niles et al. 2008). Thus, as least some of these birds are considered *rufa* red knots. Also on the Pacific, Laguna Superior (State of Oaxaca, Mexico) is a recently documented wintering area for red knots, with over 300 birds reported in the winters of 2011 and 2012 (eBird.org 2012).

The North American Atlantic Coast

Small numbers of wintering red knots have been reported from Maryland, U.S., to Nova Scotia, Canada (BandedBirds.org 2012; Burger et al. 2012; eBird.org 2012), but no systematic winter surveys have been conducted in these northern areas. In surveys of five sites within North Carolina's Outer Banks in 1992 and 1993, Dinsmore et al. (1998) found over 500 red knots per year.

Southeastern U.S. and Caribbean

Extensive data for Florida are available from the International Shorebird Survey and other sources. However, geographic coverage has been inconsistent, ranging from 1 to 29 sites per year from 1974 to 2004. Statewide annual totals ranged from 5 knots (1 site in 1976) to 7,764 knots (7 sites in 1979). The greatest geographic coverage occurred in 1993 (4,265 knots at 25 sites) and 1994 (5,018 knots at 29 sites) (Niles et al. 2008). Harrington et al. (1988) reported that the mean count of birds wintering in Florida was 6,300 birds (± 3,400, one standard deviation) based on four aerial surveys conducted from October to January in 1980 to 1982. These surveys covered the Florida Gulf coast from Dunedin to Sanibel-Captiva, sometimes going as far south as Cape Sable). Based on those surveys and other work, the Southeast wintering group was estimated at roughly 10,000 birds in the 1970s and 1980s (Harrington 2005a).

Sprandel et al. (1997) identified the top 60 sites for wintering shorebirds in Florida and surveyed those areas in 1994. Red knots were found at 27 sites, mainly on the central Gulf coast. Adding the average number of birds counted at each site, these authors estimated a statewide total of 1,452 red knots across three sites in the Florida Panhandle, 18 sites in southwest Florida, four sites in the Everglades, and two sites in Northeast Florida (Sprandel et al. 1997). During frequent surveys of nine sites along about 55 miles of the central Florida Panhandle, Smith (2010) found a mean of about 84 wintering red knots in the winter of 2007. Smith (2010) covered roughly 25 percent of the Panhandle region as delineated by Sprandel et al. (1997), with the survey sites clustered on the eastern end of that region.

Niles (2009) conducted winter aerial and ground counts along Florida's Gulf coast from 2006 to 2010, covering essentially the same area in which Harrington et al. (1988) had reported an average of 6,300 red knots (± 3,400) in the winters of 1980 to 1982. As the more recent aerial counts were lower, red knot numbers may have decreased in western Florida, perhaps due to birds shifting elsewhere within the larger Southeast wintering region (Harrington 2005a). However, a comparison of the geographic coverage of Sprandel et al. (1997) with Niles (2009) suggests that red knot numbers did not change much from 1994 to 2010.

Based on re-sightings of birds banded in South Carolina and Georgia from 1999 to 2002, the Southeast wintering population was estimated at 11,700 ± 1,000 (one standard error) red knots. Although there appears to have been a gradual shift by some of the southeastern knots from the Florida Gulf coast to the Atlantic coasts of Georgia and South Carolina, population estimates for the Southeast region in the 2000s were at about the same level as during the 1980s (Harrington 2005a). Based on recent modeling using re-sightings of marked birds staging in Georgia in fall, as well as other evidence, the Southeast wintering group may number as high as 20,000, but field survey data are not available to corroborate this estimate.

Two recent winter estimates are available for the central Gulf of Mexico. During the International Piping Plover Census in 2006 and 2011, 250 to 500 knots were counted from Alabama to Louisiana. From work related to the Deepwater Horizon oil spill, an estimated 900 red knots were reported from the Florida Panhandle to Mississippi. Older surveys recorded similar numbers from the central Gulf coast, with peak counts of 752 red knots in Alabama (1971) and 40 knots in Mississippi (1979) (Morrison and Harrington 1992). Numbers of red knots wintering in the Caribbean are essentially unknown, but in the course of piping plover surveys in February 2011 in the Bahamas, 70 red knots were observed on the Joulters Cays just north of Andros Island, and 7 knots were observed on the Berry Islands. In December 2012 (*i.e.*, winter 2013), 52 red knots were observed in the Green Turtle Cay flats in Abaco, Bahamas. Roughly 50 red knots occur annually on Green Turtle Cay (eBird.org 2012).

Northwest Gulf of Mexico

Except for localized areas, there have been no long-term systematic surveys of red knots in Texas or Louisiana, and no information is available about the number of red knots that winter in northeastern Mexico. From survey work in the 1970s, Morrison and Harrington (1992) reported peak winter counts of 120 red knots in Louisiana and 1,440 in Texas, although numbers in Texas between December and February were typically in the range of 100 to 300 birds. Records compiled by Skagen et al. (1999) give peak counts of 2,838 and 2,500 red knots along the coasts of Texas and Louisiana, respectively, between January and June over the period 1980 to 1996, but these figures could include spring migrants. Morrison et al. (2006) estimated only about 300 red knots wintering along the Texas coast, based on surveys in January 2003 (Niles et al. 2008). Higher counts of roughly 700 to 2,500 red knots have recently been made on Padre Island, Texas, during October, which could include wintering birds (Niles et al. 2009; Newstead et al. 2013).

Foster et al. (2009) found a mean daily abundance of 61.8 red knots on Mustang Island, Texas, based on surveys every other day from 1979 to 2007. Similar winter counts were reported by Dey et al. (2011b) for Mustang Island from 2005 to 2011. From 1979 to 2007, mean abundance of red knots on Mustang Island decreased 54 percent, but this may have been a localized response to increasing human disturbance, coastal development, and changing beach management practices (Foster et al. 2009; Newstead et al. 2013).

There are no current estimates for the size of the Northwest Gulf of Mexico wintering group as a whole (Mexico to Louisiana). The best available current estimates for portions of this wintering region are about 2,000 in Texas (Niles 2012a) or approximately 3,000 in Texas and Louisiana, with about half in each State and movement between them.

Spring Stopover Areas

Records of migrating red knots have been collected at many sites along the Atlantic coast. Not all migration areas are well surveyed, and considerable turnover of individuals occurs as birds migrate through an area. Consequently, using counts of migrating red knots as a basis for population estimates may lead to inaccuracies due to errors associated with turnover or double-counting. However, long-term counts made at a specific location are good indicators of usage trends for that area and, considered together, may reflect trends in the overall population of the red knot.

South America

Peak counts of red knots declined at three South American stopover sites (*i.e.*, Fracasso Beach, Argentina; Bahía San Antonio, Argentina; and Lagoa do Peixe, Brazil) from the 1990s through the mid-2000s. Although trends at stopover areas can reflect changing usage of the site, the timing of these declines over roughly the same period as those in Tierra del Fuego and Delaware Bay (late 1990s to early 2000s) is more suggestive of a decrease in the overall subspecies. At Fracasso Beach on Península Valdés in Argentina, ground surveys were conducted weekly from February through April (González 2005). At Bahía San Antonio in Argentina, the surveys were ground-based counts conducted January to April, weekly through 1999, but varying from daily to every 10 days from 2000 to 2005 (González 2005). Counts at Lagoa do Peixe in Brazil were obtained during expeditions that covered the peak spring passage in April (Niles et al. 2008). Other observers noted 5,000 red knots at Lagoa do Peixe in April 2005 (Fedrizzi and Carlos in Lanctot 2009) suggesting that usage of this site had partially rebounded from lower numbers seen in the early 2000s.

Virginia

Aerial surveys of the entire chain of barrier island beaches in Virginia have been conducted since 1995 using consistent methods and observers. Although the number of surveys has varied from one to six per year, the aerial survey effort has consistently covered the peak period during the last week of May. Since 2007, Karpenty et al. (2012) have estimated total red knots based on ground counts at 100 to 150 randomly selected points throughout Virginia's barrier island beaches including peat banks, with each location visited from one to three times per stopover season. Although the recent ground surveys show an upward trend, the aerial counts have been relatively steady since the mid-1990s. Because of differences in methodology and timing, the two data sets are not comparable.

Because birds pass in and out of a stopover area, the peak count (the highest number of birds seen on a single day) for a particular year is lower than the total passage population (*i.e.,* the total number of birds that stopped at that site over the course of that migration season). Using re-sightings of marked birds, several attempts have been made to estimate the total passage population of Virginia through mathematical modeling.

Delaware Bay

Aerial surveys have been conducted in Delaware Bay since 1981. Methods and observers were consistent from 1986 to 2008. The methodology during this period involved weekly counts; thus, it was possible the absolute peak number of birds was missed in some years. However, since most shorebirds remain in Delaware Bay at least a week, it is likely that the true peak was captured in most years (Clark et al. 1993). The surveys covered consistent areas of New Jersey and Delaware from the first week of May to the second week of June. All flights were conducted 3 to 4 hours after high tide, a period when birds are usually feeding on the beaches (Clark et al. 2009).

Methodologies and observers changed several times from 2009 to 2012. Flights are now flown only during the end of May. In addition, aerial counts for 2010 and 2011 were adjusted with ground counts from Mispillion Harbor, Delaware, to more accurately reflect large concentrations of birds at this key site (Dey et al. 2011b). Further, problems in 2009 and 2012 prevented accurate aerial counts, and ground counts have been substituted. Caution should be used in comparing ground and aerial counts (Laursen et al. 2008). Differences between the two methods may account for markedly higher counts in 2009 and 2012. Although aerial counts had typically been higher than ground counts prior to 2009, this was likely because many areas that could be surveyed by air were inaccessible on the ground. Since 2009, ground survey crews have attempted to minimize the access problem by using boats in remote areas.

As with other stopover areas, it is impossible to separate population-wide trends from trends in usage of a particular spring site. Because birds pass in and out of a stopover area, the peak count for a particular year is lower than the total passage population. Thus, differences in the number of birds in Delaware Bay may reflect stopover patterns rather than (or in addition to) trends in the overall red knot population (Clark et al. 1993). Using re-sightings of marked birds, several attempts have been made to estimate the total passage population of Delaware Bay through mathematical modeling. However, the pattern and timing of these declines in Delaware Bay relative to Tierra del Fuego and other stopovers is suggestive of a decrease in the overall population. Comparing four different time periods, average red knot counts in Delaware Bay declined by approximately 70 percent from 1981 to 2012.

Other areas along the U.S. Atlantic Coast

Beginning in 2006, coordinated red knot surveys have been conducted from Florida to Delaware Bay during two consecutive days from May 20 to 24. This period is thought to represent the peak of the red knot migration. There has been variability in methods, observers and areas covered. From 2006 to 2010, there was no change in counts that could not be attributed to varying geographic survey coverage (Dey et al. 2011b); thus, we do not consider any apparent trends in these data before 2010. Because red knot numbers peak earlier in the Southeast than in the mid-Atlantic, the late-May coast-wide survey data likely reflect the movement of some birds north along the coast, and may miss other birds that depart for Canada from the Southeast along an interior (overland) route prior to the survey window. Thus, greater numbers of red knots may utilize southeastern stopovers than suggested by the data.

Fall stopover areas

Few regular surveys are conducted in fall because southbound red knots tend to be less concentrated than during winter or spring. No regular surveys are conducted in Hudson Bay or James Bay, Canada. However, aerial surveys of the Ontario coastlines of James Bay and Hudson Bay in the late 1970s produced totals of 7,000 to 10,000 red knots, with more recent surveys reporting 5,000 to 10,000 (Morrison and Harrington 1992). There were numerous reports of 100 to 1,300 red knots at James Bay (Ontario) in August 2011, and one report of nearly 4,000 birds in this area (eBird.org 2012). Based on intensive field work and analysis of re-sightings of marked birds, at least 7,200 red knots are estimated to have used the Mingan Islands Archipelago (Canada) in fall 2008 (Wilson et al. 2010; Service 2011a).

Using daily checklist data submitted by birdwatchers during fall migrations from 1976 to 1998 in southern Quebec, Canada, Aubry and Cotter (2001) found a statistically significant decline in sightings of red knots. In surveys of Eastern Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland), fall counts of red knots dropped 5.3 to 15.3 percent per year (depending on the statistical method used) from 1974 to 1991, with considerably greater decreases later in the study period; however, the findings were not statistically significant (Morrison et al. 1994). Analyzing more years from this same data set from 1974 to 1998, Morrison et al. (2001) found a statistically significant annual decrease of 17.6 percent.

Fall peak counts from International Shorebird Survey sites along the U.S. Atlantic coast ranged from 6,000 to 9,000 red knots during the mid- to late-1970s (Morrison and Harrington 1992). In a review of numbers and distribution of red knots on the Massachusetts coast during southward migration, Harrington et al. (2010a) found that overall red knot numbers increased from the late 1940s to the early 1970s, especially on the mainland (western Cape Cod Bay), with a smaller increase on outer Cape Cod. After 1975, counts declined significantly on the mainland, but increased significantly on outer Cape Cod (Harrington et al. 2010b). Evidence suggests that both the mainland and the Cape Cod areas were historically used by red knots having Argentina-Chile destinations, but that recently the Cape Cod locations have increasingly been used by red knots with wintering destinations in the Southeast U.S., thus, balancing out the declining numbers of red knots with Argentina-Chile wintering destinations (Harrington et al. 2010b). By 2008, peak counts of Argentina-Chile red knots in Massachusetts had fallen to about 1,000 birds, while birds from the Southeast group increased to about 800 (Harrington et al. 2010a).

No regular counts are currently conducted in Massachusetts, but flocks of over 100 knots are routinely reported from Monomoy National Wildlife Refuge (eBird.org 2012). About 1,500 red knots were present in Avalon on the coast of New Jersey in the fall of 2011 (Service 2011b). Also, on the coast of New Jersey, hundreds of red knots are regularly reported from North Brigantine and Stone Harbor, sometimes in flocks of over 500 (eBird.org 2012). Islands at the mouth of the Altamaha River, Georgia, support the only known late summer and fall staging site on the east coast of the U.S., attracting as many as 12,000 knots at one time (Schneider and Winn 2010).

The Caribbean islands may be an important refuge for migrating shorebirds during storms (Nebel 2011). Puerto Rico and some of the Lesser Antilles (*e.g.,* St. Croix in the U.S. Virgin Islands, Guadeloupe, Barbados, and Trinidad) are also used as fall stopover areas (Niles et al. 2010; eBird.org 2012), with birds occurring regularly, but in small numbers. In Guadeloupe, the red knot is an uncommon, but regular visitor during fall migration, typically in small groups of up to 3 birds, but as many as 16 have been observed in a flock. In Barbados, the red knot is a fairly regular fall transient in small numbers, usually occurring as single individuals and in small groups, but occasionally knots may occur in flocks of up to a dozen birds, and a group of 63 birds was recorded in 1951. Detailed records from 1950 to 1965 show an average of about 20 red knots per year in Barbados (Hutt and Hutt 1992). Flocks of up to a dozen red knots were reported from Trinidad each year from 2008 to 2011, with multiple sightings each fall (eBird.org 2012).

In late August 2012, 1,700 knots were observed in rice fields near Mana, French Guiana, and a large number of these birds had been marked in the Chile portion of Tierra del Fuego (Niles 2012b). Based on this survey and recent geolocator results, French Guiana is emerging as an important fall stopover area (Niles 2012b). Adjacent Suriname and Brazil are also used in the fall (Niles et al. 2010; Spaans 1978), but little information is available regarding the numbers of birds in these areas. In Suriname, a total of nearly 160 red knots were counted during two surveys conducted in late August of 1970 to 1973. Larger red knot numbers apparently do not occur in Suriname as the habitat is not ideal. In September 2007, the average peak count of red knots at Cajuais Bank in the Brazilian State of Ceará was 434 ± 95 (Carlos et al. 2010). During aerial surveys of Panama Bay in the fall of 1997, Watts (1998) documented a peak count of 2,460 red knots in September; the subspecies composition is unknown. Watts (1998) also reported that red knot counts in Panama were likely underestimated.

Summary

After a careful review of available survey data from areas regularly used by substantial numbers of red knots in spring, fall, and winter, the Service has determined that:

- For some areas, available data are insufficient to substantiate any conclusions regarding population trends over time.

- For other areas, there are apparent trends, but they are associated with relatively low confidence.
- For a few key areas, the consistency of geographic coverage, methodologies, and surveyors lead us to greater confidence in apparent trends. Those population data are summarized as follows:

Patagonia and Tierra del Fuego wintering region: There are declines through the 2000s, possibly stabilizing at a relatively low level since 2008, which are associated with higher confidence.
North-Central Brazil wintering region: There is an apparent decline when comparing surveys with similar methods, coverage, and observers in 1982 and 2011, which are associated with lower confidence due to the availability of only two data points, and the complexity of the shoreline that makes surveying difficult. Partial surveys in the winters of 2005 and 2007 suggest that any declines occurred after 2005.
Northwest Gulf of Mexico wintering region: There are insufficient data for trend analysis.
Southeast wintering region: There is an apparent decline on Florida's Gulf coast when comparing aerial surveys from 1980 to 1982, with similar surveys (using different surveyors) of approximately the same area from 2006 to 2010, which are associated with lower confidence because birds may have simply shifted elsewhere within this large wintering region. The two region-wide survey efforts to date (from the 2006 and 2011 piping plover surveys) are associated with lower confidence inherent in the methodology (red knots are not the focus of this survey), but do tend to support the perception that knots shift from state to state within this region among years. A long-term data set from Georgia, showing wide inter-annual fluctuations, also supports this perception. Data from the Caribbean are insufficient to infer any trends. Comparing ground surveys of Florida's Gulf coast in 1994 to aerial surveys of about this same area from 2006 to 2010, red knot counts were roughly the same over this time period.
South American spring stopover sites: There are apparent declines at three key stopover sites from the late 1990s through the mid-2000s, which are associated with moderate confidence because we have little information regarding the consistency of methodologies or surveyors and because no data are available after 2005.
Virginia barrier islands spring stopover area: There is no apparent trend based on aerial surveys since 1995, which is associated with high confidence. A newer data set based on ground surveys suggests an increase since 2007.
Delaware Bay spring stopover area: There is a highly variable data set showing possible declines in the 1990s, and more consistent and substantial declines through the mid-2000s, which are associated with high confidence during the core years of 1986 to 2008. Numbers may have stabilized from 2009 to 2012, but we have lower confidence in trends over this later period due to multiple shifts in methodology and surveyors.
Atlantic coast spring window survey: There is an apparent increase from 2010 to 2012, but it is associated with lower confidence because, despite improvements, methodology and geographic coverage are still stabilizing and because only 3 years of (relatively consistent) data are available.
Fall stopover areas: There are insufficient data for trend analysis in most areas. Since the 1970s, there were probable declines in some parts of eastern Canada and changes in red knot

usage of Massachusetts (mainland versus Cape Cod, proportion of birds bound for Southeast versus Argentina-Chile wintering destinations).

In conclusion, we have high confidence in two data sets from key red knot areas, Tierra del Fuego and Delaware Bay, showing declines over roughly the same period. Data sets associated with lower confidence from the Brazil wintering region and three South American spring stopovers also suggest declines roughly over this same timeframe. We conclude that the Virginia spring stopover was stable during this period (the 2000s). We do not conclude that the Southeast wintering region declined, due to the likelihood that knot usage shifted geographically within this region from year to year. Our analysis of the best available data concludes that an overall, sustained decline of red knot numbers occurred in the 2000s, and that red knot populations may have stabilized at a relatively low level in the last few years. Inferring long-term population trends from various national or regional datasets derived from volunteer shorebird surveys and other sources, Morrison et al. (2006) and Andres (2009) also concluded that red knot numbers declined, probably sharply, in recent decades.

Status and distribution

The red knot's range spans 40 states, 24 countries, and their administrative territories or regions extending from their breeding grounds in the Canadian Arctic to migration stopover areas along the Atlantic and Gulf coasts of North America, to wintering grounds throughout the southeastern U.S., the Gulf coast, and South America (reaching as far south as Tierra del Fuego at the southern tip of South America). In Delaware Bay and Tierra del Fuego, the era of modern surveys for the red knot and other shorebird species began in the early 1980s. Systematic red knot surveys of other areas began later, and for many portions of the knot's range, available survey data are patchy. Prior to the 1980s, numerous natural history accounts are available, but provide mainly qualitative or localized population estimates. Nonetheless, a consistent narrative emerges across many historical accounts that red knots were extremely abundant in the early 1800s, decreased sharply starting in the mid-1800s, and may have begun to recover by the mid-1900s. Most writers agree the cause of that historical decline was intensive sport and market hunting. It is unclear whether the red knot population fully recovered its historical numbers (Harrington 2001) following the period of unregulated hunting.

The current geographic distribution of the red knot has not changed relative to that recorded in historical writings with the notable exception of Delaware Bay (discussed in detail below). Several early writers reported that red knots breed in the Arctic and winter along the U.S. Gulf coast and in South America including Brazil and Tierra del Fuego (Audubon 1844; Mackay 1893; Shriner 1897; Eaton 1910; Forbush 1912; Ridgway 1919; Bent 1927; Hellmayr and Conover 1948; Lowery 1974). Bent (1927) included Jamaica and Barbados as part of the possible wintering range of red knots, and described knots as "rarely" wintering in parts of Louisiana and Florida. Hellmayr and Conover (1948) noted the use of the West Indies (Jamaica, Barbados, and Trinidad) during migration. Several writers described the red knot as occurring primarily along the coasts with relatively few sightings inland, but interior migration routes through the central U.S. were also known (Audubon 1844; Eaton 1910; Forbush 1912; Ridgway 1919; Bent 1927; Hellmayr and Conover 1948; Lowery 1974). As with the geographic distribution, a number of historical accounts suggest that the timing of the red knot's spring and fall migrations along the Atlantic coast was generally the same in the past as it is today (Wilson 1829; Roosevelt 1866; Stearns and Coues 1883; Giraud 1844; Mackay 1893; Dixon 1895 in Barnes and Truitt 1997; Shriner 1897; Forbush 1912; Bent 1927; Stone 1937; Urner and Storer 1949; Myers and Myers).

Although the large-scale geographic distribution of migration stopover habitats does not seem to have changed, some authors have noted regional changes in the patterns of red knot stopover habitat usage along the U.S. Atlantic coast. For example, based on a review of early literature, Cohen et al. (2008) suggest that red knots had a more extensive spring stopover range a century ago than now, with thousands of birds noted in Massachusetts, New York, New Jersey, and Virginia during the spring. Harrington et al. (2010a) found changes in the regional patterns of stopover habitat usage in Massachusetts, as well as a shift in the wintering destination of birds stopping in Massachusetts during fall migration.

Delaware Bay

Delaware Bay was not recognized as a major shorebird stopover area until the early 1980s, despite detailed shorebird studies (*e.g.,* Stone 1937; Urner and Storer 1949) in the South Jersey region (Clark et al. 1993; Clark in Farrell and Martin 1997; Botton et al. in Shuster et al. 2003; Clark et al. 2009). There were some early anecdotal reports involving horseshoe crabs, as summarized by Botton et al. (in Shuster et al. 2003). Wilson (1829) noted that ruddy turnstones in the bay fed "almost wholly on the eggs, or spawn, of the great king crab," but no similar accounts were made of red knots. Forbush (1912) noted that red knots "are fond of the spawn of the horsefoot crab, which, often in company with the Turnstone, they dig out of the sand…" Stone (1937) observed ruddy turnstones and black-bellied plovers regularly feeding on dead horseshoe crabs in Delaware Bay. Stone (1937) also mentions flights of ruddy turnstones across the Cape May Peninsula in the spring, as happens today when they go to roost at night along the Atlantic coastal marshes (Botton et al. in Shuster et al. 2003). Interestingly, no mention of horseshoe crab eggs as food is found in Stone's (1937) accounts of any shorebird in the Cape May area, or in the decade-long study by Urner and Storer (1949) and (Botton et al. in Shuster et al. 2003). During his early studies of horseshoe crabs in 1951, Shuster observed many shorebirds feeding along Delaware Bay beaches, including red knots. However, another 30 years elapsed before scientists began to study the shorebird/horseshoe crab relationship in detail, and documented the very large numbers of shorebirds using the bay as a stopover (Botton et al. in Shuster et al. 2003). Lack of earlier scientific documentation cannot be attributed to remoteness. Delaware Bay is located within a few hours' drive of millions of people, and university marine laboratories were established many years ago on both shores of the bay (Botton et al. in Shuster et al. 2003).

It is unclear if the large magnitude of the shorebird-horseshoe crab phenomenon was simply missed by science until 1981, or if the distribution of the red knot and other shorebird species changed over the period of the historical record. For much of the 20th century, this phenomenon in Delaware Bay may have been much reduced (relative to 1980s levels), and therefore, easier to miss, due to the occurrence of low points in the abundance of both shorebirds (caused by hunting) and horseshoe crabs (caused by intensive harvest) (Clark in Farrell and Martin 1997; Botton et al. in Shuster et al. 2003). Alternatively, it may be that the red knot did not make extensive use of Delaware Bay prior to its population decline a century ago. Under this scenario, red knots came to rely on Delaware Bay because their populations were recovering at the same time that Atlantic-side stopover habitats in the region were becoming developed and the shorelines stabilized (Cohen et al. 2008). We have no means to determine how long shorebirds have been reliant on horseshoe crab eggs in Delaware Bay (Botton et al. in Shuster et al. 2003) prior to the early 1980s.

The middle part of the 20th century coincided with the recovery of shorebird populations following the regulation of hunting (Bent 1927; Urner and Storer 1949), a low point in horseshoe crab abundance following a period of intensive harvest (Atlantic States Marine Fisheries Commission (ASMFC) 2009), and the large-scale development and stabilization of Atlantic coast beaches in the mid-Atlantic region (Nordstrom 2000; Nordstrom and Mauriello 2001). Any or all of these factors may have influenced the red knot's use of, and reliance on, Delaware Bay as its primary Atlantic stopover site in spring.

<u>Threats to Red Knots and Their Habitat</u>

In this section, we provide an analysis of threats to red knots and their habitat in their migration and wintering range, with some specific references to their breeding range. Because we lack information on threats to red knots for many countries outside the U.S. (with a few exceptions), this analysis is mainly focused on threats to red knots within the continental U.S. portion of their migration and wintering range, unless otherwise noted.

<u>Climate change</u>

The natural history of Arctic-breeding shorebirds makes this group of species particularly vulnerable to global climate change (*e.g.,* Lindström and Agrell 1999; Piersma and Baker 2000; Zöckler and Lysenko 2000; Rehfisch and Crick 2003; Piersma and Lindström 2004; Meltofte et al. 2007). Relatively low genetic diversity, which is thought to be a consequence of survival through past climate-driven population bottlenecks, may put shorebirds at more risk from human-induced climate variation than other avian taxa (Meltofte et al. 2007); low genetic diversity may result in reduced adaptive capacity as well as increased risks when population sizes drop to low levels.

In the short term, red knots may benefit if warmer temperatures result in fewer years of delayed horseshoe crab spawning in Delaware Bay (Smith and Michaels 2006) or fewer occurrences of late snow melt in the breeding grounds (Meltofte et al. 2007). However, there are indications that changes in the abundance and quality of red knot prey are already under way (Jones et al. 2010; Escudero et al. 2012), and prey species face ongoing climate-related threats from warmer temperatures (Philippart et al. 2003; Rehfisch and Crick 2003; Fabry et al. 2008; Jones et al. 2010), ocean acidification (National Research Council (NRC) 2010), and possibly increased prevalence of disease and parasites (Ward and Lafferty 2004). In addition, red knots face imminent threats from loss of habitat caused by sea level rise (Titus 1990; Galbraith et al. 2002;

NRC 2010), and increasing asynchronies (''mismatches'') between the timing of their annual breeding, migration, and wintering cycles and the windows of peak food availability on which the birds depend (Baker et al. 2004; van Gils et al. 2005a; Meltofte et al. 2007; McGowan et al. 2011; Smith et al. 2011).

Several threats are related to the possibility of changing storm patterns. While variation in weather is a natural occurrence and is normally not considered a threat to the survival of a species, persistent changes in the frequency, intensity, or timing of storms at key locations where red knots congregate (*e.g.*, key stopover areas) can pose a threat. Storms impact migratory shorebirds like the red knot both directly and indirectly. Direct impacts include energetic costs from a longer migration route as birds avoid storms, blowing birds off course, and outright mortality (Niles et al. 2010). Indirect impacts include changes to habitat suitability, storm-induced asynchronies between migration stopover periods and the times of peak prey availability, and possible prompting of birds to take refuge in areas where shorebird hunting is still practiced (Dey et al. 2011a; Nebel 2011; Niles et al. 2012b).

With Arctic warming, vegetation conditions in the red knot's breeding grounds are expected to change, causing the zone of nesting habitat to shift and perhaps contract, but this process may take decades to unfold (Kaplan et al. 2003; Meltofte et al. 2007; Feng et al. 2012). Ecological shifts in the Arctic may appear sooner. High uncertainty exists about when and how changing interactions among vegetation, predators, competitors, prey, parasites, and pathogens may affect the red knot, but the impacts are potentially profound (Ims and Fuglei 2005; Meltofte et al. 2007; Schmidt et al. 2012; Fraser et al. 2013).

Due to background rates of sea level rise and the naturally dynamic nature of coastal habitats, we conclude that red knots are adapted to moderate (although sometimes abrupt) rates of habitat change in their wintering and migration areas. However, rates of sea level rise are accelerating beyond those that have occurred over recent millennia. In most of the red knot's nonbreeding range, shorelines are expected to undergo dramatic reconfigurations over the next century as a result of accelerating sea level rise. Extensive areas of marsh are likely to become inundated, which may reduce foraging and roosting habitats. Marshes may be able to establish farther inland, but the rate of new marsh formation (*e.g.*, intertidal sediment accumulation, development of hydric soils, colonization of marsh vegetation) may be slower than the rate of deterioration of existing marsh, particularly under higher sea level rise scenarios. The primary red knot foraging habitats (*i.e.*, intertidal flats and sandy beaches) will likely be locally or regionally inundated, but replacement habitats are likely to reform along the shoreline in its new position. However, if shorelines experience a decades-long period of high instability and landward migration, the formation rate of new beach habitats may be slower than the inundation rate of existing habitats. In addition, low-lying and narrow islands (*e.g.*, in the Caribbean and along the Gulf and Atlantic coasts) may disintegrate rather than migrate, representing a net loss of red knot habitat. Superimposed on these changes are widespread human attempts to stabilize the shoreline, which are known to exacerbate losses of intertidal habitats by blocking their landward migration. The cumulative loss of habitat across the nonbreeding range could affect the ability of red knots to complete their annual cycles, possibly affecting fitness and survival, and is thereby likely to negatively influence the long-term survival of the red knot.

In summary, climate change is expected to affect red knot fitness and, therefore, survival through direct and indirect effects on breeding and nonbreeding habitat, food availability, and timing of the birds' annual cycle. Ecosystem changes in the Arctic (*e.g.,* changes in predation patterns and pressures) may also reduce reproductive output. Together, these anticipated changes will likely negatively influence the long-term survival of the red knot.

<u>Reduced food availability</u>

Commercial harvest of horseshoe crabs has been implicated as a causal factor in the decline of the red knot populations in the 2000s, by decreasing the availability of horseshoe crab eggs in the Delaware Bay stopover (Niles et al. 2008). Due to harvest restrictions and other conservation actions, horseshoe crab populations showed some signs of recovery in the early 2000s, with apparent signs of red knot stabilization (survey counts, rates of weight gain) occurring a few years later (as might be expected due to biological lag times). Since about 2005, however, horseshoe crab population growth has stagnated for unknown reasons. Under the current management framework, the present horseshoe crab harvest is not considered a threat to the red knot. However, it is not yet known if the horseshoe crab egg resource will continue to adequately support red knot populations over the next 5 to 10 years. In addition, implementation of the current management framework could be impeded by insufficient funding.

The causal role of reduced Delaware Bay food supplies in driving red knot population declines shows the vulnerability of red knots to declines in the quality or quantity of their prey. This vulnerability has also been demonstrated in other *C. canutus* subspecies, although not to the severe extent experienced by the *rufa* subspecies. In addition to the fact that horseshoe crab population growth has stagnated, red knots now face several emerging threats to their food supplies throughout their nonbreeding range. These threats include: small prey sizes (from unknown causes) at two key wintering sites on Tierra del Fuego; warming water temperatures that may cause mollusk population declines and range contractions (including the likely loss of a key prey species from the Virginia spring stopover within the next decade); ocean acidification to which mollusks are particularly vulnerable; physical habitat changes from climate change affecting invertebrate communities; possibly increasing rates of mollusk diseases due to climate change; invasive marine species from ballast water and aquaculture; and the burial and crushing of invertebrate prey from sand placement and recreational activities. Although threats to food quality and quantity are widespread, red knots in localized areas have shown some adaptive capacity to switch prey when the preferred prey species became reduced (Musmeci et al. 2011; Escudero et al. 2012), suggesting some adaptive capacity to cope with this threat. Nonetheless, based on the combination of documented past impacts and a spectrum of ongoing and emerging threats, we conclude that reduced quality and quantity of food supplies is a threat to the *rufa* red knot at the subspecies level, and the threat is likely to continue into the future.

Asynchronies ("mismatches") in the red knot's annual cycle

The red knot's life history strategy makes this species inherently vulnerable to mismatches in timing between its annual cycle and those periods of optimal food and weather conditions upon which it depends. For unknown reasons, more red knots arrived late in Delaware Bay in the early 2000s, which is generally accepted as a key causative factor (along with reduced supplies of horseshoe crab eggs) behind red knot population declines that were observed over this same timeframe. Thus, the red knot's sensitivity to timing asynchronies has been demonstrated through a population-level response. Both adequate supplies of horseshoe crab eggs and high-quality foraging habitat in Delaware Bay, can serve to partially mitigate minor asynchronies at this key stopover site. However, the factors that caused delays in the spring migrations of red knots from Argentina and Chile are still unknown, and we have no information to indicate if this delay will reverse, persist, or intensify.

Superimposed on this existing threat of late arrivals in Delaware Bay are new threats of asynchronies emerging due to climate change. Climate change is likely to affect the reproductive timing of horseshoe crabs in Delaware Bay, mollusk prey species at other stopover sites, or both, possibly pushing the peak seasonal availability of food outside of the windows when red knots rely on them. In addition, both field studies and modeling have shown strong links between the red knot's reproductive output and conditions in the Arctic including insect abundance and snow cover. Climate change may also cause shifts in the period of optimal Arctic conditions relative to the time period when red knots currently breed.

The red knot's adaptive capacity to deal with numerous changes in the timing of resource availability across its geographic range is largely unknown. A few examples suggest some flexibility in migration strategies. However, available information suggests that the timing of the red knot's annual cycle is controlled at least partly by celestial and endogenous cues, while the reproductive seasons of prey species, including horseshoe crabs and mollusks, are largely driven by environmental cues such as water temperature. These differences between the timing cues of red knots and their prey suggest limitations on the adaptive capacity of red knots to deal with numerous changes in the timing of resource availability across their geographic range. Based on the combination of documented past impacts and a spectrum of ongoing and emerging threats, we conclude that asynchronies (mismatches between the timing of the red knot's annual cycles and the periods of favorable food and weather upon which it depends) are likely to cause deleterious subspecies-level effects.

Shoreline stabilization and coastal development

Much of the U.S. coast within the range of the red knot is already extensively developed. Direct loss of shorebird habitats occurred over the past century as substantial commercial and residential developments were constructed in and adjacent to ocean and estuarine beaches along the Atlantic and Gulf coasts. In addition, red knot habitat was also lost indirectly, as sediment supplies were reduced and stabilization structures were constructed to protect developed areas. Sea level rise and human activities within coastal watersheds can lead to long-term reductions in sediment supply to the coast. The damming of rivers, bulk-heading of highlands, and armoring of coastal bluffs have reduced erosion in natural source areas and consequently the sediment loads reaching coastal areas. Although it is difficult to quantify, the cumulative reduction in sediment supply from human activities may contribute substantially to the long-term shoreline erosion rate. Along coastlines subject to sediment deficits, the amount of sediment supplied to the coast is less than that lost to storms and coastal sinks (inlet channels, bays, and upland deposits), leading to long-term shoreline recession (Greene 2002; Herrington 2003; Morton 2003; Morton et al. 2004; Defeo et al. 2009; Climate Change Science Program [CCSP] 2009; Florida Oceans and Coastal Council 2010; Coastal Protection and Restoration Authority of Louisiana 2012).

In addition to reduced sediment supplies, other factors such as stabilized inlets, shoreline stabilization structures, and coastal development can exacerbate long-term erosion (Herrington 2003). Coastal development and shoreline stabilization can be mutually reinforcing. Coastal development often encourages shoreline stabilization because stabilization projects cost less than the value of the buildings and infrastructure. Conversely, shoreline stabilization sometimes encourages coastal development by making a previously high-risk area seem safer for development (CCSP 2009). Protection of developed areas is the driving force behind ongoing shoreline stabilization efforts. Large-scale shoreline stabilization projects became common in the past 100 years with the increasing availability of heavy machinery. Shoreline stabilization methods change in response to changing new technologies, coastal conditions, and preferences of residents, planners, and engineers. Along the Atlantic and Gulf coasts, an early preference for shore-perpendicular structures (*e.g.,* groins) was followed by a period of construction of shore-parallel structures (*e.g.*, seawalls), and then a period of beach renourishment, which is now favored (Nordstrom 2000; Morton et al. 2004).

The mid-Atlantic coast from New York to Virginia is the most urbanized shoreline in the country, except for parts of Florida and southern California. In New York and New Jersey, hard structures and beach renourishment programs cover much of the coastline. Farther south, there are more undeveloped and preserved sections of coast (Leatherman 1989). Along the entire Atlantic, most of the ocean coast is fully or partly developed, less than 10 percent is in conservation, and about one-third is undeveloped and still available for new development (Titus et al. 2009).

The U.S. southeastern coast from North Carolina to Florida is the least urbanized along the Atlantic coast, although both coasts of Florida are urbanizing rapidly. Texas has the most extensive sandy coastline in the Gulf, and much of the area is sparsely developed (Leatherman 1989). Region-wide, about 40 percent of the southeast and Gulf coast is already developed (Rice 2012; Service 2012a). Not all of the remaining 60 percent in the "undeveloped" category, however, is still available for development because about 43 percent (about 910 miles) of beaches across this region are considered preserved. Preserved beaches include those in public or nongovernmental conservation ownership and those under conservation easements.

Past and ongoing stabilization projects fundamentally alter the naturally dynamic coastal processes that create and maintain beach strand and bayside habitats, including those habitat components that red knots rely upon. Past loss of stopover and wintering habitat likely reduce the resilience of the red knot by making it more dependent on those habitats that remain, and more vulnerable to threats (*e.g.*, disturbance, predation, reduce quality or abundance of prey, increased intraspecific and interspecific competition) within those restricted habitats.

Hard structures

Hard structures constructed of stone, concrete, wood, steel, or geotextiles have been used for centuries as a coastal defense strategy (Defeo et al. 2009). The most common hard stabilization structures fall into two groups: structures that run parallel to the shoreline (*e.g.*, seawalls, revetments, bulkheads) and structures that run perpendicular to the shoreline (*e.g.*, groins, jetties). Groins are often clustered in groin fields, and are intended to protect a finite section of beach, while jetties are normally constructed at inlets to keep sand out of navigation channels and provide calm-water access to harbor facilities (Corps 2002). Descriptions of the different types of stabilization structures can be found in Corps (2002), Herrington (2003), and Rice (2009).

Prior to the 1950s, the general practice in the U.S. was to use hard structures to protect developments from beach erosion or storm damages (Corps 2002). The pace of constructing new hard stabilization structures has since slowed considerably (Corps 2002). Many states within the range of the red knot now discourage or restrict the construction of new, hard oceanfront protection structures, although the hardening of bayside shorelines is generally still allowed (Titus 2000; Greene 2002; Kana 2011). Most existing hard oceanfront structures continue to be maintained, and some new structures continue to be built. While some states have restricted new construction, hard structures are still among the alternatives in the Federal shore protection program (Corps 2002).

Hard shoreline stabilization projects are typically designed to protect property (and its human inhabitants) not beaches (Pilkey and Howard 1981; Kana 2011). Through effects on waves and currents, sediment transport rates, Aeolian (wind) processes, and sand exchanges with dunes and offshore bars, hard structures change the erosion/accretion dynamics of beaches and constrain the natural migration of shorelines (Nordstrom 2000; Scavia et al. 2002; Morton 2003; CCSP 2009; Defeo et al. 2009). There is ample evidence of accelerated erosion rates, pronounced breaks in shoreline orientation, and truncation of the beach profile down-drift of perpendicular structures, and of reduced beach widths (relative to unprotected segments) where parallel structures have been in place over long periods of time (Pilkey and Wright 1988; Nordstrom 2000; Scavia et al. 2002; Corps 2002; Morton 2003; CCSP 2009; Hafner 2012). In addition, marinas and port facilities built out from the shore can have effects similar to hard stabilization structures (Nordstrom 2000).

Structural development along the shoreline and manipulation of natural inlets upset the naturally dynamic coastal processes and result in loss or degradation of beach habitat (Melvin et al. 1991). As beaches narrow, the reduced habitat can directly lower the diversity and abundance of biota (life forms), especially in the upper intertidal zone. Shorebirds may be impacted both by reduced habitat area for roosting and foraging, and by declining intertidal prey resources, as has been documented in California (Dugan and Hubbard 2006; Defeo et al.

2009). In an estuary in England, Stillman et al. (2005) found that a 2 to 8 percent reduction in intertidal area (the magnitude expected through sea level rise and industrial developments including extensive stabilization structures) decreased the predicted survival rates of five out of nine shorebird species evaluated (although not of red knots). In Delaware Bay, hard structures also cause or accelerate loss of horseshoe crab spawning habitat (Botton et al. 1988; Botton et al. in Shuster et al. 2003; CCSP 2009), and shorebird habitat has been, and may continue to be, lost where bulkheads have been built (Clark in Farrell and Martin 1997). In addition to directly eliminating red knot habitat, hard structures interfere with the creation of new shorebird habitats by interrupting the natural processes of over-wash and inlet formation. Where hard stabilization is installed, the eventual loss of the beach and its associated habitats is virtually assured (Rice 2009) in the absence of beach renourishment, and therefore, may impact red knots as discussed below. Where they are maintained, hard structures are likely to significantly increase the amount of red knot habitat lost as sea levels continue to rise.

In a few isolated locations, however, hard structures may enhance red knot habitat, or may provide artificial habitat. In Delaware Bay, for example, Botton et al. (1994) found that creek mouths, jetties and other artificial obstructions can act to concentrate drifting horseshoe crab eggs and thereby attract shorebirds. Another example comes from the Delaware side of the bay, where a seawall and jetty at Mispillion Harbor protect the confluence of the Mispillion River and Cedar Creek. These structures create a low energy environment in the harbor, which seems to provide highly suitable conditions for horseshoe crab spawning over a wider variation of weather and sea conditions than anywhere else in the bay. Horseshoe crab egg densities at Mispillion Harbor are consistently an order of magnitude higher than at other bay beaches (Dey et al. 2011b), and this site consistently supports upwards of 15 to 20 percent of all red knots recorded in Delaware Bay (Lathrop 2005). In Florida, red knots have been observed on multiple instances using artificial structures such as docks, piers, jetties, causeways, and construction barriers. The Service does not have any information regarding the frequency, regularity, timing, or significance of this use of artificial habitats.

Mechanical sediment transport

Several types of sediment transport are employed to stabilize shorelines, protect development, maintain navigation channels, and provide for recreation (Corps 2002; Kana 2011; Gebert 2012). The effects of these projects are typically expected to be relatively short in duration, usually less than 10 years, but often these actions are carried out every few years in the same area, resulting in a more lasting impact on habitat suitability for shorebirds. Mechanical sediment transport practices include beach renourishment, sediment back-passing, sand scraping, and dredging.

Since the 1970s, 90 percent of the Federal appropriation for shore protection has been for beach renourishment (Corps 2002), which has become the preferred course of action to address shoreline erosion in the U.S. (Greene 2002; Morton and Miller 2005; Kana 2011). Beach renourishment requires an abundant source of sand that is compatible with the native beach material. The sand is trucked to the target beach or hydraulically pumped using dredges (Hafner 2012). Sand for beach renourishment operations can be obtained from dry land-based sources; estuaries, lagoons, or inlets on the backside of the beach; sandy shoals in inlets and navigation channels; near-shore ocean waters; or offshore ocean waters; with the last two being the most common sources (Greene 2002).

Where shorebird habitat has been severely reduced or eliminated by hard stabilization structures, beach renourishment may be the only means available to replace any habitat for as long as the hard structures are maintained (Nordstrom and Mauriello 2001), although such habitat will persist only with regular renourishment episodes (typically on the order of every 2 to 6 years). In Delaware Bay, beach renourishment has been recommended to prevent loss of spawning habitat for horseshoe crabs (ASMFC 1998; Carter et al. in Guilfoyle et al. 2007; Kalasz 2008), and is being pursued as a means of restoring shorebird habitat in Delaware Bay following Hurricane Sandy (Corps 2012; Niles et al. 2013). Beach renourishment was part of a 2009 project to maintain important shorebird foraging habitat at Mispillion Harbor, Delaware (Siok and Wilson 2011). However, red knots may be directly disturbed if beach renourishment takes place while the birds are present. On New Jersey's Atlantic coast, beach renourishment has typically been scheduled for the fall, when red knots are present, because of various constraints at other times of year. In addition to causing disturbance during construction, beach renourishment often increases recreational use of the widened beaches that, without careful management, can increase disturbance of red knots. Beach renourishment can also temporarily depress, and sometimes permanently alter, the invertebrate prey base on which shorebirds depend.

In addition to disturbing the birds and impacting the prey base, beach renourishment can affect the quality and quantity of red knot habitat (Greene 2002). The artificial beach created by renourishment may provide only suboptimal habitat for red knots, as a steeper beach profile is created when sand is stacked on the beach during the renourishment process. In some cases, renourishment is accompanied by the planting of dense beach grasses, which can directly degrade habitat, as red knots require sparse vegetation to avoid predation. By precluding over-wash and Aeolian transport, especially where large artificial dunes are constructed, beach renourishment can also lead to further erosion on the bayside and promote bayside vegetation growth, both of which can degrade the red knot's preferred foraging and roosting habitats (sparsely vegetated flats in or adjacent to intertidal areas). Preclusion of over-wash also impedes the formation of new red knot habitats. Beach renourishment can also encourage further development, bringing further habitat impacts, reducing future alternative management options such as a retreat from the coast, and perpetuating the developed and stabilized conditions that may ultimately lead to inundation where beaches are prevented from migrating (Greene 2002).

Following placement of sediments much coarser than those native to the beach, Peterson et al. (2006) found that the area of intertidal-shallow sub-tidal shorebird foraging habitat was reduced by 14 to 29 percent at a site in North Carolina. Presence of coarse shell material armored the substrate surface against shorebird probing, further reducing foraging habitat by 33 percent, and probably also inhibiting manipulation of prey when encountered by a bird's bill (Peterson et al. 2006). In addition to this physical change from adding coarse sediment, renourishment that places sediment dissimilar to the native beach also substantially increases impacts to the red knot's invertebrate prey base.

Sediment back-passing is a technique that reverses the natural migration of sediment by mechanically (via trucks) or hydraulically (via pipes) transporting sand from accreting, downdrift areas of the beach to eroding, up-drift areas of the beach (Chasten and Rosati 2010; Kana 2011). Currently, less prevalent than beach renourishment, sediment back-passing is an emerging practice because traditional renourishment methods are beginning to face constraints on budgets and sediment availability (Chase 2006; Hafner 2012). Beach bulldozing or scraping is the process of mechanically redistributing beach sand from the littoral zone (along the edge of the sea) to the upper beach to increase the size of the primary dune or to provide a source of sediment for beaches that have no existing dune; no new sediment is added to the system (Lindquist and Manning 2001; Greene 2002; Kana 2011). Beach scraping tends to be a localized practice. In Florida, beach scraping is usually used only in emergencies such as after hurricanes and other storms, but in New Jersey this practice is more routine in some areas. Many of the effects of sediment back-passing and beach scraping are similar to those for beach renourishment (Lindquist and Manning 2001; Service 2011c), including disturbance during and after construction, alteration of prey resources, reduced habitat area and quality, and precluded formation of new habitats. Relative to beach renourishment, sediment back-passing and beach scraping can involve considerably more driving of heavy trucks and other equipment on the beach including areas outside the sand placement footprint, potentially impacting shorebird prey resources over a larger area (Service 2011c). In addition, these practices can directly remove sand from red knot habitats, as is the case in one red knot concentration area in New Jersey (Service 2011c). Back-passing and sand scraping can involve routine episodes of sand removal or transport that maintain the beach in a narrower condition, indefinitely reducing the quantity of back-beach roosting habitat.

Sediments are also manipulated to maintain navigation channels. Many inlets in the U.S. range of the red knot are routinely dredged and sometimes relocated. In addition, near-shore areas are routinely dredged ("mined") to obtain sand for beach renourishment. Regardless of the purpose, inlet and nearshore dredging can affect red knot habitats. Dredging often involves removal of sediment from sand bars, shoals, and inlets in the near-shore zone, directly impacting optimal red knot roosting and foraging habitats (Winn and Harrington in Guilfoyle et al. 2006; Harrington in Guilfoyle et al. 2007; Harrington 2008). These ephemeral habitats are even more valuable to red knots because they tend to receive less recreational use than the main beach strand. In addition to causing this direct habitat loss, the dredging of sand bars and shoals can preclude the creation and maintenance of red knot habitats by removing sand sources that would otherwise act as natural breakwaters and weld onto the shore over time (Morton 2003; Hayes and Michel 2008). Further, removing these sand features can cause or worsen localized erosion by altering depth contours and changing wave refraction (Hayes and Michel 2008), potentially degrading other nearby red knot habitats indirectly because inlet dynamics exert a strong influence on the adjacent shorelines. Studying barrier islands in Virginia and North Carolina, Fenster and Dolan (1996) found that inlet influences extend 3.4 to 8.1 mi (5.4 to 13.0 kilometer [km]), and that inlets dominate shoreline changes for up to 2.7 mi

(4.3 km). Changing the location of dominant channels at inlets can create profound alterations to the adjacent shoreline (Nordstrom 2000).

Wrack removal and beach cleaning

Wrack on beaches and baysides provides important foraging and roosting habitat for red knots and many other shorebirds on their winter, breeding, and migration grounds. Because shorebird numbers are positively correlated with wrack cover and biomass of their invertebrate prey that feed on wrack (Tarr and Tarr 1987; Dugan et al. 2003; Hubbard and Dugan 2003), beach grooming will lower bird numbers (Defeo et al. 2009).

There is increasing popularity along developed beaches in the Southeast, especially in Florida, for beach communities to carry out "beach cleaning" and "beach raking" actions. Beach cleaning occurs on private beaches, where red knot use is not well documented, and on some municipal or county beaches that are used by red knots. Most wrack removal on state and Federal lands is limited to post-storm cleanup and does not occur regularly.

Man-made beach cleaning and raking machines effectively remove seaweed, fish, glass, syringes, plastic, cans, cigarettes, shells, stone, wood, and virtually any unwanted debris (Barber Beach Cleaning Equipment 2009). These efforts remove accumulated wrack, topographic depressions, and sparse vegetation nodes used by roosting and foraging red knots. Removal of wrack also eliminates a beach's natural sand-trapping abilities, further destabilizing the beach. In addition, sand adhering to seaweed and trapped in the cracks and crevices of wrack is removed from the beach. Although the amount of sand lost due to single sweeping actions may be small, it adds up considerably over a period of years (Nordstrom et al. 2006; Neal et al. 2007). Beach cleaning or grooming can result in abnormally broad unvegetated zones that are inhospitable to dune formation or plant colonization, thereby enhancing the likelihood of erosion (Defeo et al. 2009).

The Service estimates that 240 of 825 miles (29 percent) of sandy beach shoreline in Florida are cleaned or raked on various schedules (*i.e.*, daily, weekly, monthly) (FDEP 2008). Service biologists estimate that South Carolina mechanically cleans approximately 34 of its 187 shoreline miles (18 percent), and Texas mechanically cleans approximately 20 of its 367 shoreline miles (5.4 percent). In Louisiana, beach raking occurs on Grand Isle (the state's only inhabited island) along approximately 8 miles of shoreline, roughly 2 percent of the state's 397 sandy shoreline miles.

Tilling beaches to reduce soil compaction, as sometimes required by the Service for sea turtle protection after beach renourishment activities, also has similar impacts. Recently, the Service improved sea turtle protection provisions in Florida; these provisions now require tilling, when needed, to be above the primary wrack line, not within it.

Invasive vegetation

A recently identified threat to red knot is the spread of coastal invasive plants into suitable red knot habitat. Like most invasive species, coastal exotic plants reproduce and spread quickly and exhibit dense growth habits, often outcompeting native plant species. If left uncontrolled, invasive plants cause a habitat shift from open or sparsely vegetated sand to dense vegetation, resulting in the loss or degradation of red knot roosting habitat, which is especially important during high tides and migration periods.

Beach vitex (*Vitex rotundifolia*) is a woody vine introduced into the southeastern U.S. as a dune stabilization and ornamental plant (Westbrooks and Madsen 2006). It currently occupies a very small percentage of its potential range in the U.S.; however, it is expected to grow well in coastal communities throughout the southeastern U.S. from Virginia to Florida, and west to Texas
(Westbrooks and Madsen 2006). In 2003, the plant was documented in New Hanover, Pender, and Onslow counties in North Carolina, and at 125 sites in Horry, Georgetown, and Charleston counties in South Carolina. Beach vitex has been documented from two locations in northwest Florida, but one site disappeared after erosional storm events. The landowner of the other site has indicated an intention to eradicate the plant, but follow through is unknown. The task forces formed in North and South Carolina in 2004 and 2005 have made great strides to remove this plant from their coasts. To date, about 200 sites in North Carolina have been treated, with 200 additional sites in need of treatment. Similar efforts are underway in South Carolina.

Unquantified amounts of crowfoot grass (*Dactyloctenium aegyptium*) grow invasively along portions of the Florida coastline. It forms thick bunches or mats that may change the vegetative structure of coastal plant communities and alter shorebird habitat. The Australian pine (*Casuarina equisetifolia*) also changes the vegetative structure of the coastal community in south Florida and islands within the Bahamas. Shorebirds prefer foraging in open areas where they are able to see potential predators, and tall trees provide good perches for avian predators. Australian pines potentially impact shorebirds, including the red knot, by reducing attractiveness of foraging habitat and/or increasing avian predation.

The propensity of these exotic species to spread, and their tenacity once established, make them a persistent threat, partially countered by increasing landowner awareness and willingness to undertake eradication activities.

Aquaculture and agriculture

In some localized areas within the red knot's range, aquaculture or agricultural activities are impacting habitat quality and quantity. Those impacts, however, occur mainly in Canada, Brazil, Río Gallegos (southern Argentina), and Bahía Lomas (Chilean Tierra del Fuego). In the U.S., Luckenbach (2007) found that aquaculture of clams (*Mercenaria mercenaria*) in the lower Chesapeake Bay occurs in close proximity to shorebird foraging areas. The current distribution of clam aquaculture in the very low intertidal zone minimizes the amount of direct overlap with shorebird foraging habitats, but if clam aquaculture expands farther into the intertidal zone, more shorebird impacts (*e.g.*, habitat alteration) may occur. However, these Chesapeake Bay intertidal zones are not considered the primary habitat for red knots (Cohen et al. 2009), and red knots were not among the shorebirds observed in this study (Luckenbach 2007). Likewise, oyster aquaculture is practiced in Delaware Bay (New Jersey Department of Environmental Protection [NJDEP] 2011), but we have no information to indicate that this activity is affecting red knots.

Hunting

Since the late 19th century, hunters concerned about the future of wildlife and the outdoor tradition have made countless contributions to conservation. In many cases, managed hunting is an important tool for wildlife management. However, unregulated or illegal hunting can cause population declines, as was documented in the 1800s for red knots in the U.S. While no longer a concern in the U.S., under-regulated or illegal hunting of red knots and other shorebirds is ongoing in parts of the Caribbean and South America.

Scientific study

Considerable care is taken to minimize disturbance caused to shorebirds from these research activities. Numbers of birds per catch and total numbers caught over the season are limited, and careful handling protocols are followed, including a 3-hour limit on holding times (Niles et al. 2008; Niles et al. 2010). Despite these measures, hundreds of red knots are temporarily stressed during the course of annual research, and mortality, though rare, does occasionally occur (Taylor 1981). However, we conclude that these research activities are not a threat to the red knot because evaluations have shown no effects of these short-term stresses on red knot survival. Further, the rare, carefully documented, and properly permitted mortality of an individual bird in the course of well-founded research does not affect red knot populations or the overall subspecies.

Disease

Red knots are exposed to parasites and disease throughout their annual cycle. Susceptibility to disease may be higher when the energy demands of migration have weakened the immune system. Studying red knots in Delaware Bay in 2007, Buehler et al. (2010) found that several indices of immune function were lower in birds recovering protein after migration than in birds storing fat to fuel the next leg of the migration. These authors hypothesized that fueling birds may have an increased rate of infection or may be bolstering immune defense, or recovering birds may be immuno-compromised because of the physical strain of migratory flight or as a result of adaptive energy tradeoffs between immune function and migration, or both (Buehler et al. 2010). A number of known parasites (*e.g.*, sporozoans, hookworms, flatworms, and ectoparasites) and viruses (*e.g.*, avian influenza and avian paramyxovirus) have been documented in red knots, but we have no evidence that disease is a current threat to the red knot.

Predation

In wintering and migration areas, the most common predators of red knots are peregrine falcons (*Falco peregrinus*), harrier hawks (*Circus* spp.), accipiters (*Accipiter* spp.), merlins (*Falco columbarius*), short-eared owls (*Asio flammeus*), and greater black-backed gulls (*Larus marinus*) (Niles et al. 2008). In addition to greater black-backed gulls, other large gulls (*e.g.*, herring gulls [*Larus* spp.]) are anecdotally known to prey on shorebirds (Breese 2010). Predation by a great horned owl (*B. virginianus*) has been documented in Florida. Nearly all documented predation of wintering red knots in Florida has been by avian, not terrestrial, predators. However in migration areas like Delaware Bay, terrestrial predators such as red foxes (*V. vulpes*) and feral cats may be a threat to red knots by causing disturbance, but direct mortality from these predators may be low (Niles et al. 2008).

Raptor predation has been shown to be an important mortality factor for shorebirds at several sites (Piersma et al. 1993). However, Niles et al. (2008) concluded that increased raptor populations have not been shown to affect the size of shorebird populations. Based on studies of other red knot subspecies in the Dutch Wadden Sea, Piersma et al. (1993) concluded that the chance for an individual to be attacked and captured is small, as long as the birds remain in the open and in large flocks so that approaching raptors are likely to be detected. Although direct mortality from predation is generally considered relatively low in nonbreeding areas, predators also impact red knots by affecting habitat use and migration strategies (Stillman et al. 2005; Niles et al. 2008) and by causing disturbance, thereby potentially affecting red knots' rates of feeding and weight gain.

In wintering and migration areas, predation is not directly impacting red knot populations despite some direct mortality. At key stopover sites, however, localized predation pressures are likely to exacerbate other threats to red knot populations, such as habitat loss, food shortages, and asynchronies between the birds' stopover period and the occurrence of favorable food and weather conditions. Predation pressures worsen these threats by pushing red knots out of otherwise suitable foraging and roosting habitats, causing disturbance, and possibly causing changes to stopover duration or other aspects of the migration strategy.

Although little information is available from the breeding grounds, the long-tailed jaeger (*Stercorarius longicaudus*) is prominently mentioned as a predator of red knot chicks in most accounts. Other avian predators include parasitic jaeger (*S. parasiticus*), pomarine jaeger (*S. pomarinus*), herring gull, glaucous gull (*L. hyperboreus*), gyrfalcon (*F. rusticolus*), peregrine falcon, and snowy owl. Mammalian predators include arctic fox and sometimes arctic wolves (*Canis lupus arctos*) (COSEWIC 2007; Niles et al. 2008). Predation pressure on Arctic-nesting shorebird clutches varies widely regionally, inter-annually, and even within each nesting season, with nest losses to predators ranging from close to 0 percent to near 100 percent (Meltofte et al. 2007), depending on ecological factors. In the Arctic, 3-to 4-year lemming cycles give rise to similar cycles in the predation of shorebird nests. When lemmings are abundant, predators concentrate on the lemmings, and shorebirds breed successfully. When lemmings are in short supply, predators switch to shorebird eggs and chicks (Summers and

Underhill 1987; Blomqvist et al. 2002; Service 2003; COSEWIC 2007; Meltofte et al. 2007; Niles et al. 2008).

In addition to affecting reproductive output, these cyclic predation pressures have been shown to influence shorebird nesting chronology and distribution. Studying 12 shorebird species, including red knot, over 11 years at four sites in the eastern Canadian Arctic, Smith et al. (2010) found that both snow conditions and predator abundance have significant effects on the chronology of breeding. Higher predator abundance resulted in earlier nesting than would be predicted by snow cover alone (Smith et al. 2010). Based on the adaptations of various species to deal with predators, Larson (1960) concluded that the distribution and abundance of red knots and other Arctic-breeding shorebirds were strongly influenced by arctic fox and rodent cycles, such that birds were in low numbers or absent in areas without lemmings because foxes preyed predominately on birds in those areas (Fraser et al. 2013). Unsuccessful breeding seasons contributed to at least some of the observed reductions in the red knot population in the 2000s. However, rodent-predator cycles have always affected the productivity of Arctic-breeding shorebirds and have generally caused only minor year-to-year changes in otherwise stable populations (Niles et al. 2008).

We conclude that cyclic predation in the Arctic results in years with extremely low reproductive output, but this does not threaten the red knot. The cyclical nature of this predation on shorebirds is a situation that has probably occurred over many centuries, and under historic conditions likely had no lasting impact on red knot populations. Where and when rodent-predator cycles are operating, we expect red knot reproductive success will also be cyclic. However, these cycles are being interrupted for reasons that are not yet fully clear. The geographic extent and duration of future interruptions to the cycles cannot be forecasted, but may intensify as the arctic climate changes. Disruptions in the rodent-predator cycle pose a substantial threat to red knot populations, as they may result in prolonged periods of very low reproductive output. Superimposed on these potential cycle disruptions are warming temperatures and changing vegetative conditions in the Arctic, which are likely to bring about additional changes in the predation pressures faced by red knots on the breeding grounds.

Human disturbance

In some wintering and stopover areas, red knots and recreational users (*e.g.*, pedestrians, offroad vehicles, dog walkers, boaters) are concentrated on the same beaches (Niles et al. 2008; Tarr 2008). Recreational activities affect red knots both directly and indirectly. These activities can cause habitat damage (Anders and Leatherman 1987; Schlacher and Thompson 2008), cause shorebirds to abandon otherwise preferred habitats, negatively affect the birds' energy balances, and reduce the amount of available prey. In Florida, the most immediate and tangible threat to migrating and wintering red knots is chronic disturbance (Niles et al. 2006, 2008), which may affect the ability of birds to maintain adequate weights in some areas (Niles 2009).

Effects to red knots from vehicle and pedestrian disturbance can also occur during construction of shoreline stabilization projects including beach renourishment. Red knots can also be disturbed by motorized and non-motorized boats, fishing, kite surfing, aircraft, and research activities (Burger 1986; Meyer et al. 1999; Harrington 2005b; Peters and Otis 2007; Niles et al. 2008) and by beach raking. In Delaware Bay, red knots could also potentially be disturbed by hand-harvest of horseshoe crabs during the spring migration stopover period, but under the current management of this fishery, State waters from New Jersey to coastal Virginia are closed to horseshoe crab harvest and landing from January 1 to June 7 each year (ASMFC 2012); thus, disturbance from horseshoe crab harvest is no longer occurring. Active management can be effective at reducing and minimizing the adverse effects of recreational disturbance (Burger et al. 2004; Forys 2011), but such management is not occurring throughout the red knot's range.

Red knots are exposed to disturbance from recreational and other human activities throughout their nonbreeding range. Excessive disturbance has been shown to preclude shorebird use of otherwise preferred habitats and can impact energy budgets. Both of these effects are likely to exacerbate other threats to the red knot, such as habitat loss, reduced food availability, asynchronies in the annual cycle, and competition with gulls (such competition is greater in Delaware Bay when foraging on horseshoe crab eggs; in other areas, the two species' diets do not tend to overlap).

<u>Harmful algal blooms</u>

A harmful algal bloom (HAB) is the proliferation of a toxic or nuisance algal species (which can be microscopic or macroscopic, such as seaweed) that negatively affects natural resources or humans (Florida Fish and Wildlife Conservation Commission [FWC] 2011b). The primary groups of microscopic species that form HABs are flagellates (including dinoflagellates), diatoms, and blue green algae (which are actually cyanobacteria, rather than true algae). Of the approximately 85 HAB-forming species currently documented, almost all of them are plant-like microalgae that require light and carbon dioxide to produce their own food using chlorophyll (FWC 2011b). Blooms can appear green, brown, or red-orange, or may be colorless, depending upon the species blooming and environmental conditions. Although HABs are popularly called "red tides," this name can be misleading, as it includes many blooms that discolor the water but cause no harm, while also excluding blooms of highly toxic cells that cause problems at low (and essentially invisible) concentrations (Woods Hole 2012). In this document, the term "red tide" refers only to blooms of the dinoflagellate *Karenia brevis*.

For shorebirds, shellfish are a key route of exposure to algal toxins. When toxic algae are filtered from the water as food by shellfish, their toxins accumulate in those shellfish to levels that can be lethal to animals that eat the shellfish (Anderson 2007). Several shellfish poisoning syndromes have been identified according to their symptoms. Those shellfish poisoning syndromes that occur prominently within the range of the red knot include: Amnesic Shellfish Poisoning, occurring in Atlantic Canada, caused by *Pseudo-nitzchia* spp.; Neurotoxic Shellfish Poisoning (also called "red tide"), occurring on the U.S. coast from Texas to North Carolina, caused by *K. brevis* and other species; and Paralytic Shellfish Poisoning (PSP), occurring in Atlantic Canada, the U.S. coast in New England, Argentina, and Tierra del Fuego, caused by *Alexandrium* spp. and others (Food and Agriculture Organization of the United Nations [FAO] 2004; Woods Hole 2012). The highest levels of PSP toxins have been recorded in shellfish from Tierra del Fuego (International Atomic Energy Agency 2004), and high levels can persist in mollusks for months following a PSP bloom (FAO 2004). In Florida, the St. Johns, St. Lucie, and Caloosahatchee Rivers and estuaries have also been affected by persistent HABs of cyanobacteria (FWC 2011b).

Algal toxins may be a direct cause of death in seabirds and shorebirds via an acute or lethal exposure, or birds can be exposed to chronic, sub-lethal levels of a toxin over the course of an extended bloom. Sub-acute doses may contribute to mortality due to an impaired ability to forage productively, disrupted migration behavior, reduced nesting success, or increased vulnerability to predation, dehydration, disease, or injury (VanDeventer 2007). It is commonly believed that the primary risk to shorebirds during an HAB is via contamination of shellfish and other invertebrates that constitute their normal diet. Coquina clams and other items that shorebirds feed upon can accumulate marine toxins during HABs and may pose a risk to foraging shorebirds. In addition to consuming toxins via their normal prey items, shorebirds have been observed consuming dead fish killed by HABs (VanDeventer 2007). Brevetoxins were found both in the dead fish and in the livers of dead shorebirds that were collected from beaches and rehabilitation centers (VanDeventer et al. 2011). Although scavenging has not been documented in red knots, clams and other red knot prey species are among the organisms that accumulate algal toxins.

Sick or dying birds often seek shelter in dense vegetation; thus, those that succumb to HAB exposure are not often observed or documented. Birds that are debilitated or die in exposed areas are subject to predation or may be swept away in tidal areas. When extensive fish kills occur from HABs, the carcasses of smaller birds such as shorebirds may go undetected. Some areas affected by HABs are remote and rarely visited. Thus, mortality of shorebirds associated with HABs is likely underreported.

To date, direct impacts to red knots from HABs have been documented only in Texas, although a large die-off in Uruguay may have also been linked to an HAB. We conclude that some level of undocumented red knot mortality from HABs likely occurs most years, based on probable underreporting of shorebird mortalities from HABs and the direct exposure of red knots to algal toxins (particularly via contaminated prey) throughout the knot's nonbreeding range. We have no documented evidence that HABs were a driving factor in red knot population declines in the 2000s. However, HAB frequency and duration have increased and do not show signs of abating over the next few decades. Combined with other threats, ongoing and possibly increasing mortality from HABs may affect the red knot at the population level.

Environmental contaminants

Although red knots are exposed to a variety of contaminants across their nonbreeding range, we have no evidence that such exposure is impacting health, survival, or reproduction at the subspecies level. Exposure risks exist in localized red knot habitats in Canada, but best available data suggest shorebirds in Canada are not impacted by background levels of contamination. Levels of most metals in red knot feathers from the Delaware Bay have been somewhat high, but generally similar to levels reported from other studies of shorebirds. One preliminary study suggests organochlorines and trace metals are not elevated in Delaware Bay shorebirds, although this finding cannot be confirmed without updated testing. Levels of metals in horseshoe crabs are generally low in the Delaware Bay region and not likely impacting red knots or recovery of the crab population.

Horseshoe crab reproduction does not appear impacted by the mosquito control chemical methoprene (at least through the first juvenile molt) or by ambient water quality in mid-Atlantic estuaries. Shorebirds have been impacted by pesticide exposure, but use of the specific chemical that caused a piping plover death in Florida has subsequently been banned in the U.S. Exposure of shorebirds to agricultural pollutants in rice fields may occur regionally in parts of South America, but red knot usage of rice field habitats was low in the several countries surveyed. Finally, localized urban pollution has been shown to impact South American red knot habitats, but we are unaware of any documented health effects or population-level impacts. Thus, we conclude that environmental contaminants are not a threat to the red knot.

Oil spills

The red knot has the potential to be exposed to oil spills and leaks throughout its migration and wintering range. Oil, as well as spill response activities, can directly and indirectly affect both the bird and its habitat through several pathways. Red knots can be exposed to petroleum products via spills from shipping vessels, leaks or spills from offshore oil rigs or undersea pipelines, leaks or spills from onshore facilities such as petroleum refineries and petrochemical plants, and beach-stranded barrels and containers that can fall from moving cargo ships or offshore rigs. Several key red knot wintering or stopover areas also contain large-scale petroleum extraction, transportation, or both activities. With regard to potential effects on red knot habitats, the geographic location of a spill, weather conditions (*e.g.*, prevailing winds), and type of oil spilled are as important, if not more so, than the volume of the discharge.

Red knots are exposed to large-scale petroleum extraction and transportation operations in many key wintering and stopover habitats including Tierra del Fuego, Patagonia, the Gulf of Mexico, Delaware Bay, and the Gulf of St. Lawrence. To date, the documented effects to red knots from oil spills and leaks have been minimal; however, information regarding any oiling of red knots during the Deepwater Horizon spill has not yet been released. We conclude that high potential exists for small or medium spills to impact moderate numbers of red knots or their habitats, such that one or more such events is likely over the next few decades, based on the proximity of key red knot habitats to high-volume oil operations. Risk of a spill may decrease with improved spill contingency planning, infrastructure safety upgrades, and improved spill response and recovery methods. However, these decreases in risk (*e.g.*, per barrel extracted or transported) could be offset if the total volume of petroleum extraction and transport continues to grow. A major spill affecting habitats in a key red knot concentration area (*e.g.*, Tierra del Fuego, Gulf coasts of Florida or Texas, Delaware Bay, Mingan Archipelago) while knots are present is less likely, but would be expected to cause population-level impacts.

Wind energy development

Within the red knot's U.S. wintering and migration range, substantial development of offshore wind facilities is planned, and the number of wind turbines installed on land has increased considerably over the past decade. The rate of wind energy development will likely continue to increase into the future as the U.S. looks to decrease reliance on the traditional sources of energy (*e.g.,* fossil fuels). Wind turbines can have a direct (*e.g.,* collision mortality) and indirect (*e.g.,* migration disruption, displacement from habitat) impact on shorebirds. We have no information on wind energy development trends in other countries, but risks of red knot collisions would likely be similar wherever large numbers of turbines are constructed along migratory pathways, either on land or offshore.

We analyzed shorebird mortality at land-based wind turbines in the U.S., and we considered the red knot's vulnerability factors for collisions with offshore wind turbines that we expect will be built in the next few decades. Based on our analysis of wind energy development in the U.S., we expect ongoing improvements in turbine siting, design, and operation will help minimize bird collision hazards. However, we also expect cumulative avian collision mortality to increase through 2030 as the number of turbines continues to grow, and as wind energy development expands into coastal and offshore environments. Shorebirds as a group have constituted only a small percentage of collisions with U.S. turbines in studies conducted to date, but wind development along the coasts (where shorebirds might be at greater risk) did not begin until 2005.

We are not aware of any documented red knot mortalities at any wind turbines to date, but low levels of red knot mortality from turbine collisions may be occurring now based on the number of turbines along the red knot's migratory routes and the frequency with which red knots traverse these corridors. Based on the current number and geographic distribution of turbines, if any such mortality is occurring, it is likely not causing subspecies-level effects. However, as build-out of offshore, coastal, and inland wind energy infrastructure progresses, increasing mortality from turbine collisions may contribute to a subspecies-level effect due to the red knot's vulnerability to direct human-caused mortality. We anticipate that the threat to red knots from wind turbines will be primarily related to collision or behavioral changes during migratory or daily flights. Unless facilities are constructed at key stopover or wintering habitats, we do not expect wind energy development to cause significant direct habitat loss or degradation, or displacement of red knots from otherwise suitable habitats.

Threats summary

The Service has assessed the best scientific and commercial data available regarding past, present, and future threats to the red knot. The primary threats to the red knot are from habitat loss and degradation due to sea level rise, shoreline stabilization, and Arctic warming; and reduced food availability and asynchronies in the annual cycle. Other threats are moderate in comparison to the primary threats; however, cumulatively, they could become significant when working in concert with the primary threats if they further reduce the species' resiliency. Such secondary threats include hunting, predation, human disturbance, harmful algal blooms, oil spills, and wind energy development, all of which affect red knots across their range. Although conservation efforts (*e.g.*, management of the horseshoe crab population and regulatory mechanisms for the species and its habitat) are being implemented in many areas of the red knot's range and reduce some threats, significant risks to the subspecies remain.

ENVIRONMENTAL BASELINE

The sandy beaches of Anna Maria Island and Longboat Key are characteristic of low energy shorelines, having a relatively gentle, shallow offshore slope. Currently, narrow low dunes are generally present throughout the length of the islands, interrupted in some places by seawalls. Within the action area, the beach and vegetated dune habitat is limited in places due to the development of the shoreline and ongoing erosion. Beach and dune habitat varies in width, in part related to past renourishment projects. Coquina Beach Park, located in the City of Bradenton Beach at the south end of Anna Maria Island, has dune habitat ranging up to 250 feet in width. Beaches along the southern shoreline of the park are, in part, stabilized by the jetty on the north side of Longboat Pass. This 96-acre beach and park system includes areas for picnicking, grilling, bath houses with restroom facilities, a playground, lifeguard stations and recreation areas. North of the park, little or no dunes remain between the Gulf beaches and development, which mainly consists of private residences and beach resorts. On the north end of Longboat Key, Beer Can Island (now contiguous with Longboat Key) remains undeveloped, but has suffered intense erosion; about a quarter mile of Gulf beach remains. Further south within the action area, beach and dune widths range from near zero at armored shoreline protecting development to over 500 feet along portions of Whitney Beach. Aside from the extreme north end, the Longboat Key portion of the action area is bordered primarily by residential development (private homes, condominiums, or time shares).

Other projects on Anna Maria Island and Longboat Key overlap the Longboat Pass Project action area. All of the Anna Maria Island portion of the action area and much of the Longboat Key portion of the action area were renourished in 2014. Recent, ongoing, and anticipated future projects that occur within the action area were summarized by CBI (2015). These included the completed Coquina Beach Restoration Project (SAJ-2000-03874), the federal (Corps) Manatee County Beach Renourishment Project (125429), the ongoing Cortez Groins Replacement Project (SAJ-2013-01353), the North End Stabilization Structures (SAJ-2012-01018), and the Longboat Key (Island Wide) Renourishment Project (SAJ-2009-03350). An additional project, not referenced, is the West Coast Inland Navigation District's Longboat Pass Flood Shoal Project (SAJ-2011-02907).

On Anna Maria Island, the Cortez Groins Replacement Project (R-33 to R-36) is currently under construction and is anticipated to be completed by December 2015. The Coquina Beach Restoration Project (R-33 to R-40.5+220) and Manatee County Beach Renourishment Project (R-12 to R-36) were completed in 2014. The next federal Beach Renourishment Project on Anna Maria Island is expected to be constructed sometime between 2022 and 2024, barring storm impacts. The Longboat Key North End Stabilization Structures (R-42 to R-45), consisting of two semi-permeable groins, are complete, with sand being placed around the groins to provide additional stabilization. The Longboat Key Renourishment

Project will allow for renourishment of eroded areas as-needed along the length of the island through 2023. Longboat Pass Flood Shoal Project in 2014 deposited sand on Longboat Key from R-44 to R-48. Future work under this permit may deposit sand on both the southern beaches of Anna Maria Island (R-36 to R-41) and northern beaches of Longboat Key.

Status of the red knot within the action area

Red knots are typically most abundant in the action area from November through April, but are often present mid-July through early May. Summering birds are rarely encountered. Lack of regular historical surveys, apparent fluctuations in use by red knots from year to year, and inability at times to distinguish migrating birds (generally passing through July to October and March to May) from those that are over-wintering, make it difficult to estimate the number of red knots using the action area.

CBI (2015) summarized reports of red knots within the action area. They provided two occurrences from 2009 to 2015 between R-30 to R-41+305 on Anna Maria Island. Records available to the Service include two additional reports in that area since 2007. The highest reported count was 20 individuals. CBI also provided 20 occurrences of red knot since 2004 from R-43.5 to R-50.5 on Longboat Key. In 12 cases reports were of 50 individuals or more, with a high count of 432.

Sauers (2015) provided the Town with a summary of red knots and piping plover he encountered during bird surveys in 2005 to 2007, 2010, 2011, and 2014, in various seasons and over various reaches of the Longboat Key shoreline. Surveys were often conducted during the bird nesting season (spring and summer). Separately, Sauers reported a group of 538 red knots just south of the action area during a survey of all Longboat Key Gulf beaches conducted on February 10, 2015. Reports by Sauers and CBI indicate that the Whitney Beach area, centered at approximately R-46, has regularly supported high numbers of red knot. Dates when high numbers of red knots were reported suggest that while Longboat Key often supports relatively large numbers of wintering red knots, use by migratory knots (spring and fall) is more modest. Even in winter, there appears considerable variability in numbers of red knots from year to year and within year, from month to month.

Conservation significance

Estimates of the wintering red knot populations in the southeastern U.S. vary greatly (see Population Dynamics above). Recent sightings on Longboat Key suggest that, at least on occasion, 5 percent of the southeastern U.S. wintering population of the red knots may be present, many using the action area of the Longboat Pass Project. There is little indication that Longboat Key receives a significant influx or migratory red knots in spring or fall, or is an important stopover site for migrants. Unlike Longboat Key and northern portions Anna Maria Island, southern portions of the Anna Maria Island appear to support relatively few red knots. Reasons for the discrepancy are not obvious. Three of the four reports within the action area on Anna Maria Island were from winter.

Factors affecting the red knot within the action area

Gulf beaches of Anna Maria Island and Longboat Key within the action area are mostly developed with private residences and beach resorts, and, where not developed, support significant human recreation. Beach width and profile at any one location and time is dependent on past beach renourishment projects, localized rates of erosion or accretion, season, and recent storms.

Like beach width and profile, the extent and quality of red knot feeding and roosting habitat within the action area varies over location and time. Beach renourishment temporarily creates wider beaches seaward of existing development, often augmenting the extent of usable red knot habitat where the beach had been lost due to erosion. Beach renourishment projects can also degrade habitat by smothering benthic invertebrates upon which the red knots feed, altering the natural sediment composition, and adversely modifying the beach profile. The effects of beach renourishment projects to red knot habitat, both beneficial and detrimental, are typically temporary and relatively short in duration. However, if beach renourishment is carried out frequently in an area, impacts become intermittent and the cumulative impacts on red knot habitat over time are more substantial.

Within the action area, low elevations and proximity to the Gulf make red knot foraging and roosting habitats vulnerable to the effects of rising sea-level. Inundation of red knot habitat by rising seas can lead to permanent loss or modification of habitat waterward of structures, roads, and armored shoreline. Natural overwash and barrier island migration with sea-level rise are impeded by development, which prevents sand on Gulf-facing beaches from washing east over the island and to the bay side. Without additional sand, bayside flats and shorelines often used by red knots become increasingly submerged with rising sea levels.

Coastal development brings an increase in humans and sources of disturbance that may limit red knot use of beaches. Chronic disturbance has been singled out as the greatest threat to migrating and wintering red knots on the Gulf Coast of Florida (Niles et al. 2006). Within the action area on Anna Maria Island and Longboat Key, recreational use of beaches, beach raking or cleaning that occurs in some locations, and vehicle use contribute to disturbance that red knots face while feeding or roosting.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on migrating and wintering red knots within the action area. The analysis includes effects of interrelated and interdependent activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed action. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The Longboat Pass Project may include dredging and beach renourishment events occurring year-round within habitat that is used by migrating and wintering red knots. Effects of the action may include: disturbance of feeding and roosting red knots in the construction area due to human and equipment presence, noise, vehicle movement, sand placement, contouring, and subsequent tilling as may be required under the 2015-SPBO; burying of intertidal benthic invertebrates resulting in loss of organisms on which the red knots feed; removal of wrack that red knots use for foraging and roosting; modification of beach habitat through changes to sediment composition and beach profile; and, increased recreational disturbance resulting from presence of enhanced, nourished beaches. These effects may hinder the ability of wintering red knots to recuperate from the migratory flight from their breeding grounds, survive through the winter, build fat reserves in preparation for migration back to the Arctic breeding grounds, and once there to reproduce successfully. Channel dredging may affect dynamics of Longboat Pass and adjacent beaches, including the formation of spits, shoals, and sandbars that could be used by the red knot.

Proximity of the action

Construction would occur within and adjacent to habitat used by red knots for foraging and roosting.

Distribution

Beach renourishment events and resulting impacts would occur on Gulf beaches of Anna Maria Island and Longboat Key. Dredging could affect development of shoals and sandbars associated with the flood and ebb tide deltas of Longboat Pass.

Timing

Beach renourishment activities could directly impact red knots at any time of year, with the possible exception of June when red knots are rarely present. Greatest potential for direct impacts would occur from project construction November through February when the maximum number of wintering red knots is usually present.

Nature of the effect

The effects of beach renourishment activities may change the feeding and roosting behavior of red knots in the action area; temporarily reduce foraging habitat; force them to seek alternate, potentially inferior habitat; and, diminish their fitness, affecting survival and fecundity.

Duration

Individual beach renourishment events are expected to take from up to 3 to 5 months to complete. While some direct effects from construction would be of relatively short duration, recovery of the intertidal benthic invertebrate community typically takes 6 months to 2 years to recover (Peterson *et al.* 2006). Changes in habitat, including sediment composition and beach profile, in some instances may last for years, potentially impacting red knots over multiple migration and wintering seasons.

Disturbance frequency

Over the proposed 15-year permit for the Longboat Pass Project, the Anna Maria Island and Longboat Key shoreline may be subject to multiple beach renourishment events. Dredging is expected to occur every 4 to 8 years. Other projects, including the Longboat Pass Flood Shoal Project, could place material on the same beaches. Since effects of a single event may last multiple years, some reaches could experience impacts from repeated disturbance over a significant portion of the permit life.

Disturbance intensity and severity

Intensity and severity of disturbance will be dependent on the number, location, and extent of renourishment events within the action area over time. Some beach renourishment events may be limited to highly eroded beaches that support less than optimal feeding or roosting habitat. Since red knots are considered fairly mobile when wintering and more so when migrating, availability of quality alternative habitat on undisturbed shorelines within or outside of the action area may be significant. Conservation measures have been incorporated into the project to minimize impacts and monitor red knot use of the action area.

Analyses for effects of the action

Beneficial effects

Beneficial effects are wholly positive without any adverse effects. The Longboat Pass Project is designed to use compatible sand to widen eroding beaches, which at times will provide more roosting habitat for the red knot. Deposited sand will be reworked and redistributed through wind and wave action, and storm events. Natural processes working on the added sand may serve to maintain or enhance habitat features suitable for the red knot.

Direct effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Implementation of the Longboat Pass Project is not likely to directly kill red knots since the birds are highly mobile and can quickly move from areas of construction. Heavy machinery and equipment operating within the action area, potential placement of the dredge pipeline along the shoreline, sand placement, and subsequent grading and tilling may directly affect migrating and wintering red knots in the action area through disruption of foraging and roosting. The proposed permit would allow for multiple beach renourishment events. Construction windows may extend through one red knot wintering season and one or more migration seasons. While a renourishment event may last up to 5 months, any one location will see active sand placement and grading for a shorter duration.

Sand placement will result in burial and suffocation of intertidal benthic invertebrate prey of the red knot and loss of wrack. Time frames projected for benthic invertebrate recruitment and re-establishment following sand placement are from 6 months to 2 years, assuming sand used for renourishment and the resulting beach profile is supportive of benthic invertebrates. Wrack will be restored over time as it is deposited on the beach by tides and wave action.

Disturbance and habitat alteration from construction activities may result in increased energy expenditure by red knots and reduced food availability. This in turn can contribute to decreased fitness, decreased survival rates, and decreased fecundity in the following breeding season.

Indirect effects

Indirect effects are those that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Beach renourishment restores eroded beaches, making them increasingly attractive for human recreation. Recreational uses including swimming, sports activities, sunbathing, picnicking, and walking may adversely affect the red knot through disturbance. In Florida, the most immediate and tangible threat to migrating and wintering red knots is likely chronic disturbance while feeding and resting. Long-term effects could include decrease in red knot use of desirable habitat due to increased human disturbance (Niles et al. 2006). Conservation measures proposed by the County and Town, including education regarding effects of disturbance on shorebirds, will help to reduce impacts of human disturbance. There is potential for channel dredging and renourishment to affect inlet and shoreline dynamics, though it appears uncertain whether significant positive or negative effects to red knot habitat would occur.

Species response to the proposed action

The proposed project will occur in habitat used by migrating and wintering red knots almost year-round. Construction is likely to occur when red knots are utilizing these beaches. During construction work red knots are likely to avoid or be flushed from foraging and roosting habitat. Habitat impacts resulting from beach renourishment may discourage red knots from using nourished beaches until food resources return. Increased human recreational use of nourished beaches may disturb red knots and discourage their use of otherwise favorable habitat.

It is unknown how far migrating and wintering red knots may be displaced due to disturbance or reduced food resources. Variability of red knot presence on Anna Maria Island and Longboat Key from year to year and within the winter season suggests use of alternate sites by wintering birds. Beyond the action area, the Gulf beaches further north on Anna Maria Island and further south on Longboat Key are regularly used by red knots. However, these beaches may also be impacted at times by beach renourishment projects and human recreational disturbance, or may otherwise provide less than favorable habitat. Bayside locations may also provide alternative habitat, including feeding habitat at low tides on intertidal flats. Migrating red knots passing south or north along the Gulf Coast may continue through the project area and choose alternate locations to feed or rest.

Cumulative effects

Cumulative effects include the effects of State, tribal, local, or private actions that are reasonably certain to occur in the action area. The Anna Maria Island and Longboat Key coastline is already extensively developed; however, it is reasonable to expect continued private development and redevelopment along these beaches. Given the available information concerning the effects of global climate change and the rate of sea level rise, it is reasonable to expect more frequent beach renourishment and shoreline stabilization projects along developed shorelines present in the action area. While some may have no federal nexus, we have identified no specific actions that meet the cumulative effects criteria.

CONCLUSION

The survival and recovery of the red knot is fundamentally dependent on the continued availability of sufficient appropriate habitat in their coastal migration and wintering ranges, where the species spends more than two-thirds of its annual cycle. The approximately 3.4 miles of Gulf beaches within the action area represent a small fraction (much less than 1 percent) of migratory and wintering habitat used by the red knot. Implementation of the Longboat Pass Project is not likely to directly kill any red knots since they are highly mobile and can move out of harm's way. Construction disturbance would alter normal red knot foraging and roosting behavior and result in increased energy expenditure by individuals at or near active construction areas. Most effects (both beneficial and detrimental) to migrating and wintering red knot habitat would be temporary and would affect only a portion of the action area at any one time during the course of the 15-year permit. Both construction disturbance, the temporary reduction of red knot feeding and roosting habitat (including the elimination of wrack), may affect survival, fitness, and fecundity of some red knots. Some wintering red knots will likely be displaced by disturbance or choose to relocate due to reduced food resources following renourishment events. Red knots may seek out alternate coastal habitat within, near, or far from the action area. Increased human recreational use and accompanying disturbance may follow renourishment events. Conservation measures pursued by the County and by the Town will help reduce the potential impacts of the Longboat Pass Project to red knot populations, especially those impacts attributable to human disturbance. After reviewing the environmental baseline for the action area, the effects of the project, and the cumulative effects, it is the Service's Biological Opinion that implementation of the Longboat Pass Project, as proposed, is not likely to significantly affect the survival and recovery of the red knot and will, therefore, not jeopardize the continued existence of the species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the T&Cs of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the T&Cs, or (2) fails to adhere to the T&Cs of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or applicant must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or extent of take

Disturbance to the red knot resulting from construction and associated impacts to habitat will affect the ability of an undetermined number of red knots to find suitable foraging and roosting habitat during any given time over the life of the permit and potentially for some time thereafter. It is difficult for the Service to predict the number of red knots what would be migrating through or wintering in the action area at any particular time. The frequency or of beach renourishment that will occur at any one location under the proposed 15-year permit is also difficult to predict.

Incidental take of red knots will be difficult to detect for the following reasons:

1. The number of red knots present within the action area and that may be impacted by the project will be difficult to assess. Wintering red knot numbers vary from year to year and within years. Migrating red knot numbers are difficult to monitor since their presence is transitory and their occurrence overlaps with that of wintering birds, from which they cannot generally be differentiated.

2. Over-wintering survival will be difficult to determine because it is difficult to detect birds that do not survive. During winter, movements of red knots present likely take them well beyond the action area. Dead birds may be carried away by predators. If a carcass is found, cause of mortality may be difficult to determine. Survival rates could be impacted by a number of non-project related factors.

3. Harassment to the level of harm may only be apparent away from the action area, in migration or on the breeding grounds as lowered survival, or resulting in reduced fitness and fecundity. All would be difficult to detect because of our inability to track individual birds from their wintering grounds to their breeding grounds.

The Service anticipates that directly or indirectly an unspecified number of red knots will be taken in the form of harm or harassment as the result of the proposed action because:

1. Red knots are known to migrate through and winter in the action area.

2. The placement of sand and associated actions will disturb red knots that are present and will temporarily degrade up to approximately 3.4 miles of red knot feeding and roosting habitat over multiple migrating and wintering seasons, until all beach renourishment is complete and until intertidal benthic invertebrate populations recover.

3. Disturbance (harassment), and loss and degradation of foraging and roosting habitat, will result in decreased fitness and survival (injury via habitat modification) of migrating or wintering red knots during the non-breeding season.

4. Disturbance, and loss and degradation of foraging and roosting habitat will result in decreased fitness, survival, and fecundity of red knots during the subsequent Arctic breeding season.

The following surrogate for take of red knots can be utilized because disturbance, and degradation of suitable habitat on Gulf beaches of Anna Maria Island and Longboat Key would affect the ability of an unknown number of red knots to find foraging and roosting habitat throughout the migrating and wintering periods for the duration of Longboat Pass Project and until intertidal benthic invertebrate populations recover. The Service anticipates that, directly and indirectly, red knots using approximately 3.4 miles of Gulf beaches on Anna Maria Island and Longboat Key will be taken in the form of harm or harassment as a result of the proposed action.

Effect of Take

In the accompanying Biological Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the red knot.

REASONABLE AND PRUDENT MEASURES

The Service believes the following RPMs are necessary and appropriate to monitor and minimize take of red knots during implementation of the Longboat Pass Project. Note that some RPMs and implementing T&Cs that follow may be similar or identical to those in the 2015-SPBO or the P^{3}BO.

1. Conservation measures agreed to by the County and Town shall be implemented as part of the Longboat Pass Project.

2. All derelict material or other debris shall be removed from the beach prior to any sand placement.

3. All sand placed on the beach or in the nearshore shall be compatible with the existing beach and will maintain the general character and functionality of the existing beach.

4. Measures shall be taken on and near the site of active beach renourishment events to protect red knots and their habitats from construction activities.

5. A meeting or conference call among appropriate agencies and parties shall be held prior to initiation of construction for any beach renourishment events authorized by this permit.

6. For one year prior and two years following a renourishment event, red knot and all other shorebird occurrence will be monitored in the relevant portion of the action area and summarized annually in the form of a report to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following T&Cs, which implement the RPMs, described above and outline reporting/monitoring requirements. These T&Cs are nondiscretionary.

1. Conservation measures cited by the County in CBI's June 1, 2015, submittal and in the Town's May 12, 2015, "Conservation Measures for Shorebirds" document shall be implemented as stated, unless revised by the RPMs and Terms and Conditions below. These measures shall be incorporated as a requirement of any permit issued by the Corps for the Longboat Pass Project.

2. Monitoring and reporting of non-breeding shorebirds proposed as conservation measures by the County and Town will be consistent with protocols and data sheet formats developed for the FWC non-breeding shorebird database and will be provided to the Service annually by July 31 (to JAXREGS@fws.gov). Once online entry is available, all shorebird survey data will also be entered to the FWC on line database by the applicants.

3. All derelict concrete, metal, and coastal armoring geotextile material, and other debris shall be removed from the beach to the maximum extent possible prior to any sand placement.

4. Beach-compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that

maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection Rule 62B-412.007(2)(j).. If a variance is requested from FDEP, the Service must be contacted to discuss whether the variance is acceptable. A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

5. Red knot habitat adjacent to or outside of construction areas shall be avoided to the maximum extent practicable when staging and storing equipment, establishing access and travel corridors, and aligning pipeline.

6. Driving on the beach for construction shall be limited to the minimum necessary and, if outside the immediate beach renourishment area (for example where beach access must be located away from the active beach renourishment site), shall be within designated travel corridors established just above or just below the primary wrack line.

7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for project construction, to minimize the potential for attracting predators of red knots and other shorebirds. Workers shall be briefed on the importance of not littering and keeping the action area trash and debris free.

8. A meeting between representatives of the Service, FWC, Corps, County and/or Town, contractor, the permitted shorebird surveyor, and other species surveyors as appropriate, shall be held prior to the commencement of construction for beach renourishment events authorized by this permit. A conference call may be held instead of a meeting if agreed to by all parties. Notification of the meeting shall occur at least 10 business days prior to its occurrence. At the meeting the County and/or Town shall confirm: 1) the project location (including the FDEP Range Monuments and latitude and longitude coordinates); 2) project details including linear feet of beach that will be affected, actual fill template, and access routes; 3) anticipated date of commencement and anticipated duration of construction; and, 4) names and qualifications of personnel involved in shorebird surveys.

9. In addition to T&C 2. above, for one year prior and two years following a renourishment event, red knot and all other shorebird occurrence will be monitored in the relevant portion of the action area and summarized in the form of a report to the Service. The County or Town (depending on the renourishment location) shall submit (to JAXREGS@fws.gov), by July 31 of each year (or by another date agreed to by the Service), a report for previous non-breeding shorebird season (through May 15) that that is specific to the action area. The report shall include shorebird survey data for the action area, and discuss the location of any identified feeding or roosting area of importance and any significant sources of disturbance to red knots or other shorebirds that was observed. A final report covering the second year of post-construction shorebird monitoring shall address any discernable trends in pre-construction, during construction, and post-construction beach use by feeding and roosting red knots; any apparent effects attributable to the beach nourishment event; and any conclusions reached regarding red knot distribution and abundance in the action area.

10. Upon locating injured, sick, or dead red knot, initial notification should be made to FWC Wildlife Alert at 1-888-404-FWCC (3922) and the Service's North Florida Ecological Services Field Office at 904-731-3336. Care shall be taken in handling injured red knots to ensure effective treatment or care, and in handling dead specimens to preserve biological materials in the best possible state for potential analysis into cause of death.

COORDINATION OF INCIDENTAL TAKE STATEMENT WITH THE MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA), as amended (16 U.S.C. 703 et. seq.) implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA, it is unlawful "by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

All sand placement events have the potential to impact nesting shorebirds protected under the MBTA (16 U.S.C. 701 et seq.). In order to comply with the MBTA and address the potential for the project to impact nesting shorebirds, the Town shall comply with the FWC standard shorebird protection guidelines to protect against impacts to nesting shorebirds during implementation of the project.

The Service will not refer the incidental take of red knots associated with this Project for prosecution under the MBTA, as amended (16 U.S.C. 703-712), if such take is in compliance with the Terms and Conditions specified here.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Corps, in conjunction with Manatee County, the Town of Longboat Key, and the West Coast Inland Navigation District, should coordinate renourishment of beaches near Longboat Pass to minimize frequency of renourishment events on any one beach.

2. The Corps should work with the Service to improve monitoring and reporting compliance on beach renourishment projects.

3. The Corps should work with the Service, FWC, local partners, and applicants to reduce human disturbance to red knots (e.g., placing symbolic fencing around important feeding or roosting areas, arranging for bird stewards where high human use and important feeding or roosting habitat overlaps, encouraging enactment and enforcement of dog regulations, providing outreach materials regarding red knots and beach habitat, erecting appropriate signage at beach access points).

4. The Corps should work with the Service and the FWC to develop best management practices for beach renourishment projects to benefit the red knot, piping plover, and other declining shorebird species. Where appropriate, projects could include the creation of habitat features such as ephemeral tide pools, irregular shorelines, and extended intertidal flats to enhance feeding and roosting habitats. Such features would prove most beneficial if provided near inlets and passes.

5. The Corps should discourage dredging of sand spits, submerged and emergent shoals, and sandbars whenever possible to maintain natural inlet and beach dynamics that support shorebird habitat. These features provide excellent foraging and roosting habitat for migrating and wintering red knots.

6. The Corps should support scientific study of the effects of beach renourishment on intertidal benthic invertebrate prey upon which the red knot depends.

In order for the Service to keep informed of actions minimizing or avoiding adverse effects, or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if:

1. The amount or extent of incidental take is exceeded;

2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Biological Opinion;

3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Biological Opinion; or,

4. A new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the effort to protect fish and wildlife resources. Should you have questions regarding this Biological Opinion or require clarification, please contact Peter Plage at 904-371-3085 or peter_plage@fws.gov.

Sincerely,

for Jay B. Herrington
Field Supervisor

cc: Corps, Tampa (M. Peterson)
FWS, Vero Beach (J. Howe)
FWS, Tallahassee Florida (J. Ziewitz)
FWC, Lakeland (N. Douglas)

LITERATURE CITED

Anders, F.J. and S.P. Leatherman. 1987. Disturbance of beach sediment by off-road vehicles. Environmental Geology and Water Sciences 9:183-189.

Anderson, D.M. 2007. The ecology and oceanography of harmful algal blooms: Multidisciplinary approaches to research and management. IOC Technical Series 74. United Nations Educational, Scientific and Cultural Organization, Paris, available athttp://unesdoc.unesco.org/images/0016/001631/163114e.pdf.

Andres, B.A. 2009. Analysis of shorebird population trend datasets. Unpublished report by the U.S. Fish and Wildlife Service; Denver, Colorado.

Antas, P.T.Z. and I.L.S. Nascimento. 1996. Analysis of red knot *Calidris canutus rufa* banding data in Brazil. International Wader Studies 8:63-70.

Atlantic States Marine Fisheries Commission (ASMFC). 1998. Interstate fishery management plan for horseshoe crab. Fishery management report no. 32, available at http://http://www.asmfc.org.

Atlantic States Marine Fisheries Commission (ASMFC). 2009. Horseshoe crab stock assessment for peer review. Stock assessment report no. 09-02 (Supplement A). Unpublished report by ASMFC, available at http://http://www.asmfc.org.

Atlantic States Marine Fisheries Commission (ASMFC). 2012. 2012 review of the Fishery Management Plan in 2011 for horseshoe crab (*Limulus polyphemus*). Unpublished report by SMFC, available at http://http://www.asmfc.org.

Aubry, Y. and R. Cotter. 2001. Using trend information to develop the Quebec Shorebird Conservation Plan. Bird Trends 8:21-24.

Audubon, J.J. 1844. Audubon images: The octavo editions. Plate 328: Red breasted sandpiper, available at http://audubonimages.org/b301-00/328_red_breasted_sand.htm.

Baker, A.J., P.M. González, T. Piersma, L.J. Niles, d.N. de Lima Serrano, P.W. Atkinson, N.A. Clark, C.D.T. Minton, M.K. Peck, and G. Aarts. 2004. Rapid population decline in red knots: Fitness consequences of decreased refueling rates and late arrival in Delaware Bay. Proceedings of the Royal Society Biological Sciences, Series B 271(1541):875-882.

Baker, A.J., P.M. González, I.L. Serrano, R.T.J. Wallace, M.A. Efe, S. Rice, V.L. D'Amico, M.C. Rocha, and M.E. Echave. 2005. Assessment of the wintering area of red knots in Maranhao, northern Brazil. Wader Study Group Bulletin (107):10-18.

Bandedbirds.org. 2012. Bandings and resightings. Available at bandedbirds.org.

Barber Beach Cleaning Equipment. 2009. Information accessed from website at http://www.hbarber.com/cleaners/beach_cleaning_equipment.aspx.

Barnes, B.M. and B.R. Truitt. 1997. Seashore chronicles. Three centuries on the Virginia Barrier Islands. University of Virginia Press; Charlottesville, Virginia.

Bart, J. and V. Johnston. 2012. Arctic shorebirds in North America: A decade of monitoring. University of California Press; Berkeley, California.

Bent, A.C. 1927. Life histories of North American shore birds: Order Limicolae (Part 1). Smithsonian Institution United States National Museum Bulletin (142):131-145.

Blomqvist, S., N. Holmgren, S. Åkesson, A. Hedenström, and J. Pettersson. 2002. Indirect effects of lemming cycles on sandpiper dynamics: 50 years of counts from southern Sweden. Oecologia 33(2):146-158.

Botton, M.L., R.E. Loveland, and T.R. Jacobsen. 1988. Beach erosion and geochemical factors: Influence on spawning success of horseshoe crabs (*Limulus polyphemus*) in Delaware Bay. Marine Biology 99(3):325-332.

Botton, M.L., R.E. Loveland, and T.R. Jacobsen. 1994. Site selection by migratory shorebirds in Delaware Bay, and its relationship to beach characteristics and abundance of horseshoe crab (*Limulus polyphemus*) eggs. The Auk 111(3):605-616.

Breese, G. 2010. Compiled by Gregory Breese from notes and reports. Unpublished report to U.S. Fish and Wildlife Service, Shorebird Technical Committee.

Buehler, D.M. 2002. Shorebird counts in Panama during emphasize the need to monitor and protect the Upper Panama Bay. Wader Study Group Bulletin 99:41-44.

Buehler, D.M., B.I. Tieleman, and T. Piersma. 2010. Indices of immune function are lower in red knots (*Calidris canutus*) recovering protein than in those storing fat during stopover in Delaware Bay. The Auk 127:394-401.

Burger, J. 1986. The effect of human activities on shorebirds in two coastal bays in the northeastern United States. Environmental Conservation 13:123-130.

Burger, J., D. Caldwell Hahn, and J. Chase. 1979. Aggressive interactions in mixed-species flocks of migrating shorebirds. Animal Behaviour 27:459-469.

Burger, J., C. Jeitner, K. Clark, and K.J. Niles. 2004. The effect of human activities on migrant shorebirds: Successful adaptive management. Environmental Conservation 31(4):283-288.

Burger, J., L.J. Niles, R.R. Porter, A.D. Dey, S. Koch, and C. Gordon. 2012. Migration and over wintering of red knots (*Calidris canutus rufa*) along the Atlantic coast of the United States. The Condor 114(2):1-12.

Carlos, C.J., C.E. Fedrizzi, A.A. Campos, H. Matthews-Cascon, C.X. Barroso, S.G. Rabay, L.E.A. Bezerra, C.A.O. Meirelles, A. J. de Andrade, and P.R.L. Thiers. 2010. Migratory shorebirds conservation and shrimp farming in NE Brazil: Final report, agreement #BRN11. Unpublished report prepared for U. S. Fish and Wildlife Service.

CBI Coastal Planning and Engineering, Inc. 2015. Longboat Pass navigational and maintenance dredging and beach nourishment project, permit application No. SAJ-2014-00606(SP-MEP), additional information provided for USFWS.

Chase, S. 2006. Sand back-passing with land-based equipment, a cost-effective approach for beach restoration. Shore and Beach 74(2):19-25.

Chasten, M.A. and J.D. Rosati. 2010. Townsends Inlet to Cape May Inlet, NJ. Evaluation of sediment back-passing along the Avalon shoreline. U.S. Army Corps of Engineers, Philadelphia District; Philadelphia, Pennsylvania.

Clark, K.E., L.J. Niles, and J. Burger. 1993. Abundance and distribution of migrant shorebirds in Delaware Bay. The Condor 95:694-705.

Clark, K.E., R.R. Porter, and J.D. Dowdell. 2009. The shorebird migration in Delaware Bay. New Jersey Birds 35(4):85-92.

Climate Change Science Program (CCSP). 2009. Coastal sensitivity to sea-level rise: A focus on the Mid-Atlantic Region. A report by the U.S. Climate Change Science Program and the subcommittee on Global Change Research. J.G. Titus, coordinating lead author. Environmental Protection Agency; Washington, D.C.

Coastal Eco-Group, Inc. 2014. Biological Assessment, periodic beach nourishment from the New Pass ebb shoal, Longboat Key and Lido Key, Florida. 84pp.

Coastal Protection and Restoration Authority of Louisiana. 2012. Louisiana's comprehensive master plan for a sustainable coast. Louisiana Office of Coastal Protection and Restoration, Baton Rouge, LA, available at http://www.coastalmasterplan.louisiana.gov.

Cohen, J.B., S.M. Karpanty, J.D. Fraser, B. Watts, and B. Truitt. 2008. Red knot stopover ecology in Delaware Bay and Virginia. Unpublished PowerPoint presentation.

Cohen, J.B., S.M. Karpanty, J.D. Fraser, B.D. Watts, and B.R. Truitt. 2009. Residence probability and population size of red knots during spring stopover in the mid-Atlantic region of the United States. Journal of Wildlife Management 73(6):939-945.

Cohen, J.B., S.M. Karpanty, J.D. Fraser, and B.R. Truitt. 2010. The effect of benthic prey abundance and size on red knot (*Calidris canutus*) distribution at an alternative migratory stopover site on the U.S. Atlantic Coast. Journal of Ornithology 151:355-364.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2007. COSEWIC assessment and status report on the red knot, *Calidris canutus* in Canada. COSEWIC, Gatineau, QC. Available at: http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_calidris_canutus_e.pdf.

Davis, T.H. 1983. Loons to sandpipers. Pages 372-375 *in* J. Farrand, editor. The Audubon Society master guide to birding. Knopf; New York, New York.

Defeo, O., A. McLachlan, D.S. Schoeman, T.A. Schlacher, J. Dugan, A. Jones, M. Lastra, and F. Scapini. 2009. Threats to sandy beach ecosystems: A review. Estuarine, Coastal and Shelf Science 81(2009):1-12.

Dey, A., K. Kalasz, and D. Hernandez. 2011a. Delaware Bay egg survey: 2005-2010. Unpublished report to ASMFC.

Dey, A., L. Niles, H. Sitters, K. Kalasz, and R.I.G. Morrison. 2011b. Update to the status of the red knot, *Calidris canutus* in the Western Hemisphere, April, 2011, with revisions to July 14, 2011. Unpublished report to New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program.

Dinsmore, S.J., J.A. Collazo, and J.R. Walters. 1998. Seasonal numbers and distribution of shorebirds on North Carolina's Outer Banks Wilson Bulletin 110:171-181.

Dugan, J.E., D.M. Hubbard, M.D. McCrary, and M.O. Pierson. 2003. The response of macrofauna communities and shorebirds to macrophyte wrack subsidies on exposed sandy beaches of southern California. Estuarine, Coastal and Shelf Science 58:25-40.

Dugan, J.E. and D.M. Hubbard. 2006. Ecological responses to coastal armoring on exposed sandy beaches. Journal of the American Shore and Beach Preservation Association 74(1).

Duerr, A.E., B.D. Watts, and F.M. Smith. 2011. Population dynamics of red knots stopping over in Virginia during spring migration. Center for Conservation Biology technical report series. College of William and Mary and Virginia Commonwealth University, CCBTR-11-04, Williamsburg, VA.

Eaton, E.H. 1910. Birds of New York. University of the State of New York; Albany, New York. Available at http://www.biodiversitylibrary.org/item/74037#page/7/mode/1up.

eBird.org. 2012. eBird: An online database of bird distribution and abundance (web application). Cornell Lab of Ornithology; Ithaca, New York. Available at http://www.ebird.org/.

Escudero, G., J.G. Navedo, T. Piersma, P. De Goeij, and P. Edelaar. 2012. Foraging conditions at the end of the world in the context of long-distance migration and population declines in red knots. Austral Ecology 37:355-364.

Fabry, V.J., B.A. Seibel, R.A. Feely, and J.C. Orr. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Science 65:414-432.

Farrell, J.G. and C.S. Martin. 1997. Proceedings of the horseshoe crab forum: Status of the resource. University of Delaware; Sea Grant College Program; Newark, Delaware.

Feng, S., C. Ho, Q. Hu, R.J. Oglesby, and S. Jeong. 2012. Evaluating observed and projected future climate changes for the Arctic using the Koppen-Trewartha climate classification. Climate Dynamics 38:1359-1373.

Fenster, M. and R. Dolan. 1996. Assessing the impact of tidal inlets on adjacent barrier island shorelines. Journal of Coastal Research 12(1):294-310.

Florida Department of Environmental Protection (DEP). 2008. Critically eroded beaches in Florida. Bureau of Beaches and Coastal Systems.

Florida Fish and Wildlife Conservation Commission (FWC). 2011a. Standard Manatee Conditions for In-Water Work 2011. Tallahassee, Florida. Available from: http://myfwc.com/wildlifehabitats/managed/manatee/permit-review/#Main

Florida Fish and Wildlife Conservation Commission (FWC). 2011b. Red tides in Florida. Available at http://myfwc.com/research/redtide/information/general/redtides-fl/.

Florida Fish and Wildlife Conservation Commission (FWC). 2015. 2014 Statewide Nesting Totals. Available from: http://www.myfwc.com/research/wildlife/sea-turtles/nesting/statewide/

Florida Oceans and Coastal Council. 2010. Climate change and sea-level rise in Florida: An update of "The effects of climate change on Florida's ocean and coastal resources". Available at: http://www.floridaoceanscouncil.org/reports/Climate_Change_and_Sea_Level_Rise.pdf.

Food and Agriculture Organization of the United Nations (FAO). 2004. Marine biotoxins. FAO food and nutrition paper 80. FAO, Rome, Available at: http://www.fao.org/docrep/007/y5486e/y5486e00.HTM.

Forbush, E.H. 1912. Knot (*Tringa canutus*). Page 262 *in* A History of the Game Birds, Wild-fowl and Shore Birds of Massachusetts and Adjacent States. Massachusetts State Board of Agriculture; Boston, Massachusetts. Available at: http://www.biodiversitylibrary.org/item/115411#page/9/mode/1up.

Forys, B. 2011. An evaluation of existing shorebird management techniques' success at locations in Pinellas County. Final Report. Unpublished report by Eckerd College; St. Petersburg, Florida.

Foster, C., A. Amos, and L. Fuiman. 2009. Trends in abundance of coastal birds and human activity on a Texas barrier island over three decades. Estuaries and Coasts 32:1079-1089.

Fraser, J.D., S.M. Karpanty, J.B. Cohen, and B.R. Truitt. 2013. The red knot (*Calidris canutus rufa*) decline in the western hemisphere: Is there a lemming connection? Canadian Journal of Zoology 91:13-16.

Galbraith, H., R. Jones, R. Park, J. Clough, S. Herrod-Julius, B. Harrington, and G. Page. 2002. Global climate changes and sea level rise: Potential loss of intertidal habitat for shorebirds. Waterbirds 25:173-183.

Gebert, J. 2012. 2012 Status report on USACE-Philadelphia district beaches and inlets in New Jersey. In 25-years of New Jersey coastal studies, February 15, 2012, The Richard Stockton College Coastal Research Center, Galloway, New Jersey. Available at: http://intraweb.stockton.edu/eyos/coastal/25yrConference/2012_Status_Report.pdf.

Gerasimov, K.B. 2009. Functional morphology of the feeding apparatus of red knot, *Calidris canutus*, great knot *C. tenuirostris* and surfbird *Aphriza virgate*. In International Wader Study Group Annual Conference, September 18-21, 2009. International Wader Study Group, Norfolk, United Kingdom.

Giraud, J.P., Jr. 1844. Birds of Long Island. Wiley & Putman; New York, New York. Available at: http://www.biodiversitylibrary.org/item/68875#page/7/mode/1up.

González, P.M. 2005. Report for developing a red knot status assessment in the U.S. Unpublished report by Fundacion Inalafquen; Rio Negro, Argentina.

Greene, K. 2002. Beach nourishment: a review of the biological and physical impacts. Atlantic States Marine Fisheries Commission. ASMFC Habitat Management Series #7.

Guilfoyle, M.P., R.A. Fischer, D.N. Pashley, and C.A. Lott, editors. 2006. Summary of first regional workshop on dredging, beach nourishment, and birds on the south Atlantic coast. ERDC/EL TR-06-10. U.S. Army Corps of Engineers; Washington, D.C. Available at: http://www.fws.gov/raleigh/pdfs/ES/trel06-10.pdf.

Guilfoyle, M.P., R.A. Fischer, D.N. Pashley, and C.A. Lott, editors. 2007. Summary of second regional workshop on dredging, beach nourishment, and birds on the north Atlantic coast. ERDC/EL TR-07-26. U.S. Army Corps of Engineers; Washington, D.C. Available at: http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA474358.

Hafner, S. 2012. Beach stabilization - Structure and beach nourishment alternatives. In 25-years of New Jersey coastal studies, February 15, 2012. The Richard Stockton College Coastal Research Center; Galloway, New Jersey. Available at: http://intraweb.stockton.edu/eyos/coastal/25yrConference/Beach-Stabilization.pdf.

Harrington, B.A. 1996. The flight of the red knot: A natural history account of a small bird's annual migration from the Arctic Circle to the tip of South America and back. W. W. Norton & Company; New York.

Harrington, B.A. 2001. Red knot (*Calidris canutus*) *in* The Birds of North America No. 563. A. Poole and F. Gill, editors. Philadelphia, Pennsylvania.

Harrington, B.A. 2005a. Unpublished information on red knot numbers and distribution in the eastern United States: Based largely on ongoing projects and manuscripts under development at the Manomet Center for Conservation Sciences and the Georgia Department of Natural Resources.

Harrington, B.A. 2005b. Studies of disturbance to migratory shorebirds with a focus on Delaware Bay during north migration. Unpublished report by Manomet Center for Conservation Sciences; Manomet, Massachusetts.

Harrington, B.A. 2008. Coastal inlets as strategic habitat for shorebirds in the southeastern United States. DOER technical notes collection. U.S. Army Engineer Research and Development Center; Vicksburg, Mississippi. Available at: http://el.erdc.usace.army.mil/elpubs/pdf/doere25.pdf.

Harrington, B.A., J.M. Hagen, and L.E. Leddy. 1988. Site fidelity and survival differences between two groups of New World red knots (*Calidris canutus*). The Auk 105:439-445.

Harrington, B.A., N.P. Hill, and N. Blair. 2010a. Changing use of migration staging areas by red knots: An historical perspective from Massachusetts. Waterbirds 33(2):188-192.

Harrington, B.A., S. Koch, L.K. Niles, and K. Kalasz. 2010b. Red knots with different winter destinations: Differential use of an autumn stopover area. Waterbirds 33(3):357-363.

Hayes, M.O. and J. Michel. 2008. A coast for all seasons: A naturalist's guide to the coast of South Carolina. Pandion Books; Columbia, South Carolina.

Hellmayr, C.E. and B. Conover. 1948. Subfamily Eroliinae. Sandpipers. Genus *Calidris*. Pages 166-169 *in* Catalogue of Birds of the Americas Zoological Series. Part 1 Number 3. Field Museum of Natural History; Chicago, Illinois. Available at: http://www.biodiversitylibrary.org/item/20854#page/8/mode/1up.

Herrington, T.O. 2003. Manual for costal hazard mitigation. New Jersey Sea Grant Consortium; Fort Hancock, New Jersey.

Hubbard, D.M. and J.E. Dugan. 2003. Shorebird use of an exposed sandy beach in southern California. Estuarine Coastal Shelf Science 58:41-54.

Hutt, M.B. and H. Hutt. 1992. The birds of Barbados West Indies: An annotated checklist. 70-71.

Ims, R.A. and E. Fuglei. 2005. Trophic interaction cycles in tundra ecosystems and the impact of climate change. BioScience 55(4):311-322.

International Atomic Energy Agency. 2004. The algae's toxic brews. Available at: http://www.iaea.org/newscenter/features/algalbloom/algae.html.

Jones, S.J., F.P. Lima, and D.S. Wethey. 2010. Rising environmental temperatures and biogeography: Poleward range contraction of the blue mussel, *Mytilus edulis* L., in the western Atlantic. Journal of Biogeography 37:2243-2259.

Kalasz, K. 2008. Delaware shorebird conservation plan. Version 1.0. Delaware Natural Heritage and Endangered Species Program Division of Fish and Wildlife; Delaware Department of Natural Resources & Environmental Control; Smyrna, Delaware.

Kana, T. 2011. Coastal erosion control and solutions: A primer, 2nd ed. Coastal Science & Engineering; Columbia, South Carolina. Available at: http://coastalscience.com/cses-coastalerosion-andsolutions-a-primer-2nd-edition-now-available/.

Kaplan, J.O., N.H. Bigelow, P.J. Bartlein, T.R. Christiansen, W. Cramer, S.M. Harrison, N.V. Matveyeva, A.D. McGuire, D.F. Murray, and I.C. Prentice. 2003. Climate change and Arctic ecosystems II: Modeling, paleodata-model comparisons, and future projections. Journal of Geophysical Research 108(D17):8171.

Karpanty, S.M., J.D. Fraser, J. Berkson, L. Niles, A. Dey, and E.P. Smith. 2006. Horseshoe crab eggs determine distribution of red knots in the Delaware Bay. Journal of Wildlife Management 70:1704-1710.

Karpanty, S.M., J.D. Fraser, J.B. Cohen, S. Ritter, B. Truitt, and D. Catlin. 2012. Update of red knot numbers and prey counts in Virginia using ground survey methods. Unpublished report to the Delaware Bay Technical Committee and the Atlantic States Marine Fisheries Commission, Department Fish and Wildlife Conservation.

Lanctot, R. 2009. Third meeting: Western Hemisphere Shorebird Group. Introduction. Pages 93-136 *in* Third meeting: Western Hemisphere Shorebird Group, March 9-13, 2009, International Wader Study Group, Norfolk, United Kingdom. Available at: http://www.shorebirdplan.org/wpcontent/uploads/2013/01/ShorebirdScienceConference2009.pdf.

Larson, S. 1960. On the influence of the Arctic fox *Alopex lagopus* on the distribution of Arctic birds. Oikos 11:276-305.

Lathrop, R.G., Jr. 2005. Red knot habitat in Delaware Bay: Status and trends. Unpublished report by the Department of Ecology, Evolution & Natural Resources, Center for Remote Sensing & Spatial Analysis, Rutgers University; New Brunswick, New Jersey.

Laursen, K., J. Frikke, and J. Kahlert. 2008. Accuracy of 'total counts' of waterbirds from aircraft in coastal waters. Wildlife Biology 14:165-175.

Leatherman, S.P. 1989. National assessment of beach nourishment requirements associated with accelerated sea level rise *in* The potential effects of global climate change on the United States. Report to Congress. U.S. Environmental Protection Agency; EPA 230-05-89-052; Washington, D.C. Available at: http://nepis.epa.gov.

Lindquist, N. and L. Manning. 2001. Impacts of beach nourishment and beach scraping on critical habitat and productivity of surf fishes. Final report. North Carolina Sea Grant, North Carolina State University; Raleigh, North Carolina. Available at: http://www.ncsu.edu/ncsu/CIL/sea_grant/FRG/PDF/98EP05.PDF.

Lindström, Å. and J. Agrell. 1999. Global change and possible effects on the migration and reproduction of Arctic-breeding waders. Ecological Bulletins 47:145-159.

Lowery Jr., G.H. 1974. Red knot, *Calidris canutus*. Pages 308-310, *in* Louisiana Birds. Louisiana State University Press; Baton Rouge, Louisiana.

Luckenbach, M. 2007. Potential interactions between clam aquaculture and shorebird foraging in Virginia, U.S.A. Unpublished report by Virginia Institute of Marine Science, College of William and Mary; Gloucester Point, Virginia.

Mackay, G.H. 1893. Observations on the knot (*Tringa canutus*). The Auk 10:25-35.

McGowan, C.P., J.E. Hines, J.D. Nichols, J.E. Lyons, D.R. Smith, K.S. Kalasz, L.J. Niles, A.D. Dey, N.A. Clark, and P.W. Atkinson. 2011. Demographic consequences of migratory stopover: Linking red knot survival to horseshoe crab spawning abundance. Ecosphere 2(6):1-22.

Meltofte, H., T. Piersma, H. Boyd, B. McCaffery, B. Ganter, V.V. Golovnyuk, K. Graham, C.L.Gratto-Trevor, R.I.G. Morrison, and E. Nol. 2007. Effects of climate variation on the breeding ecology of Arctic shorebirds. Meddelelser om Grønland, Bioscience 59. Danish Polar Center, Copenhagen. Available at: http://www.worldwaders.org/dokok/literature/125/effects_of_climate_on_arctic_shorebirds_mog_biosci_59_2007.pdf.

Melvin, S.M., C.R. Griffin, and L.H. MacIvor. 1991. Recovery strategies for piping plovers in managed coastal landscapes. Coastal Management 19: 21-34.

Meyer, S.R., J. Burger, and L.J. Niles. 1999. Habitat use, spatial dynamics, and stopover ecology of red knots on Delaware Bay. Unpublished report to the New Jersey Endangered and Nongame Species Program; Division of Fish and Wildlife; Trenton, New Jersey.

Morrison, R.I.G. 2006. Body transformations, condition, and survival in red knots, *Calidris canutus* traveling to breed at Alert, Ellesmere Island, Canada. Ardea 94(3):607-618.

Morrison, R.I.G., and B.A. Harrington. 1992. The migration system of the red knot, *Calidris canutus* in the New World. Wader Study Group Bulletin 64:71-84.

Morrison, R.I.G. and R.K. Ross. 1989. Atlas of Nearctic shorebirds on the coast of South America. Canadian Wildlife Service; Ottawa, Canada.

Morrison, R.I.G., C. Downes, and B. Collins. 1994. Population trends of shorebirds on fall migration in eastern Canada 1974-1991. Wilson Bulletin 106(3):431-447.

Morrison, R.I.G., Y. Aubry, R.W. Butler, G.W. Beyersbergen, G.M. Donaldson, C.L. Gratto-Trevor, P.W. Hicklin, V.H. Johnston, and R.K. Ross. 2001. Declines in North American shorebird populations. Wader Study Group Bulletin 94:34-38.

Morrison, R.I.G., K. Ross, and L.J. Niles. 2004. Declines in wintering populations of red knots in southern South America. The Condor 106:60-70.

Morrison, R.I.G., B.J. McCaffery, R.E. Gill, S.K. Skagen, S.L. Jones, W. Gary, C.L. Gratto-Trevor, and B.A. Andres. 2006. Population estimates of North American shorebirds. Wader Study Group Bulletin 111:67-85.

Morrison, R.I.G., D.S. Mizrahi, R.K. Ross, O.H. Ottema, N. de Pracontal, and A. Narine. 2012. Dramatic declines of semipalmated sandpipers on their major wintering areas in the Guianas, northern South America. Waterbirds 35(1):120-134.

Morton, R.A. 2003. An overview of coastal land loss: With emphasis on the southeastern United States. USGS Open File Report 03-337. U.S. Geological Survey Center for Coastal and Watershed Studies; St. Petersburg, Florida. Available at: http://pubs.usgs.gov/of/2003/of03-337/pdf.html.

Morton, R.A. and T.L. Miller. 2005. National assessment of shoreline change: Part 2: Historical shoreline changes and associated coastal land loss along the U.S. Southeast Atlantic Coast. Open file report 2005-1401. U.S. Geological Survey, Center for Coastal and Watershed Studies; St. Petersburg, Florida. Available at: http://pubs.usgs.gov/of/2005/1401/.

Morton, R.A., T.L. Miller, and L.J. Moore. 2004. National assessment of shoreline change: Part 1: Historical shoreline changes and associated coastal land loss along the U.S. Gulf of Mexico. Openfile report 2004-1043. U.S. Geological Survey Center for Coastal and Watershed Studies; St. Petersburg, Florida. Available at: http://pubs.usgs.gov/of/2004/1043/.

Musmeci, L., A.J. Gatto, M.A. Hernández, L.O. Bala, and J.A. Scolaro. 2011. Plasticity in the utilization of beaches by the red knots at Peninsula Valdés, Patagonia Argentina: Diet and prey selection. In Western Hemisphere Shorebird Group: Fourth meeting, August 11-15, 2011, International Wader Study Group; Norfolk, United Kingdom. Available at: http://www.sfu.ca/biology/wildberg/4WHSG/WHSGProgramFinal.pdf.

Myers, J.P. and L.P. Myers. 1979. Shorebirds of coastal Buenos Aires Province, Argentina. Ibis 121:186-200.

National Research Council (NRC). 2010. Advancing the science of climate change. The National Academies Press; Washington, D.C. Available at: http://www.nap.edu/catalog.php?record_id=12782.

Neal, W.J., O.H. Pilkey, J.T. Kelley. 2007. Atlantic Coast Beaches: A Guide to Ripples, Dunes, and Other Natural Features of the Seashore. Mountain Press Publishing Company; Missoula, Montana.

Nebel, S. 2011. Notes & news: Shooting of whimbrels sparks calls for regulation of shorebird hunting in the Caribbean. Wader Study Group Bulletin 118(1):217.

Newstead, D.J., L.J. Niles, R.R. Porter, A.D. Dey, and J. Burger. 2013. Geolocation reveals midcontinent migratory routes and Texas wintering areas of red knots (*Calidris canutus rufa*). Wader Study Group Bulletin. 120(1):53-59

New Jersey Department of Environmental Protection [NJDEP]. 2011. New Jersey Coastal Management Program Section 309 Assessment for 2011-2015. NJDEP, Trenton, NJ.

Niles, L. 2009. Red knots wintering on the Florida Gulf Coast 2005-2009. Unpublished final report (Report on Red Knot Surveys in Florida 2008-2009). Neotropical Migrant Bird Conservation Act. Project #3556, Agreement #NJ-N31.

Niles, L.J. 2012a. A rube with a view: Unraveling the Texas knot. Available at: http://arubewithaview.com/2012/05/01/unraveling-the-texas-knot/.

Niles, L.J. 2012b. A rube with a view: The challenge of the rice fields of Mana. Available at: http://arubewithaview.com/2012/08/26/the-challege-of-the-rice-fields-of-mana/.

Niles, L.J., A.D. Dey, N.J. Douglass, J.A. Clark, N.A. Clark, A.S. Gates, B.A. Harrington, M.K. Peck, and H.P. Sitters. 2006. Red knots wintering in Florida: 2005/6 expedition. Wader Study Group Bulletin 111:86-99.

Niles, L.J., H.P. Sitters, A.D. Dey, P.W. Atkinson, A.J. Baker, K.A. Bennett, R. Carmona, K.E. Clark, N.A. Clark, and C. Espoza. 2008. Status of the red knot (*Calidris canutus rufa*) in the Western Hemisphere. Studies in Avian Biology 36:1-185.

Niles, L.J., H.P. Sitters, D. Newstead, J. Sitters, A.D. Dey, and B. Howe. 2009. Shorebird project on the gulf coast of Texas: Oct 3-11, 2009. Unpublished report.

Niles, L.J., J. Burger, R.R. Porter, A.D. Dey, C.D.T. Minton, P.M. González, A.J. Baker, J.W. Fox, and C. Gordon. 2010. First results using light level geolocators to track red knots in the Western Hemisphere show rapid and long intercontinental flights and new details of migration pathways. Wader Study Group Bulletin 117(2):123-130.

Niles, L.J., J. Burger, R.R. Porter, A.D. Dey, S. Koch, B. Harrington, K. Iaquinto, and M. Boarman. 2012a. Migration pathways, migration speeds and non-breeding areas used by northern hemisphere wintering red knots, *Calidris canutus* of the subspecies *rufa*. Wader Study Group Bulletin 119(2):195-201.

Niles, L., A. Dey, D. Mizrahi, L. Tedesco, and K. Sellers. 2012b. Second report: Damage from superstorm Sandy to horseshoe crab breeding and shorebird stopover habitat on Delaware Bay. Unpublished report to New Jersey Natural Lands Trust. Available at: http://wetlandsinstitute.org/wpcontent/uploads/2013/03/2nd-report-impact-Sandycrabs-and-shorebirds-7dec12.pdf.

Niles, L., L. Tedesco, D. Daly, and T. Dillingham. 2013. Restoring Reeds, Cooks, Kimbles and Pierces Point Delaware Bay beaches, NJ, for shorebirds and horseshoe crabs. Unpublished draft project proposal.

Nordstrom, K.F. 2000. Beaches and dunes of developed coasts. Cambridge University Press; Cambridge, United Kingdom.

Nordstrom, K.F. and M.N. Mauriello. 2001. Restoring and maintaining naturally functioning landforms and biota on intensively developed barrier islands under a no-retreat alternative. Shore & Beach 69(3):19-28.

Nordstrom, K.F., N.L. Jackson, A.H.F. Klein, D.J. Sherman, and P.A. Hesp. 2006. Offshore Aeolian transport across a low fore dune on a developed barrier island. Journal of Coastal Research 22(5):1260-1267.

Normandeau Associates Inc. 2011. New insights and new tools regarding risk to roseate terns, piping plovers, and red knots from wind facility operations on the Atlantic Outer Continental Shelf. Final report. U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEMRE), BOEMRE 048-2011; New Orleans, Louisiana. Available at: http://www.data.boem.gov/PI/PDFImages/ESPIS/4/5119.pdf.

Olsen Associates, Inc. 2015. Town of Longboat Key, FL, beach renourishment. Proposed conservation measures for shorebirds. 7pp.

Peters, K.A. and D.L. Otis. 2007. Shorebird roost-site selection at two temporal scales: Is human disturbance a factor? Journal of Applied Ecology 44:196-209.

Peterson, C.H., M.J. Bishop, G.A. Johnson, L.M. D'Anna, and L.M. Manning. 2006. Exploiting beach filling as an unaffordable experiment: benthic intertidal impacts propagating upwards to shorebirds. Journal of Experimental Marine Biology and Ecology 338:205-221.

Philippart, C.J.M., H.M. van Aken, J.J. Beukema, O.G. Bos, G.C. Cadée, and R. Dekker. 2003. Climate-related changes in recruitment of the bivalve *Macoma balthica*. Limnology and Oceanography 48(6):2171-2185.

Piersma, T. and A.J. Baker. 2000. Life history characteristics and the conservation of migratoryshorebirds. Pages 105-124 *in* L.M. Gosling and W.J. Sutherland, editors. Behaviour and Conservation. Cambridge University Press; Cambridge, United Kingdom.

Piersma, T. and Å. Lindström. 2004. Migrating shorebirds as integrative sentinels of global environmental change. Ibis 146:61-69.

Piersma, T. and J.A. van Gils. 2011. The flexible phenotype. A body-centered integration of ecology, physiology, and behavior. Oxford University Press Inc.; New York, New York.

Piersma, T., R. Hoekstra, A. Dekinga, A. Koolhaas, P. Wolf, P. Battley, and P. Wiersma. 1993. Scale and intensity of intertidal habitat use by knots *Calidris canutus* in the western Wadden Sea in relation to food, friends and foes. Netherlands Journal of Sea Research 31(4):331-357.

Piersma, T., G.A. Gudmundsson, and K. Lilliendahl. 1999. Rapid changes in the size of different functional organ and muscle groups during refueling in a long-distance migrating shorebird. Physiological and Biochemical Zoology 72(4):405-415.

Pilkey, O.H. and J.D. Howard. 1981. Saving the American beach. Skidaway Institute of Oceanography; Savannah, Georgia.

Pilkey, O.H. and H.L. Wright III. 1988. Seawalls versus beaches. Journal of Coastal Research 4:41-64.

Rehfisch, M.M. and H.Q.P. Crick. 2003. Predicting the impact of climatic change on Arctic-breeding waders. Wader Study Group Bulletin 100:86-95.

Rice, T.M. 2009. Best management practices for shoreline stabilization to avoid and minimize adverse environmental impacts. Unpublished report prepared for the U.S. Fish and Wildlife Service; Panama City Ecological Services Field Office; Panama City, Florida. Available at: http://www.fws.gov/charleston/pdf/PIPL/BMPs%20For%20Shoreline%20Stabilization%20To%20Avoid%20And%20Minimize%20Adverse%20Environmental%20Impacts.pdf.

Rice, T.M. 2012. The status of sandy, oceanfront beach habitat in the coastal migration and wintering range of the piping plover (*Charadrius melodus*). Available at: http://www.fws.gov/charleston/pdf/PIPL/The%20Status%20of%20Sandy%20Oceanfront%20Beach%20Habitat%20In%20The%20Coastal%20Migration%20And%20Wintering%20Range%20Of%20The%20Piping%20Plover.pdf.

Ridgway, R. 1919. *Canutus Canutus* (Linnaeus). Knot. Pages 232-238 *in* The birds of North and Middle America: A descriptive catalogue of the higher groups, genera, species, and subspecies of birds known to occur in North America, from the Arctic lands to the Isthmus of Panama, the West Indies and other islands of the Caribbean sea, and the Galapagos Archipelago. Bulletin of the United States National Museum. No. 50. Part VIII; Government Printing Office; Washington, D.C. Available at: http://books.google.com/books?hl=en&lr=&id=mIZ5LU47jUQC&oi=fnd&pg=PA1&dq=info:tM8K7NpXf2sJ:scholar.google.com&ots=jqUMGZ65fg&sig=45_FRHcwdx6dwLTcPWbQLBELf4#v=onepage&q&f=false.

Roosevelt, R.B. 1866. The game birds of the coasts and lakes of the northern states of America. Carleton Publisher; New York, New York. Available at: http://www.biodiversitylibrary.org/item/117197#page/9/mode/1up.

Scavia, D., J.C. Field, D.F. Boesch, R.W. Buddemeier, V. Burkett, D.R. Cayan, M. Fogarty, M.A. Harwell, R.W. Howarth, C. Mason, D.J. Reed, T.C. Royer, A.H. Sallenger, and J.G. Titus. 2002. Climate change impacts on U.S. coastal and marine ecosystems. Estuaries 25:149-164.

Schekkerman, H., I. Tulp, T. Piersma, and G.H. Visser. 2003. Mechanisms promoting higher growth rate in Arctic than in temperate shorebirds. Oecologia 134:332-342.

Schlacher, T.A. and L.M.C. Thompson. 2008. Physical impacts caused by off-road vehicles (ORVs) to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. Journal of Coastal Research 24:234-242.

Schmidt, N.M., R.A. Ims, T.T. Høye, O. Gilg, L.H. Hansen, J. Hansen, M. Lund, E. Fuglei, M.C. Forchhammer, and B. Sittler. 2012. Response of an Arctic predator guild to collapsing lemming cycles. Proceedings of the Royal Society B 279:4417-4422.

Schneider, T.M. and B. Winn. 2010. Georgia species account: Red knot (*Calidris canutus*). Unpublished report by the Georgia Department of Natural Resources; Wildlife Resources Division, Nongame Conservation Section. Available at: http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/pdf/accounts/birds/calidris_canutus.pdf.

Shriner, C.A. 1897. Knot, robin snipe, or gray snipe. Page 94 *in* The Birds of New Jersey. New Jersey Fish and Game Commission. Available at: http://www.biodiversitylibrary.org/item/32639.

Shuster, C.N., Jr., R.B. Barlow, and J.H. Brockmann. 2003. The American horseshoe crab.Harvard University Press; Cambridge, Massachusetts.

Siok, D. and B. Wilson. 2011. Using dredge spoils to restore critical American horseshoe crab (*Limulus polyphemus*) spawning habitat at the Mispillion Inlet. Delaware Coastal Program; Dover, Delaware.

Skagen, S.K., P.B. Sharpe, R.G. Waltermire, and M.B. Dillon. 1999. Biogeographical profiles of shorebird migration in midcontinental North America. Biological Science Report 2000-0003. Available at: http://www.fort.usgs.gov/products/publications/pub_abstract.asp?PubID=555.

Smith, B.S. 2010. Patterns of nonbreeding snowy plover (*Charadrius alexandrinus*), piping plover (*C. melodus*), and red knot (*Calidris canutus*) distribution in northwest Florida. Florida Field Naturalist 38(2):43-54.

Smith, D.R. and S.F. Michels. 2006. Seeing the elephant: Importance of spatial and temporal coverage in a large-scale volunteer-based program to monitor horseshoe crabs. Fisheries 31(10):485-491.

Smith, P.A., H.G. Gilchrist, M.R. Forbes, J. Martin, and K. Allard. 2010. Inter-annual variation in the breeding chronology of Arctic shorebirds: Effects of weather, snow melt and predators. Journal of Avian Biology 41:292-304.

Smith, D.R., N.L. Jackson, K.F. Nordstrom, and R.G. Weber. 2011. Beach characteristics mitigate effects of onshore wind on horseshoe crab spawning: Implications for matching with shorebird migration in Delaware Bay. Animal Conservation 14:575-584.

Spaans, A.L. 1978. Status and numerical fluctuations of some North American waders along the Surinam coast. Wilson Bulletin 90:60-83.

Sprandell, G.L., J.A. Gore, and D.T. Cobb. 1997. Winter shorebird survey. Final performance report. Florida Game and Fresh Water Fish Commission; Tallahassee, Florida. Available at: http://www.flshorebirdalliance.org/pdf/Sprandel_Gore_Cobb-1994_Winter_Shorebirds.pdf.

Stearns, W.A. and E. Coues. 1883. New England bird life: Being a manual of New England ornithology, Part II. Lee and Shepard Publishers; Boston, Massachusetts. Available at: http://www.biodiversitylibrary.org/item/115807#page/236/mode/1up.

Steven Sauers Environmental Management. 2015. Historical shorebird monitoring program, Town of Longboat Key, Florida. Memo to Jaaun Florensa, Public Works Director, Town of Longboat Key. April 6, 2015. 7pp.

Stillman, R.A., A.D. West, J.D. Goss-Custard, S. McGrorty, N.J. Frost, D.J. Morrisey, A.J. Kenny, and A.L. Drewitt. 2005. Predicting site quality for shorebird communities: A case study on the Humber Estuary, UK. Marine Ecology Progress Series 305:203-217.

Stone, W. 1937. Bird studies at Old Cape May: An ornithology of coastal New Jersey. Dover Publications; New York, New York.

Summers, R.W. and L.G. Underhill. 1987. Factors related to breeding production of Brent Geese, *Branta b. bernicla* and waders (*Charadrii*) on the Taimyr Peninsula. Bird Study 34:161-171.

Tarr, N.M. 2008. Fall migration and vehicle disturbance of shorebirds at South Core Banks, North Carolina. North Carolina State University; Raleigh, North Carolina.

Tarr, J.G. and P.W. Tarr. 1987. Seasonal abundance and the distribution of coastal birds on the northern Skeleton Coast, South West Africa/Nimibia. Madoqua 15: 63-72.

Taylor, A.L. 1981. Adventitious molt in red knot possibly caused by *Actornithophilus* (Mallophaga: Menoponidae). Journal of Field Ornithology 52(3):241.

Titus, J.G. 1990. Greenhouse effect, sea level rise, and barrier islands: Case study of Long Beach Island, New Jersey. Coastal Management 18:65-90.

Titus, J.G. 2000. Does the U.S. government realize that the sea is rising? How to restructure Federal programs so that wetland and beaches survive. Golden Gate University Law Review 30(4):717-778. Available at: http://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1797&context=ggulrev.

Titus, J.G., D.E. Hudgens, D.L. Trescott, M. Craghan, W.H. Nuckols, C.H. Hershner, J.M. Kassakian, C.J. Linn, P.G. Merritt, and T.M. McCue. 2009. State and local governments plan for development of most land vulnerable to rising sea level along the US Atlantic coast. Environmental Research Letters 4(4):044008.

Truitt, B.R., B.D. Watts, B. Brown, and W. Dunstan. 2001. Red knot densities and invertebrate prey availability on the Virginia barrier islands. Wader Study Group Bulletin 95:12.

U.S. Army Corps of Engineers (Corps). 2002. Coastal engineering manual. Engineer manual 1110-2-1100. U.S. Army Corps of Engineers; Washington, D.C. Available at: http://chl.erdc.usace.army.mil/cem.

U.S. Army Corps of Engineers (Corps). 2012. Project factsheet: Delaware Bay coastline, DE & NJ, Reeds Beach and Pierces Point, NJ. Available at: http://www.nap.usace.army.mil/Missions/Factsheets/FactSheetArticleView/tabid/4694/Article/6442/delaware-bay-coastline-de-nj-reeds-beach-and-pierces-pointnj.aspx.

U.S. Fish and Wildlife Service (Service). 2003. Recovery plan for the Great Lakes piping plover (*Charadrius melodus*). U.S. Fish and Wildlife Service; Fort Snelling, Minnesota.

U.S. Fish and Wildlife Service (Service). 2011a. Species assessment and listing priority assignment form. Scientific name: *Calidris canutus* ssp. *rufa*. U.S. Fish and Wildlife Service;

Hadley, Massachusetts. Available at: http://ecos.fws.gov/docs/candidate/assessments/2012/r5/B0DM_V01.pdf.

U.S. Fish and Wildlife Service [USFWS]. 2011b. Species assessment and listing priority assignment form. Scientific name: *Calidris canutus ssp. rufa*. USFWS, Hadley, MA.

U.S. Fish and Wildlife Service (Service). 2011c. Draft biological opinion on the effects of backpassing on the federally listed (threatened) piping plover (*Charadruis melodus*) and sea-beach amaranth (*Amaranthus pumilus*) in Avalon Borough, Cape May County, New Jersey, 2011 to 2017. USFWS New Jersey Field Office, Pleasantville, NJ.

U.S. Fish and Wildlife Service (Service). 2012a. Comprehensive conservation strategy for the piping plover (*Charadrius melodus*) in its coastal migration and wintering range in the continental United States. U.S. Fish and Wildlife Service; East Lansing, Minnesota. Available at: http://www.fws.gov/midwest/endangered/pipingplover/pdf/CCSpiplNoApp2012.pdf.

U.S. Fish and Wildlife Service (Service). 2012b. Red Knot Database. Unpublished compilation of red knot occurrence records 1992-2012.

U.S. Fish and Wildlife Service (Service). 2013. Programmatic piping plover Biological Opinion to the U.S. Army Corps of Engineers (Service Consultation Code 04EF1000-2013-F-0124) for shore protection activities in the geographical region of the north and south Florida Ecological Services Field Offices (May 22, 2013). Jacksonville and Vero Beach Field Offices, Florida.

U.S. Fish and Wildlife Service (Service). 2014. Endangered and threatened wildlife and plants: Threatened species status for the *Rufa* red knot. Federal Register 79(238):73706-73748.

U.S. Fish and Wildlife Service (Service). 2015. Revised statewide programmatic Biological Opinion to the U.S. Army Corps of Engineers (FWS Log No. 41910-2011-F-0170) for shore protection activities along the coast of Florida (March 13, 2015). Jacksonville, Panama City, and Vero Beach Field Offices, Florida.

U.S. Fish and Wildlife Service (Service) and Conserve Wildlife Foundation of New Jersey. 2012b. Cooperative Agreement. Project title: Identify juvenile red knot wintering areas.

Urner, C.A. and R.W. Storer. 1949. The distribution and abundance of shorebirds on the North and Central New Jersey Coast, 1928-1938. The Auk 66(2):177-194.

van Deventer, M. 2007. Brevetoxins in marine birds: Evidence of trophic transfer and the role of prey fish as toxin vector. University of South Florida; Tampa, Florida. Available at: http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=3391&context=etd.

van Deventer, M., K. Atwood, G.A. Vargo, L.J. Flewelling, J.H. Landsberg, J.P. Naar, and D. Stanek. 2011. *Karenia brevis* red tides and brevetoxin-contaminated fish: A high risk factor for Florida's scavenging shorebirds? Botanica Marina 55(1):31-37.

van Gils, J.A., P.F. Battley, T. Piersma, and R. Drent. 2005a. Reinterpretation of gizzard sizes of red knots world-wide emphasis overriding importance of prey quality at migratory stopover sites. Proceedings of the Royal Society of London, Series B 272:2609-2618.

van Gils, J.A., A. Dekinga, B. Spaans, W.K. Vahl, and T. Piersma. 2005b. Digestive bottleneck affects foraging decisions in red knots (*Calidris canutus*). II. Patch choice and length of working day. Journal of Animal Ecology 74:120-130.

Ward, J.R. and K.D. Lafferty. 2004. The elusive baseline of marine disease: Are diseases in ocean ecosystems increasing? PLOS Biology 2(4):542-547.

Watts, B.D. 1998. An investigation of waterbirds within the Panama Canal Zone and the upper Bay of Panama. Center for Conservation Biology; College of William and Mary; Blacksburg, Virginia. CCBR-98-04.

Westbrooks, R.G. and J. Madsen. 2006. Federal regulatory weed risk assessment beach vitex (*Vitex rotundifolia* L.f.) assessment summary. U.S. Geological Survey Biological Research Division; Whiteville, North Carolina, and Mississippi State University; GeoResources Institute.

Western Hemisphere Shorebird Reserve Network (WHSRN). 2012. Site profiles. Available at: http://www.whsrn.org/sites/list-sites.

Wilson, A. 1829. Species 7. *Tringa rufa*. Red-breasted sandpiper; *Tringa cinerea*. Ashcoloured sandpiper. Pages 140-148 *in* American ornithology; or the natural history of the birds of the United States. Collins & Company; New York, New York.

Wilson, J., E. Aubry, C. Buidin, Y. Rochepault, and A.J. Baker. 2010. Three records of red knots, *Calidris canutus* possibly changing flyways. Wader Study Group Bulletin 117(3):192-193.

Woods Hole Oceanographic Institution (Woods Hole). 2012. Harmful algae: What are harmful algal blooms (HABs)? Available at: http://www.whoi.edu/redtide/home.

Zöckler, C. and I. Lysenko. 2000. Water birds on the edge: First circumpolar assessment of climate change impact on Arctic breeding water birds. World Conservation Press; Cambridge, United Kingdom. Available at: http://www.unep-wcmc.org/biodiversity-series-11_114.html.

Zwarts, L. and A.M. Blomert. 1992. Why knot *Calidris canutus* take medium-sized *Macoma balthica* when six prey species are available. Marine Ecology Progress Series 83:113-128.

Appendix A

Town Of Longboat Key, FL
Beach Renourishment

Proposed Conservation Measures for Shorebirds

Town Of Longboat Key, FL
Beach Renourishment

Proposed Conservation Measures for Shorebirds

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904-387-6114

12 May 2015

This document describes Conservation Measures proposed by the Town of Longboat Key to protect nesting, migratory, and over-wintering shorebirds along the Gulf of Mexico shoreline. The Town currently manages 10 miles of beaches along the Gulf (**Figure 1**), and as such holds or is seeking several different permits for beach nourishment projects along various segments of the island. Most notably, the Town holds FDEP Joint Coastal Permit 0296464-006 and USACE Permit SAJ-2009-03350 (IP-MEP)[1]. Longboat Key supports two federally-threatened non-breeding species, the piping plover (*Charadrius melodus*) and rufa red knot (*Calidris canuta* rufa), as well as several species of state-listed nesting shorebirds including snowy plover (*Charadrius nivosus*), least terns (*Sterna antillarum*), black skimmers (*Rynchops niger*), and numerous other species of terns. Red knots are found in Florida year round, but most frequently documented between November and May. The piping plover wintering and migration season is between July 15 and May 15.

In support of the Town's overall beach management plan and to develop information to improve the protection of the o federally-listed piping plover and red knot, „ the Town has developed a set of proposed Conservation Measures. It is important to recognize that shorebird habitat on Longboat Key is protected by the Town's existing rules and regulations which prohibit pets, campfires, and recreational motorized vehicle operation on the beach. These existing

[1] As of April 2015, the master permit is currently being reviewed for modification to allow for the nourishment of the central and southern segments of the island via upland truck-hauled sand sources. For these modifications, and the addition of the USFWS listing of the Rufa Red Knot as a Threatened species, reconsultation with the USFWS has been reinitiated for the master permit.

regulations currently provide habitat protection and reduce disturbance to shorebirds on the Town's beaches.

Figure 1 depicts the project area and the extended affected areas around Longboat Pass and New Pass. The affected area includes the sandy shorelines along the length of the island from the Gulf of Mexico Drive (S.R. 789) bridge east of R-42 in Manatee County to the terminal groin at New Pass south of R-29 in Sarasota County. In the cross shore, the affected area generally extends from the low-water line landward to the edge of development.

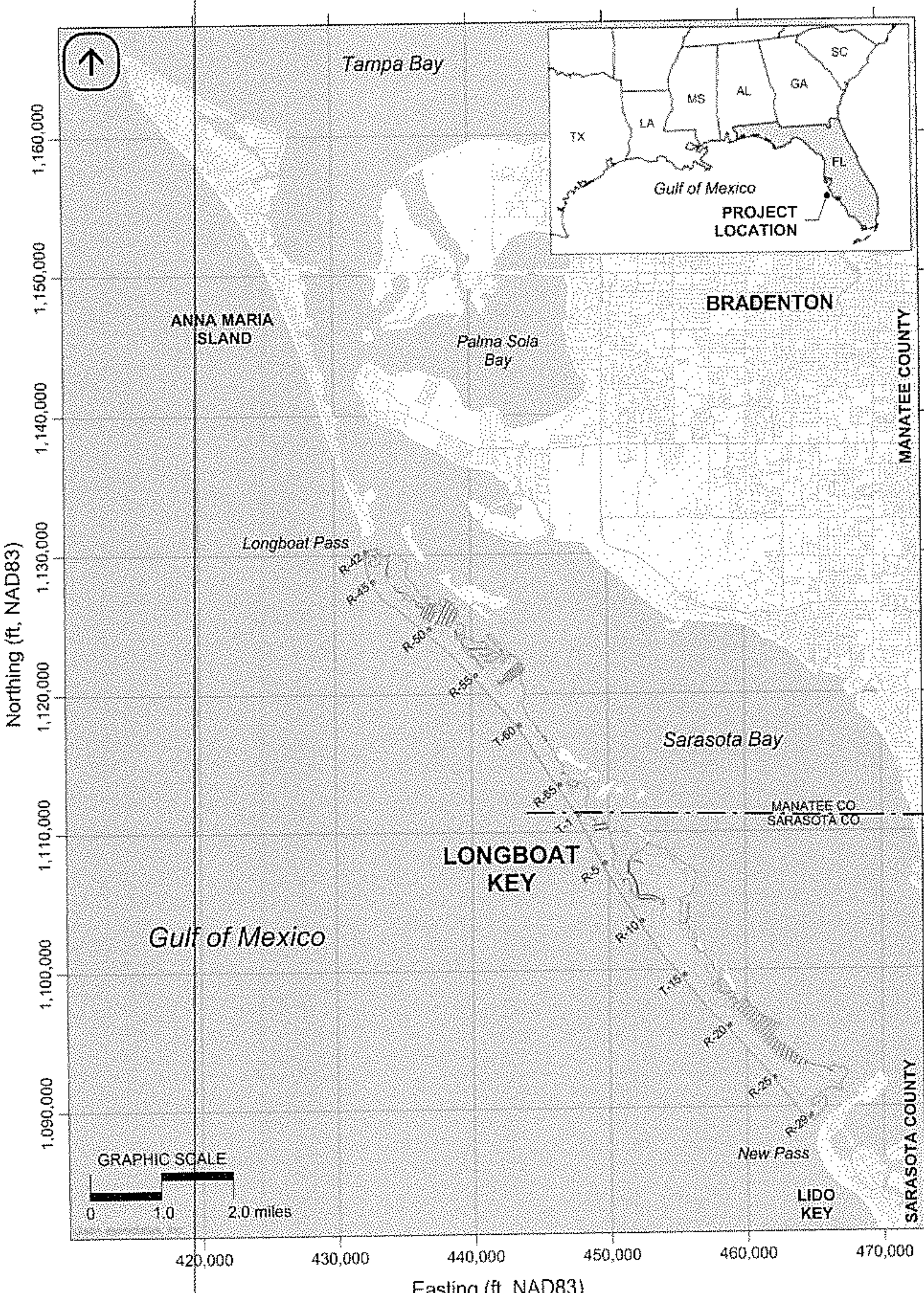

Figure 1 – Location Map, Longboat Key, FL

PART B: PROPOSED CONSERVATION MEASURES

1.0 Protection of Wrack

The Town recognizes the importance of protecting wrack -- stranded seaweed and other vegetative debris left by the high tides -- along the shoreline. Protection of wrack will minimize impacts to shorebird habitat occurring directly or indirectly by human disturbance and the proposed project(s). The Town will continue to take measures to protect wrack along its beaches and to educate the public, including tourists, private residents and condominium/hotel managers.

Measures include:

a) Discourage beach cleaning that impacts wrack.
   i. The Town presently does not conduct any beach cleaning activities other than the removal of hazardous materials and trash.
   ii. The Town does not conduct or regulate beach cleaning activities.
   iii. The Town presently does not allow access for private beach cleaning equipment on Town-owned beach access areas.

b) The Town will contact private property owners who remove the wrack on their beach to provide information regarding not only the importance of wrack, but also the following desired possibilities:
   i. Leaving a designated portion of wrack year round; and
   ii. Leaving the wrack from September 1st through May 1st.

c) Public education - The Town will publish information on the importance of wrack on the Longboat Key website, along with a link to the FWC site http://myfwc.com/Shorebirds which includes numerous links to educational materials regarding shorebirds and their protection, including
   i. coastal_beach_wrack.pdf
   ii. Share the Beach with Beach-nesting Birds
   iii. beach driving tips to avoid shorebirds

2.0 Minimization of Disturbance

The Town will seek opportunities to educate the beach-going public about bird disturbance and wrack protection (see 1.0 above). Educational efforts will including:

a) Educational signs will be installed highlighting the importance of beach habitats to wildlife and explaining the importance of the wrack along the shoreline. Examples will be obtained from the USFWS and FWC.

b) Prohibit fireworks, pets, and open fires along the beaches of Longboat Key

3.0 Driving on the Beach

The Town recognizes the need to minimize vehicular traffic on the beach and will seek to balance the need for health and safety on the beach, including emergency responders, against the potential disturbance of shorebirds. The Town supports the following measures:

a) The Town already closely regulates beach driving and only allows driving for emergency responders (including lifeguards) and limited ATV access for official Town-approved purposes (such as turtle and shorebird monitoring, beach monitoring).

b) Vehicles including all-Terrain Vehicles (ATVs) traversing the beach, used by beach life-guards, beach maintenance employees, turtle watch volunteers and law enforcement will avoid the soft sand areas in the wrack areas and follow the FWC's Beach Driving Best Management Practices:
http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/

c) Emergency vehicles shall have full access to the beach including the wrack areas.

4.0 Coordination

The Town will continue to support efforts to protect shorebirds along the Longboat Key beaches and work cooperatively with the USFWS, FWC, and local organizations. In conjunction with the monitoring program described below, the Town will establish a primary point of contact for the Town in regard to shorebird protection, to manage the stewardship of these measures. That individual will provide coordination between

a) the Town,
b) the USFWS,
c) the FWC,
d) the FDEP
e) the USACE
f) representatives of other groups (Audubon, Save our Shorebirds, etc.).

5.0 Monitoring

The Town will seek to implement a year-round shorebird monitoring program along the Gulf of Mexico shoreline. The program will identify locations of important foraging and roosting areas, in addition to nesting areas, and shall seek to identify optimal piping plover and red knot habitat in order to potentially reduce disturbance of wintering shorebirds during project activities -- to the maximum extent practicable.

In establishing the monitoring program, the following guidelines shall be considered, as developed in the USFWS Programmatic Piping Plover Biological Opinion (P3BO).

a) The person(s) conducting the survey must demonstrate the qualifications and ability to identify shorebird species and be able to provide the following:
   i. Date, location, time of day, weather, and tide cycle when survey was conducted;
   ii. Latitude and longitude of observed piping plover and red knot locations (decimal degrees preferred);
   iii. Any color bands observed on piping plovers;
   iv. Behavior of piping plovers and red knots (*e.g.*, foraging, roosting, preening, bathing, flying, aggression, walking);
   v. Landscape features(s) where piping plovers and red knots are located (*e.g.*, inlet spit, tidal creeks, shoals, lagoon shoreline);
   vi. Habitat features(s) used by piping plovers and red knots when observed (*e.g.*, intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation);
   vii. Substrata used by piping plovers and red knots (*e.g.*, sand, mud/sand, mud, algal mat);
   viii. The amount and type of recreational use (*e.g.*, people, dogs on or off leash, vehicles, kite-boarders); and
   ix. All other shorebirds/waterbirds seen within the survey area.

b) Monitoring Frequency
   i. Pre-construction – Prior to the first sand placement event, surveys shall occur three times per month for the first five months of this program (May/June to September/October 2015, approx.) along the entire Gulf of Mexico shoreline of Longboat Key. Surveys shall occur no less than 9 days apart, and shall capture both low tide and high tide events each month. After the completion of five months of pre-construction data, surveys shall continue twice per month through the completion of the first sand placement activities in each shoreline segment (expected to be

completed by 2016, approx.). Subsequent post-construction monitoring is described in item b(iii), below.

ii. Construction Periods - During construction events occurring between February 1 and August 30, daily surveys for nesting activity shall be conducted in the specific sand placement project areas, beginning February 1 or at least 10 days prior to construction start, whichever is later, and continuing through the end of construction or through August 30, whichever is earlier. The permit conditions provided by FWC for the protection of nesting and fledged shorebirds shall be adhered to. The 2x/month islandwide monitoring described in b(i) above would continue for the entire shoreline.

iii. Post-construction – Following completion of the last sand placement event planned as part of the current nourishment cycle (to occur by 2016, approx.), islandwide surveys by ATV shall occur twice per month for a period of two years, and terminating at the end of piping plover migration season in May (anticipated to be May 2018, approx.). Annual fall and spring migration piping plover and red knot abundance and distribution surveys will be conducted as a part of that effort along the entire island shoreline by vehicle (weather and tide permitting, no surveys should be conducted if sustained winds exceed 20 mph) once in early September and once in late March each season for two years post construction after the last placement event. Those surveys will be scheduled around the peak of migration and conducted around mid-tide when birds will still be foraging, making legs easier to see for re-sighting bands.

c) Reporting

i. Nesting shorebird reports shall be shared directly with USFWS and FWC personnel (as desired) and will be submitted in the appropriate format to the Florida Shorebird Database, generally on a monthly or more frequent basis. *https://public.myfwc.com/crossdoi/shorebirds/index.html*

ii. Wintering shorebird reports shall be prepared in EXCEL (typ.) format and shared directly with USFWS and FWC personnel (as desired), generally on a monthly or more frequent basis.

iii. The repositories for shorebird data may change or evolve in the future. The appropriate submittal procedures will be updated periodically.

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 5:
MANATEE CONDITIONS (2011)

2 PAGES

SAJ-2014-00606 (SP-MEP)

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK
2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or Vero Beach (1-772-562-3909) for south Florida, and to FWC at ImperiledSpecies@myFWC.com

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8 ½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to the email address listed above.

CAUTION: MANATEE HABITAT

All project vessels

IDLE SPEED / NO WAKE

When a manatee is within 50 feet of work
all in-water activities must

SHUT DOWN

Report any collision with or injury to a manatee:

Wildlife Alert:

1-888-404-FWCC(3922)

cell *FWC or #FWC

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 6:
SEA TURTLE AND SMALLTOOTH SAWFISH CONDITIONS (23 MAR 2006)

1 PAGE

SAJ-2014-00606 (SP-MEP)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 7:
SEDIMENT QA/QC PLAN (3 OCT 2014)

6 PAGES

SAJ-2014-00606 (SP-MEP)

SEDIMENT QUALITY ASSURANCE/QUALITY CONTROL PLAN
FOR BEACH PLACEMENT OF SEDIMENT FROM MAINTENANCE DREDGING

0298107-004-JC

Manatee County and Town of Longboat Key

Longboat Pass Navigational Maintenance Dredging and Beach Nourishment

October 3, 2014

A. INTRODUCTION

As indicated in the title above, this template plan is for use for beach placement of sediment from maintenance dredging of navigation channels and sediment impoundment basins. A different plan document will be used for beach restoration or nourishment using an offshore borrow area.

Pursuant to Fla. Admin. Code r. 62B-41.008 (1) (k) 4.b., permit applications for inlet excavation, beach restoration, or nourishment shall include a quality assurance/control plan that will ensure that the sediment from the borrow areas to be used in the project will meet the standard in Fla. Admin. Code r. 62B-41.007(2)(j) and (k). To protect the environmental functions of Florida's beaches, only beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system.

The Permittee has conducted geotechnical investigations that provide adequate data concerning the character of the sediment and the quantities available within the spatial limits of the permitted dredge cuts. The Permittee has provided an analysis of the existing or native sediment and the sediment within the permitted dredge cuts that demonstrates its compatibility with the naturally occurring beach sediment in accordance with Fla. Admin. Code r. 62B-41.007(2)(j) and (k).

Based upon this information and the design of the maintenance dredge project, the Department of Environmental Protection (Department) has determined that beach placement of the sediment from the dredge area(s) will maintain the general character and functionality of the sediment occurring on the beach and in the adjacent dune and coastal system. However, sediment from some dredge cuts may not be suitable for beach placement; these cuts are indicated in the permit approved plans. Furthermore, this information and the channel design provides sufficient quality assurance/quality control (QA/QC) that the mean grain size and carbonate content of the sediment from the dredge cuts will meet the requirements of Fla. Admin. Code r. 62B-41.007(2)(j) and (k); hence, additional QA/QC procedures are not required for these sediment parameters during construction.

This plan outlines the responsibilities of each stakeholder in the project as they relate to the placement of beach compatible material on the beach. These responsibilities are in response to the possibility that non-beach compatible sediments may exist within the dredge cuts and could be unintentionally placed on the beach. The QC Plan specifies the minimum construction management, inspection, and reporting requirements placed on the Marine Dredging Contractor and enforced by the Permittee, to ensure that the sediment to be placed on the beach from the dredge cuts meet the compliance specifications. The QA Plan specifies the minimum construction oversight, inspection, and reporting requirements to be undertaken by the Permittee or the Permittee's On-Site Representative to observe, sample, and test the placed sediments to verify the sediments are in compliance.

B. SEDIMENT QUALITY SPECIFICATIONS

The sediment from the dredge cut(s) is similar in Munsell color and grain size distribution to the material in the existing coastal system at the beach placement site. The Department and the Permittee acknowledge that it is possible that discrete occurrences of non-beach compatible sediments may exist within the permitted dredge cuts that do not comply with the limiting parameters of Fla. Admin. Code r. 62B-41.007(2)(j) 1. – 5. and (k), or vary in Munsell color from the composite value. Furthermore, the Department and may consider more restrictive values for the sediment parameters to ensure that the sediment from the dredge cuts is similar in color and grain size distribution to the sediment in the existing coastal system at the beach placement site. Specifically, although Fla. Admin. Code r. 62B-41.007(2)(k), deems sediment from maintenance dredging containing up to a 10% fine material passing the #230 sieve to be suitable for beach placement, a compliance value of less than 10% is necessary to meet water quality standards and maintain the general character and environmental functions of the existing beach. Therefore, fill material compliance specifications for the sediment from the borrow area(s) proposed for this project are provided in Table 1.

The compliance specifications take into account the variability of sediment on the native or existing beach, and are values which may reasonably be attained given what is known about the sediment from the dredge cuts. Beach fill material which falls outside of these limits will be considered unacceptable and subject to remediation.

Table 1- Sediment Compliance Specifications

Sediment Parameter	**Parameter Definition**	**Compliance Value**
Max. Silt Content	passing #230 sieve	**10%**
Max. Shell Content*	retained on #4 sieve	**15%**
Munsell Color Value	moist Value (chroma = 1)	**6 or lighter**
The beach fill material shall not contain construction debris, toxic material, or other foreign matter.		

*Shell Content is used as the indicator of fine gravel content for the implementation of quality assurance/quality control procedures.

C. Quality Control Plan

The contract documents shall incorporate the following technical requirements, or equivalent language that addresses the location of dredging, sediment quality monitoring on the beach, and, if necessary, remedial actions. The Permittee will seek to enforce these contract requirements during the execution of work.

1. **Electronic Positioning and Dredge Depth Monitoring Equipment**. The Contractor will continuously operate electronic positioning equipment, approved by the Permittee, to monitor the precise positioning of the excavation device location(s) and depth(s). A Differential Global Positioning System (DGPS) or equivalent system providing equal or better accuracy will be used to determine the horizontal position and will be interfaced with an appropriate depth measuring device to determine the vertical position of the bottom of the excavation device. The horizontal positioning equipment will maintain an accuracy of +/- 3.0 feet. The vertical positioning equipment will maintain a vertical accuracy of +/-0.5 feet with continuous applicable tidal corrections measured at the project site.

2. **Dredge Location Control**. The Contractor is required to have, in continuous operation on the dredge, electronic position recording equipment that will accurately compute and plot the position of the dredge's excavation device. Such fixes, and the accompanying plots, will be furnished to the Permittee's on-site representative daily as part of the QC Reports. A printout of the excavation device positions in State Plane Coordinates, the excavation device depths corrected for tide elevation and referenced to the North American Vertical Datum of 1988 (NAVD 88) and the time, will be maintained using an interval of two (2) minutes for each printed fix. A printed and computer file (in ASCII format) copy of the position data will be provided to the Engineer as part of the daily report. The Contractor will prepare a plot of the data that includes the State Plane Coordinate grid system and the borrow area limits. The format of the plot may be subject to approval by the Permittee. No dredging will take place outside of the dredge cut limits (horizontal and vertical limits) as shown on the drawings.

3. **Dredging Observation.** The Contractor will be responsible for establishing such control as may be necessary to insure that the allowable excavation depths and spatial limits are not exceeded. If the Contractor encounters noncompliant sediment during dredging, the Contractor will immediately cease dredging, relocate the dredge into compliant sediment, and will verbally notify the Permittee's On-site Representative, providing the time, location, and description of the noncompliant sediment. The Contractor will also report any encounters with noncompliant sediment in the Contractor's Daily Report, providing depth and location in State Plane Coordinates of said materials

within the dredge cut(s). The Contractor, in cooperation with the Permittee's Engineer, will use the dredge positioning records, plans, and vibracore descriptions to determine where the Contractor may dredge to avoid additional beach placement of noncompliant sediment. The Contractor will adjust his or her construction operation to implement processing and material handling methods to sequester and remove the noncompliant sediment.

4. **Beach Observation**. The Contractor will continuously visually monitor the sediment being placed on the beach. If noncompliant sediment is placed on the beach, the Contractor will immediately cease dredging, relocate the dredge into compliant sediment, and verbally notify the Permittee's On-site Representative, providing the time, location, and description of the noncompliant sediment. The Contractor will also report any encounters with noncompliant sediment in the Contractor's Daily Report, providing depth and location in State Plane Coordinates of said materials within the dredge cut(s). The Contractor will take the appropriate remediation actions as directed by the Permittee or Permittee's Engineer.

5. **Vibracore Logs and Grain Size Data.** The Contractor will be provided with all descriptions of sediment vibracore borings and/or sediment samples collected within the dredge cut(s), and will acknowledge that he or she is aware of the quality of the sediment as described in the sediment testing. These logs and/or grain size data will be presented in the construction specifications.

6. **Noncompliant Material Handling Provision.** The Contractor shall have plans and equipment available for use to handle any noncompliant material encountered during dredging.

D. QUALITY ASSURANCE PLAN

The Permittee will seek to enforce the construction contract and Department permits related to sediment quality. In order to do so, the following steps shall be followed:

1. **Construction Observation.** Construction observation by the Permittee's On-Site Representative will be performed at least twice per day during periods of active construction. Most observations will be conducted during daylight hours; however, random nighttime observations shall be conducted.

2. **On-Site Representative.** The Permittee will provide on-site observation by individuals with training or experience in beach nourishment and construction observations, and who are knowledgeable of the project design and permit conditions.

3. **Pre-Construction Meeting.** The project QA/QC Plan will be discussed as a matter of importance at the pre-construction meeting. The Contractor will be required to acknowledge the goals and intent of the above described QA/QC Plan, in writing, prior to commencement of construction. The Contractor shall continuously ensure beach fill material is in compliance with this Sediment QA/QC Plan.

4. **Contractor's Daily Reports.** The Engineer will review the Contractor's Daily Reports which characterize the nature of the sediments encountered at the borrow area and placed along the project shoreline with specific reference to moist sand color and the occurrence of rock, rubble, shell, silt or debris that exceeds acceptable limits. The Engineer will review the dredge positions in the Contractor's Daily Report.

5. **On Call.** The Engineer will be continuously on call during the period of construction for the purpose of making decisions regarding issues that involve QA/QC Plan compliance.

6. **Addendums.** Any addendum or change order to the Contract between the Permittee and the Contractor will be evaluated to determine whether or not the change in scope will potentially affect the QA/QC Plan.

7. **During Construction Sampling for Visual Inspection.** To assure that the fill material placed on the beach is in compliance with the permit, the Permittee's Engineer or On-Site Representative will conduct assessments of the beach fill material as follows:

a. During excavation and fill placement activities, the Permittee's On-Site Representative will collect a sediment sample at not less than 200-foot intervals of newly constructed berm to visually assess grain size, Munsell color, shell content, and silt content. The sample shall be a minimum of 1 U.S. pint (approximately 200 grams). This assessment will consist of handling the fill material to ensure that it is predominantly sand, to note the physical characteristics, and to assure the material meets the sediment compliance parameter specified in this Plan. If deemed necessary, quantitative assessments of the sand will be conducted for grain size, silt content, shell content and Munsell color using the methods outlined in section D.8.b. Each sample will be archived with the date, time, and location of the sample. The results of these daily inspections, regardless of the quality of the sediment, will be appended to or notated on the Contractor's Daily Report. All samples will be stored by the Permittee for at least 60 days after project completion.

b. If the Permittee or Engineer determines that the beach fill material does not comply with the sediment compliance specifications in this QA/QC Plan, the Permittee or Engineer will immediately instruct the Contractor to cease material excavation operations and take whatever actions necessary to avoid further beach placement of noncompliant sediment. The Contractor, in cooperation with the Permittee's Engineer, will use the dredge positioning records, plans, and vibracore descriptions to determine where the Contractor may dredge to avoid additional beach placement of noncompliant sediment. The sediment inspection results will be reported to the Department.

8. **Post-Construction Sampling for Laboratory Testing.** To assure that the fill material placed on the beach was adequately assessed by the channel investigation and design, the Project Engineer will conduct assessments of the sediment as follows:

a. Post-construction sampling of each acceptance section and testing of the fill material will be conducted to verify that the sediment placed on the beach meets the expected criteria/characteristics provided from the geotechnical investigation. Upon completion of an acceptance section of constructed beach, the Engineer will collect two (2) duplicate sand samples at each Department reference monument profile line to quantitatively assess the grain size distribution, moist Munsell color, shell content, and silt content for compliance. The Engineer will collect the sediment samples of a minimum of 1 U.S. pint (at least 200 grams) each from the bottom of a test hole a minimum of 18 inches deep within the limits of the constructed berm. The Engineer will visually assess grain size, Munsell color, shell content, and silt content of the material by handling the fill material to ensure that it is predominantly sand, and further to note the physical characteristics. The Engineer will note the existence of any layering or rocks within the test hole. One sample will be sent for laboratory analysis while the other sample will be archived by the Permittee. All samples and laboratory test results will be labeled with the Project name, FDEP Reference Monument Profile Line designation, State Plane (X,Y) Coordinate location, date sample was obtained, and "Construction Berm Sample."

b. All samples will be evaluated for visual attributes (Munsell color and shell content), sieved in accordance with the applicable sections of ASTM D422-63 (Standard Test Method for Particle-Size Analysis of Soils), ASTM D1140 (Standard Test Method for Amount of Material in Soils Finer than No. 200 Sieve), and ASTM D2487 (Classification of Soils for Engineering Purposes), and analyzed for carbonate content. The samples will be sieved using the following U.S. Standard Sieve Numbers: 3/4", 5/8", 7/16", 5/16", 3.5, 4, 5, 7, 10, 14, 18, 25, 35, 45, 60, 80, 120, 170, 200 and 230.

c. A summary table of the sediment samples and test results for the sediment compliance parameters shall accompany the complete set of laboratory testing results. The column headings will include: Sample Number; Mean Grain Size (mm); Sorting Value; Silt Content (%); Shell Content (%); Munsell Color Value; and a column stating whether each sample MET or FAILED the compliance values found in Table 1. The sediment testing results will be certified by a P.E or P.G. The Permittee will submit sediment testing results and analysis report to the Department within 90 days following beach construction.

d. In the event that a section of beach contains fill material that is not in compliance with the sediment compliance specifications, then the Department will be notified. Notification will indicate the volume, aerial extent and location of any unacceptable beach areas and remediation planned.

E. REMEDIATION

1. **Compliance Area.** If a sample does not meet the compliance value for construction debris, toxic material, or other foreign material, the Permittee shall determine the aerial extent and remediate regardless of the extent of the noncompliant material. If a sample is noncompliant for the silt content, shell content, coarse gravel/rock or Munsell color and the aerial extent exceeds 10,000 square feet, the Permittee shall remediate.

2. **Notification.** If an area of newly constructed beach does not meet the sediment compliance specifications, then the Department (JCPCompliance@dep.state.fl.us) will be notified. Notification will indicate the aerial extent and location of any areas of noncompliant beach fill material and remediation planned. As outlined in section E.4. below, the Permittee will immediately undertake remediation actions without additional approvals from the Department. The results of any remediation will be reported to the Department following completion of the remediation activities and shall indicate the volume of noncompliant fill material removed and replaced.

3. **Sampling to determine extent.** In order to determine if an area greater than 10,000 square feet of beach fill is noncompliant, the following procedure will be performed by the Engineer:

a. Upon determination that the first sediment sample is noncompliant, at minimum, five (5) additional sediment samples will be collected at a 25-foot spacing in all directions and assessed. If the additional samples are also noncompliant, then additional samples will be collected at a 25-foot spacing in all directions until the aerial extent is identified.
b. The samples will be visually compared to the acceptable sand criteria. If deemed necessary by the Engineer, quantitative assessments of the sand will be conducted for grain size, silt content, shell content, and Munsell color using the methods outlined in section D.8.b. Samples will be archived by the Permittee.
c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of noncompliant fill.
d. The total square footage will be determined.
e. The site map and analysis will be included in the Contractor's Daily Report.

4. **Actions.** The Permittee or Permittee's Engineer shall have the authority to determine whether the material placed on the beach is compliant or noncompliant. If placement of noncompliant material occurs, the Contractor will be directed by the Permittee or Permittee's Engineer on the necessary corrective actions. Should a situation arise during construction that cannot be corrected by the remediation methods described within this QA/QC Plan, the Department will be notified. The remediation actions for each sediment parameter are as follows:

a. Silt: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value, or removing the noncompliant fill material and replacing it with compliant fill material.
b. Shell: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value or removing the noncompliant fill material and replacing it with compliant fill material.
c. Munsell color: blending the noncompliant fill material with compliant fill material within the adjacent construction berm sufficiently to meet the compliance value or removing the noncompliant fill material and replacing it with compliant fill material.
d. Coarse gravel: screening and removing the noncompliant fill material and replacing it with compliant fill material.
e. Construction debris, toxic material, or other foreign matter: removing the noncompliant fill material and replacing it with compliant fill material.

All noncompliant fill material removed from the beach will be transported to an appropriate upland disposal facility located landward of the Coastal Construction Control Line.

5. **Post-Remediation Testing.** Re-sampling shall be conducted following any remediation actions in accordance with the following protocols:

a. Within the boundaries of the remediation actions, samples will be taken at maximum of 25-foot spacing.

b. The samples will be visually compared to the acceptable sand criteria. If deemed necessary by the Engineer, quantitative assessments of the sand will be conducted for grain size, silt content, and Munsell color using the methods outlined in section D.8.b. Samples will be archived by the Permittee.
c. A site map will be prepared depicting the location of all samples and the boundaries of all areas of remediation actions.

6. **Reporting.** A post-remediation report containing the site map, sediment analysis, and volume of noncompliant fill material removed and replaced will be submitted to the Department within 7 days following completion of remediation activities.

All reports or notices relating to this permit shall be emailed and sent to the Department at the following locations:
DEP Bureau of Beaches & Coastal Systems
JCP Compliance Officer
Mail Station 300
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000
phone: (850) 414-7716
e-mail: JCP Compliance@dep.state.fl.us

End of Plan

FDEP Approved Version dated November 17, 2014

APPENDIX A - PERMITS

USACE PERMIT ATTACHMENT 8:
HARDBOTTOM BIOLOGICAL MONITORING PLAN
(REVISED OCT 2020)

NOT TO BE IMPLEMENTED BY CONTRACTOR;
MONITORING WILL BE PERFORMED BY OTHERS

28 PAGES

JCP #0298107-010-JN

APPROVED
Biological
Monitoring Plan
Permit#: 0298107-010-JN
Approved: October 22, 2020
Beaches Inlets and Ports Program

Biological Monitoring Plan

Longboat Pass Navigational Maintenance Dredging Project

FDEP Permit No. 0298107-009-JN

USACE Permit No. SAJ-2014-00606

October 2020

Table of Contents

1.0 INTRODUCTION

The Longboat Pass Navigational Maintenance Dredging Project authorized by Florida Department of Environmental Protection (FDEP) Permit No. 0298107-009-JN includes the dredging of a navigation channel in Longboat Pass with sediment placement along the adjacent Manatee County shorelines, including the south end of Anna Maria Island and the north end of Longboat Key (Figure 1). The dredge area for the project is the Longboat Pass Channel. The sediment placement areas include previously permitted and constructed fill areas along approximately 2 miles of the southern Anna Maria Island shoreline between R-30 and R-41+305 and about 1.4 miles on the north end of Longboat Key between R-43.5 and R-50.5 (Figure 1). The placement location and fill volume will vary between maintenance dredging events depending on the timing and volume removed from the channel, but following each dredge event, dredged material will be placed within either (or both) of the two templates.

The sand placement areas on Anna Maria Island (Coquina Beach) and Longboat Key (north end) have previously been nourished and permitted as well as unpermitted impacts to nearshore hardbottom have been mitigated through construction of artificial reefs, as described at the openings of Sections 3.0 and 4.0. Given that the permitted equilibrium toe of fill (ETOF) in the areas of hardbottom resources for each of the project areas is the same or landward of previously permitted ETOFs for nourishment projects in this area, the Longboat Pass Navigational Maintenance Dredging Project is not expected to impact any unmitigated hardbottom. Still, several areas of artificial (mitigative) reef and unmitigated natural hardbottom are present in Gulf of Mexico waters offshore Anna Maria Island and Longboat Key and their proximity to the permitted ETOFs indicates this nearshore hardbottom is potentially under the influence of the proposed project. As such, monitoring of hardbottom resources (natural and artificial) within areas under the influence of the project (updrift, downdrift, and adjacent to the ETOF as well as within the mixing zone at both placement sites) will be conducted to document potential unanticipated impacts if they occur. This monitoring plan has been developed to address the potential direct and/or indirect impacts to the nearshore hardbottom communities and the mitigative artificial reefs beyond the permitted ETOF.

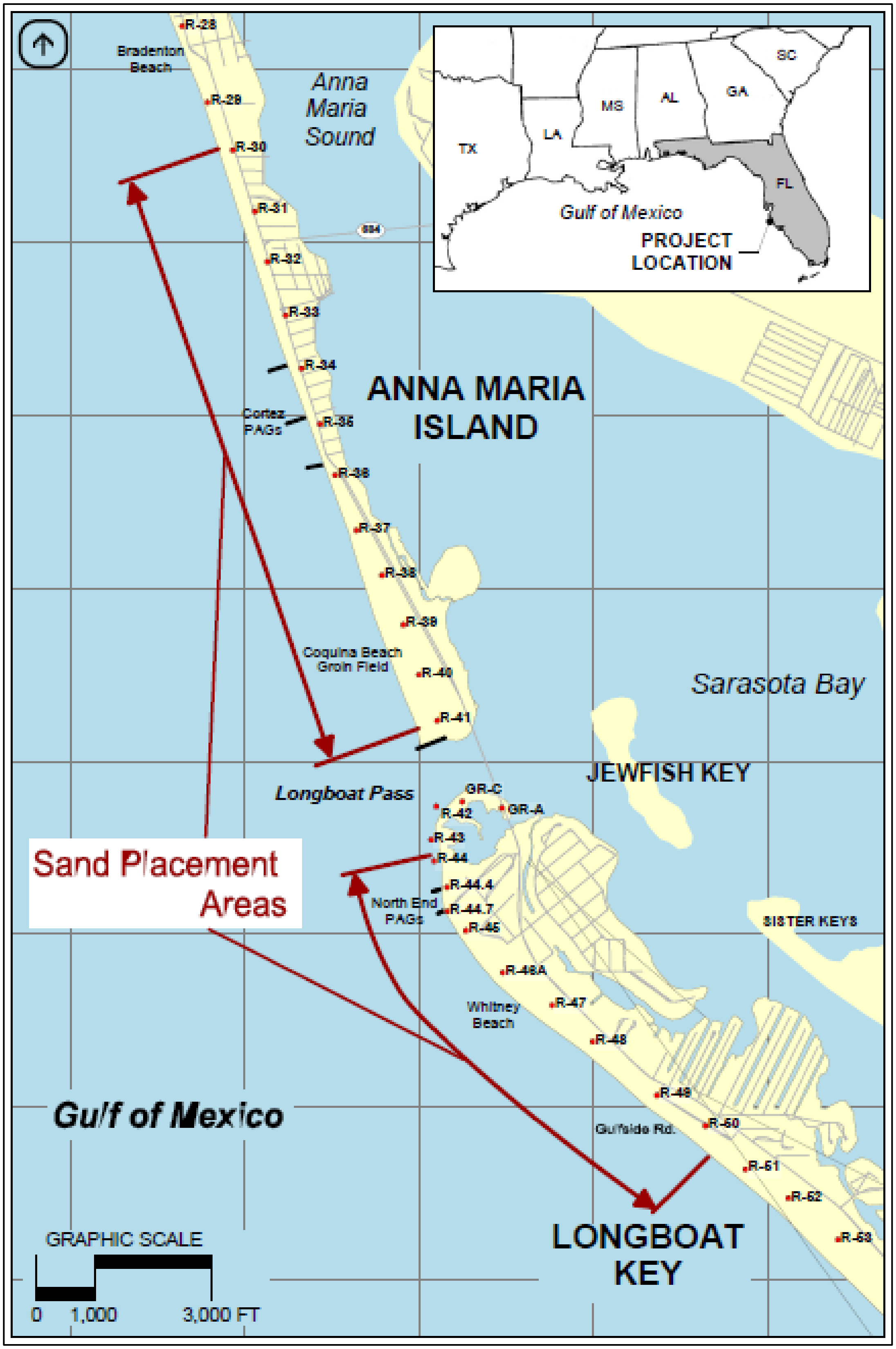

Figure 1. Longboat Pass Navigational Maintenance Dredging Project location.

2.0 MONITORING METHODS

The methods described below will be used to monitor artificial reefs adjacent to the Anna Maria Island project area and natural hardbottom and artificial reefs adjacent to the Longboat Key project area; details specific to each project area are provided in Sections 3.0 and 4.0, respectively. Section 5.0 summarizes the monitoring schedule and reporting requirements.

2.1 Monitoring Transects Beyond the ETOF

The following methods will be utilized on the monitoring transects located outside the ETOF in order to determine any project-related impacts to natural hardbottom and artificial reef habitats from the Longboat Pass Navigational Maintenance Dredging Project. All transects located on natural hardbottom will be permanently established. Artificial reef monitoring will include a combination of permanent transects and additional temporary line-intercept transects. Transect details for the Anna Maria Island and Longboat Key project areas are provided in Sections 3.0 and 4.0, respectively.

2.1.1 Line-Intercept

2.1.1.1 Natural Hardbottom Transects

Line-intercept data will be collected along each permanent nearshore hardbottom transect outside of the ETOF to document larger areas of uninterrupted sand (physical transitions along the monitoring transects between sand and hardbottom) and to track changes in sediment cover on the hardbottom. During each monitoring event, the landward and seaward position of each sand patch / trough at least 0.5 m in length shall be recorded along each transect by reference to transect tape meter marks. Meter mark references will be to one decimal place (e.g., patch from 2.4 to 3.2 m).

2.1.1.2 Mitigative Artificial Reef Transects

To measure the percentage of hardbottom present within the delineated boundary (gross acreage) of each artificial reef, line-intercept data will be collected along permanent and temporary transects during each monitoring event. For the line-intercept survey, a diver shall swim the length of each transect (permanent and temporary) on each mitigative reef. During the swim, the diver shall note the location along the transect tape and measure the linear extent of all artificial hardbottom (limestone boulders) and sand gaps between boulders. Meter mark references will be to one decimal place (e.g., patch from 2.4 to 3.2 m). Following each monitoring event, the percentage of each transect line accounted for by boulders (hardbottom) and by gaps/sand will be calculated for each transect on each mitigative reef.

2.1.2 Interval Sediment Depth

These measurements document sediment dynamics – specifically sediment movement and changes - along each natural hardbottom transect beyond the ETOF. Sediment depth data will be collected at 1-m intervals along each of the natural hardbottom transects located outside of the ETOF. This method will not be used on artificial reef transects. Sediment depth measurements shall be rounded to the nearest cm (i.e., sand thickness of less than 0.5 cm will be recorded as 0, while sand thickness greater than 0.5 cm but equal or less than 1 cm will be recorded as 1 cm, etc.). Measurements greater than 30 cm will be recorded as > 30 cm. Sediment depth measurements shall be taken along the entire length of each natural hardbottom transect including sand patches.

2.1.3 Benthic Characterization (BEAMR)

The Benthic Ecological Assessment for Marginal Reefs (BEAMR) method (Lybolt and Baron, 2006) is a quadrat-based assessment technique used to evaluate the benthic cover of macroalgal dominated marginal reefs and hardbottom formations. BEAMR samples three characteristics of the benthos: physical structure, planar percent cover of sessile benthos, and coral density. Physical characteristics recorded from quadrats include the maximum topographic relief (cm) and the maximum sediment depth (cm). Estimates of the planar percent cover of all sessile benthos are pooled to 19 major functional groups that include: sediment, macroalgae, turf algae and cyanobacteria, encrusting red algae, sponge, hydroid, octocoral, stony coral, tunicate, bare hard substrate, anemone, barnacle, bryozoan, bivalve, Millepora spp., seagrass, sessile annelid, wormrock, and zoanthid.

Datasheets for BEAMR sampling have a standardized layout that prompts biologists to enter data in all fields. The maximum diameter (cm) and species of each stony coral (Scleractinia), and the maximum height and genus of each soft coral (Octocorallia), is recorded. The minimum area cover estimate in BEAMR methodology is 1%, based on presence; therefore, the area cover of organisms representing less than 1% is necessarily overestimated. Furthermore, macroalgae percent cover data are augmented by a breakdown of all genera exhibiting at least 1% cover, and sediment descriptors are collected describing the general texture (e.g. sand, shell-hash, or mud). As with all non-consumptive surveys, BEAMR is necessarily constrained to visually conspicuous organisms with well-defined, discriminating characteristics for identification.

BEAMR samples will be collected within permanently placed 0.5-m2 quadrats along natural hardbottom transects adjacent to the Longboat Key project area. No biological data is required on Anna Maria Island artificial reef transects, which will consist only of physical data (i.e. line-intercept data). The location of transects and number of quadrats to be sampled per transect for the Longboat Key project area are described in Section 4.0.

2.1.4 Video Documentation

Video surveys shall be conducted along all permanent monitoring transects using a digital video camera in a waterproof housing. Video of the seafloor along each transect will progress no faster than 5 m per minute at a height of 40 cm above the hardbottom along each transect line. A 360º panoramic view shall also be recorded both at the beginning and at the end of each transect.

2.2 Video Transects within the ETOF

Video will be collected on the monitoring transects located within the ETOF in order to document any burial and exposure of these communities. This information is not required by FDEP, as impacts to these resources have already been offset through construction of mitigative artificial reefs. As such, this information will not be used to determine project impact, but may help better understand the movement of sand following construction of beach nourishment projects. Video will also be collected along permanent artificial reef transects.

2.3 In-Situ Hardbottom and Mitigative Artificial Reef Delineation

In order to quantify changes in hardbottom exposure, divers will delineate natural hardbottom and artificial reefs during each monitoring survey. Biologists will base hardbottom investigations on the most recent, clear aerial imagery available and/or previous habitat delineations. To map the hardbottom edge, divers will follow the edge of the hardbottom or perimeter of the artificial reef around the full extent of each formation while towing a buoy with a DGPS antenna mounted on top, attached by cable to a positioning system, interfaced with Hypack Navigational Software. The buoy will be on the shortest possible tether. If sand cover over the hardbottom is intermittent and benthic components are protruding through the sand, the area is still considered to be a hardbottom resource; in this scenario, the hardbottom edge will be delineated as the edge of the area where benthic components are protruding from the sand. Following delineation, the gross acreage (area within the delineated boundary) shall be determined for each mitigative reef.

3.0 ANNA MARIA ISLAND MONITORING PROTOCOL

When sand dredged from the Longboat Pass Navigational Maintenance Dredging Project is placed on the Anna Maria Island fill placement area (Figure 1), post-construction mitigative artificial reef monitoring will be required. Several areas of natural and artificial (mitigative) hardbottom are present in Gulf of Mexico waters offshore Anna Maria Island; this section describes these hardbottom resources and details how methods in Section 2.0 will be implemented for monitoring the mitigative artificial reefs. Section 4.0 describes Longboat Key's hardbottom resources and the specific monitoring protocols associated with placement of sand on Longboat Key. The monitoring schedule and reporting requirements are summarized in Section 5.0.

3.1 Existing Hardbottom Resources

3.1.1 Natural Hardbottom

Nearshore hardbottom habitat is present along the southern shoreline of Anna Maria Island, adjacent to Coquina Beach between FDEP monuments R-35 and R-39. These hardbottom resources are comprised primarily of scattered limestone outcroppings ranging from low-relief, well-scoured areas to some offshore isolated areas of higher relief (up to 2 ft). The benthic community is typically dominated by turf algae and macroalgae, with moderate tunicate and sponge cover. The octocorals *Leptogorgia virgulata* and *L. hebes* are commonly found in this habitat; these colonies remain small (<5 cm) on areas which experience frequent burial and may grow to 20-30 cm in isolated areas of higher relief farther offshore. Scleractinian corals such as *Solenastrea hyades* and *Phyllangia americana* are occasionally observed on the exposed hardbottom but are restricted to offshore areas of higher relief that escape sedimentation. Several fish utilize the nearshore hardbottom resources off Anna Maria Island, including sheepshead (*Archosargus probatocephalus*), red grouper (*Epinephelus morio*) and belted sandfish (*Serranus subligarius*).

The nearshore hardbottom described above (seaward of the 2014 ETOF) was impacted (unpermitted) by the 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project and its 2014 Extension Modification (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN, respectively). Manatee County has committed to offset the acreage of unpermitted impacts as well as the small amount of unimpacted hardbottom that remains by constructing a mitigative artificial reef. Mitigating for all natural hardbottom seaward of the ETOF in the Anna Maria Island project area eliminates the need to monitor these resources. As such, Administrative Modification No. 0298107-010-JN removes natural hardbottom monitoring requirements for the Anna Maria Island project area from this Plan (Section 3.0). Mitigative reef monitoring is still required and methods are specified below.

3.1.2 Mitigative Artificial Reefs

Three artificial reefs, built as mitigation for previous Anna Maria Island beach nourishment projects, sit immediately seaward of the ETOF at Coquina Beach (Figure 2). Background information on each reef is provided below.

3.1.2.1 1993 Artificial Reef

The 1993 Artificial Reef (initially designated the "Nearshore Artificial Reef") was one of two reefs (the other was built one mile offshore) constructed by Manatee County to offset permitted direct impacts to seven (7) acres of nearshore hardbottom within the ETOF of the 1992/1993 Anna Maria Island Beach Restoration Project (Wetland Resource Permit No. 411728169 and Coastal Construction Permit No. DBS 900260). The 1993 Artificial Reef was constructed approximately 304.8 m (1,000.0 ft) from the shoreline between R-38 and R-39, at a water depth of 4.9 m to 5.2 m (16.0 ft to 17.0 ft) (NAVD) (Figure 2). Approximately 15,000 tons of clean concrete material were placed over a 6.7-acre area. Vertical relief at the reef ranged from 0.2 m to 2.4 m (0.5 ft to 8.0 ft), with an average relief of 0.8 m (2.9 ft). The 1993 Artificial Reef was monitored for success following the initial 1992/1993 Beach Nourishment Project and to document potential impacts (if occurring) following the 2005 Beach Nourishment Project and the 2014 nourishment of Coquina Beach.

3.1.2.2 2005 Artificial Reef

The 2005 Artificial Reef was constructed to offset additional impacts (beyond those predicted) from the 1992/1993 Anna Maria Island Beach Restoration Project and to offset additional impacts (beyond those predicted) due to the 2002 Anna Maria Island Beach Nourishment Project (Permit No. 0039378-001-JC). In total, FDEP required Manatee County to provide 0.45 acres of mitigation to offset 0.65 acres of impacts to nearshore hardbottom. Construction of the 2005 Artificial Reef was completed in February 2005 using limestone boulders with a vertical dimension of approximately 0.9 m to 1.2 m (3.0 ft to 4.0 ft). The 2005 Artificial Reef is located approximately 274.0 m (900.0 ft) from the shoreline between R-36 and R-37 and 30.5 m (100.0 ft) from exposed, natural hardbottom communities, at a water depth of 3.4 m to 4.6 m (11.0 ft to 15.0 ft) (NAVD) (Figure 2). Approximately 1,525 tons of material were placed over a 0.50-acre site. The 2005 Artificial Reef was monitored quarterly for one year following its construction and once more in summer 2007 to document success in compliance with FDEP permit requirements. It was also monitored to document potential impacts (if occurring) following the 2014 Coquina Beach Nourishment Project.

3.1.2.3 2011 Artificial Reef

The 2011 Artificial Reef, which consists of two separate artificial reef complexes, was constructed to offset permitted direct (1.05 ac) and indirect (3.45 ac) impacts to nearshore hardbottom due to the initial 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project (FDEP Permit No. 0281452-001-JC). This artificial reef was constructed between R-35 and R-39, approximately 335 m (1100 ft) offshore of Coquina Beach in water depths ranging from 4.9 m to 5.5 m (16.0 ft to 18.0 ft) (NAVD) (Figure 2). The FDEP required 4.87 gross acres of mitigation to be constructed to offset the total 4.5 gross acres of impacts. Line-intercept surveys conducted within the area of impact prior to construction revealed hardbottom accounted for 68% of the area and the net acreage of required mitigation was set at 3.31 acres.

The 2011 Artificial Reef was constructed of limestone boulders approximately 0.9 m to 1.4 m (3.0 ft to 4.5 ft) in vertical dimension from September through December 2011. Following construction, the as-built survey indicated a total of 5.16 gross acres had been constructed and line-intercept surveys revealed that hardbottom (boulders), on average, accounted for 80% of the area (CPE, 2012), exceeding the permit-required 68% coverage by 12%. The 4.13 net acres constructed was 0.82 net acres more than the net 3.31 acres required by the permit and the FDEP agreed that the 0.82 net acres of excess mitigation could be applied to impacts caused by future projects.

An impact analysis conducted for the revised 2014 City of Anna Maria Nourishment and Coquina Beach Restoration Project (FDEP Permit Modification No. 0281452-005-JN) indicated the proposed project would impact 0.52 net acres of nearshore hardbottom in two unmitigated regions beyond (outside) the 2009 ETOF but within the 2014 ETOF. The areas were located between R-35 and R-36 and in the vicinity of R-38. The FDEP agreed that 0.52 acres of upfront mitigation could be applied from the 0.82 acres of excess mitigation, leaving 0.30 net acres of excess mitigation remaining.

3.1.2.4 Additional Impacts and New Mitigative Artificial Reef

Unmitigated nearshore hardbottom seaward of the 2014 ETOF was impacted (unpermitted) by the 2011 City of Anna Maria Nourishment and Coquina Beach Restoration Project and its 2014 Extension Modification (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN, respectively). The total remaining excess of 0.30 acres of mitigation from the 2011 Mitigative Artificial Reef will be used to partially offset these impacts. Manatee County has committed to offset the remaining acreage of unpermitted impacts as well as the small amount of unimpacted hardbottom by constructing a mitigative artificial reef. The new mitigative artificial reef will be permitted and constructed as part of the next City of Anna Maria Island Coquina Beach Nourishment Project for which planning is already underway.

3.2 Mitigative Artificial Reef Monitoring Methods

Mitigative artificial reef monitoring will consist of collecting physical and biological (video) data during post-construction monitoring events (years 1, 2, and 3) following each sand placement event. Each of the three (3) mitigative artificial reefs adjacent to the Coquina Beach section of the project template (1993, 2005, and 2011 Artificial Reefs) shall be surveyed during each artificial reef monitoring event (Figure 2). The aim of mitigative artificial reef monitoring is to identify any unpermitted direct and/or secondary adverse impacts to the mitigative reefs due to the spreading of project sand farther than permitted (i.e., seaward of the permitted ETOF). As such, surveys conducted during each artificial reef monitoring event will document the gross and net acreage of each mitigative reef and the resident biological community. Gross acreage will be determined through in situ delineation (Section 3.2.2.1) and line-intercept surveys along transects will document the percentage of hardbottom within delineated reef areas (Section 3.2.2.2) so that net acreage can be calculated (Section 3.2.2.3). Video surveys will provide qualitative information on the community that has formed on each of the reefs. For each mitigative reef, impacts (project related loss of net acreage) shall be assessed by comparing the net acreage documented during each post-construction monitoring event to the pre-construction (baseline) net acreage. Net hardbottom acreages documented during the December 2013/January 2014 pre-construction monitoring event for the 2014 Coquina Beach Nourishment Project (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN) shall serve as the pre-construction (baseline) condition for the 1993, 2005, and 2011 Mitigative Artificial Reefs (Table 1).

Table 1. Net pre-construction (2013/2014) mitigative artificial reef acreage. Documented gross delineated acreage and mean percent hardbottom along transects are also provided.

Mitigative Reef	Monitoring Event (year)	Gross Acreage (ac)	Hardbottom (%)	Net Acreage (ac)
1993	2013/2014	6.28	49.1	**3.09**
2005	2013/2014	0.51	47.8	**0.24**
2011	2013/2014	5.32	88.7	**4.72**

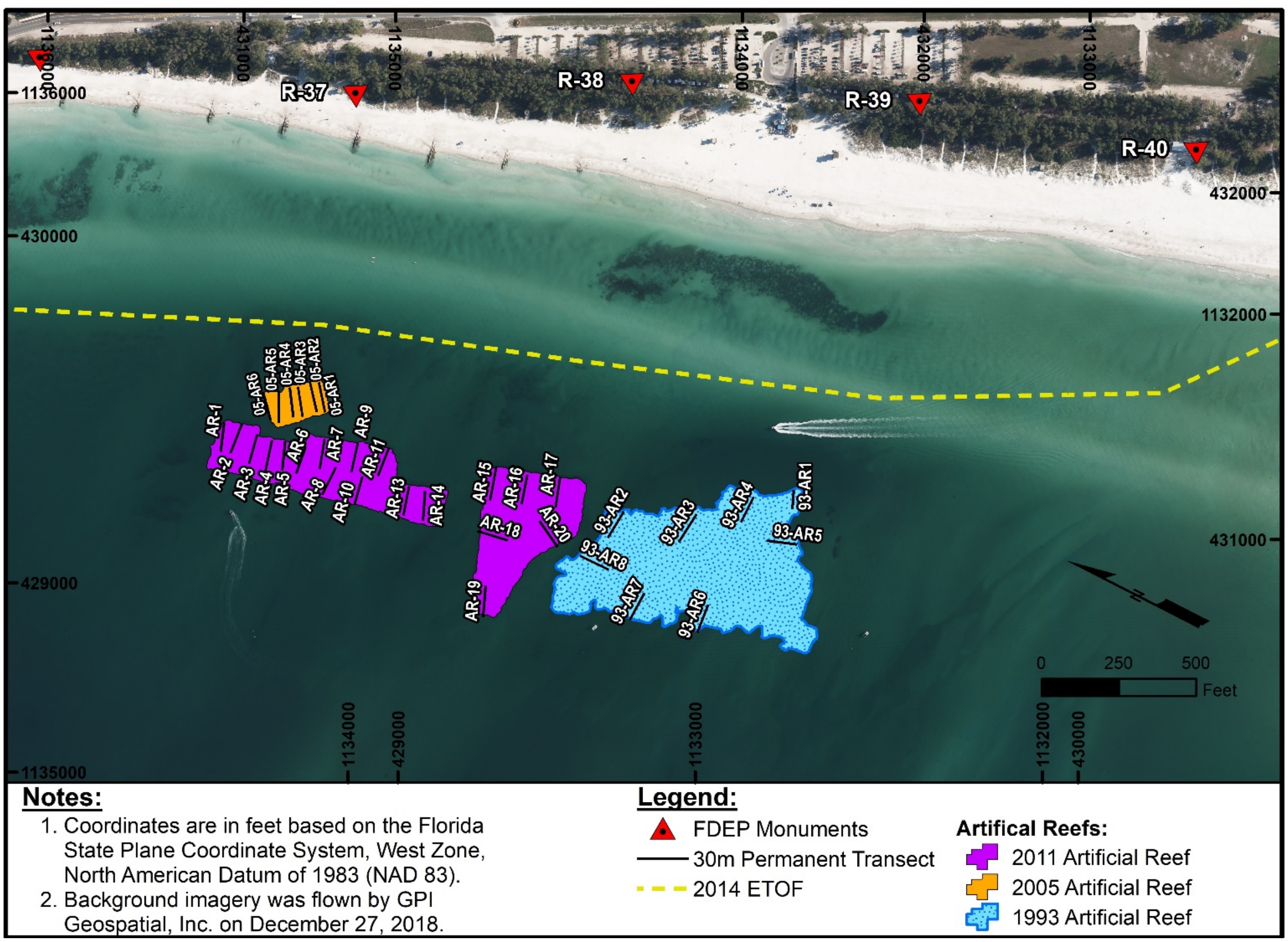

Figure 2. Anna Maria Island mitigative artificial reefs and locations of permanent monitoring transects.

3.2.1 Artificial Reef Monitoring Transects

A general summary of monitoring transects for each mitigative artificial reef is provided in Table 2. Specific information on transects (Sections 3.2.1.1 – 3.2.1.3) and surveys (Section 3.2.2) is provided below.

Table 2. Number of Anna Maria Island mitigative artificial reef transects by type.

Mitigative Reef	Transects		
	Permanent (N)	Temporary (N)	Total (N)
1993	8	42	50
2005	6	0	6
2011	20	30	50

3.2.1.1 1993 Artificial Reef Transects

Fifty (50) transects shall be surveyed on the 1993 Artificial Reef during each monitoring event, including 42 temporary transects and eight (8) permanent transects (Tables 2 and 3 and Figure 2). All transects shall be 30 m in length. Preceding each monitoring event, the location of the 42 temporary transects will be determined by randomly generating the start points and degree headings for each transect. Divers will use the GPS coordinates to locate each transect when conducting each monitoring event.

Table 3. Start and end positions of permanent transects on the 1993 Artificial Reef. Coordinates are in decimal degrees.

Transect	Start Point		End Point	
	Latitude	Longitude	Latitude	Longitude
93-AR 1*	27.449341	-82.696043	27.449273	-82.696218
93-AR 2*	27.450594	-82.697013	27.450614	-82.697319
93-AR 3*	27.450010	-82.696703	27.450036	-82.697033
93-AR 4*	27.449628	-82.696290	27.449626	-82.696572
93-AR 5	27.449090	-82.696511	27.449345	-82.696616
93-AR 6	27.449518	-82.697750	27.449546	-82.697454
93-AR 7	27.450105	-82.697948	27.450100	-82.697640
93-AR 8	27.450759	-82.697607	27.450475	-82.697599

*In addition to line-intercept surveys, video surveys will be conducted along transects 93-AR 1 to 93-AR 4 during each monitoring event.

3.2.1.2 2005 Artificial Reef Transects

The six (6) permanent transects (05-AR1 through 05-AR6) established on the 2005 Artificial Reef in April 2005 shall be surveyed during each monitoring event (Tables 2 and 4 and Figure 2). All transects shall be 30 m in length.

Table 4. Start and end positions of the six (6) permanent transects on the 2005 Artificial Reef. Coordinates are in decimal degrees.

Transect	Start Point		End Point	
	Latitude	Longitude	Latitude	Longitude
05-AR 1	27.453532	-82.697266	27.453360	-82.697504
05-AR 2	27.453605	-82.697302	27.453427	-82.697540
05-AR 3	27.453678	-82.697401	27.453519	-82.697647
05-AR 4	27.453740	-82.697446	27.453590	-82.697694
05-AR 5	27.453814	-82.697526	27.453678	-82.697812
05-AR 6	27.453933	-82.697605	27.453758	-82.697824

*In addition to line-intercept surveys, video surveys will be conducted along all six (6) transects during each monitoring event.

3.2.1.2 2011 Artificial Reef Transects

Fifty (50) transects shall be surveyed on the 2011 Artificial Reef during each monitoring event, including 30 temporary transects and 20 permanent transects (Tables 2 and 5 and Figure 2). All transects shall be 30 m in length. Preceding each monitoring event, the location of the 30 temporary transects shall be determined by randomly generating the start point and degree heading for each transect. Divers shall use the GPS coordinates to locate each transect when conducting each line-intercept survey.

Table 5. Start and end positions of the 20 permanent transects on the 2011 Artificial Reef. Coordinates are in decimal degrees.

Transect	Start Point		End Point	
	Latitude	Longitude	Latitude	Longitude
11-AR 1*	27.454115	-82.698056	27.454023	-82.698333
11-AR 2*	27.453969	-82.697985	27.453940	-82.698300
11-AR 3	27.453806	-82.698010	27.453749	-82.698307
11-AR 4*	27.453664	-82.697995	27.453589	-82.698305
11-AR 5	27.453556	-82.697945	27.453459	-82.698214
11-AR 6	27.453371	-82.697898	27.453338	-82.698178
11-AR 7*	27.453254	-82.697746	27.453170	-82.698032
11-AR 8	27.453045	-82.698249	27.453049	-82.697942
11-AR 9*	27.452975	-82.697626	27.452906	-82.697913
11-AR 10	27.452751	-82.698178	27.452803	-82.697900
11-AR 11*	27.452709	-82.697524	27.452681	-82.697827
11-AR 12	27.452482	-82.697819	27.452449	-82.698106
11-AR 13*	27.452394	-82.697771	27.452318	-82.698057
11-AR 14*	27.452249	-82.697742	27.452143	-82.698014
11-AR 15*	27.451782	-82.697208	27.451697	-82.697529
11-AR 16*	27.451507	-82.697130	27.451432	-82.697418
11-AR 17*	27.451239	-82.697000	27.451149	-82.697293
11-AR 18	27.451671	-82.697859	27.451393	-82.697802
11-AR 19	27.451274	-82.698597	27.451382	-82.698305
11-AR 20	27.450972	-82.697633	27.451221	-82.697484

*In addition to line-intercept data, video will be recorded along 11 shore facing transects during monitoring events.

3.2.2 Artificial Reef Survey Methods

Physical surveys to document gross acreage and estimate net acreage will be conducted for each mitigative reef (1993, 2005, and 2011 Artificial Reefs) each monitoring event (Sections 3.2.2.1 – 3.2.2.3). Video surveys along specified permanent transects will also be conducted during each monitoring event (Section 3.2.2.4).

3.2.2.1 In-Situ Artificial Reef Delineation

Divers will delineate the edge of the 1993, 2005, and 2011 Artificial Reefs (Figure 2) during each monitoring event using the methodology detailed in Section 2.3. As specified, divers shall swim the edge (perimeter) of each artificial reef around its full extent while towing a buoy equipped with a DGPS antenna attached by a cable to a HYPACK navigation software system onboard a survey vessel. For each monitoring event, the acreage of the delineated area (gross acreage) shall be determined for each mitigative reef.

3.2.2.2 Line-Intercept

To measure the percentage of hardbottom present within the delineated boundary (gross acreage) of each mitigative artificial reef, line-intercept data will be collected along permanent and temporary transects during each monitoring event using the methodology detailed in Section 2.1.1.2. For the 1993 Artificial Reef, divers shall collect line-intercept data along all 42 temporary transects and all eight (8) permanent transects (total of 50 transects) during each monitoring event (Table 3). For the 2005 Artificial Reef, divers shall collect line-intercept data and video data along all six (6) permanent transects during each monitoring event (Table 4). For the 2011 Artificial Reef, divers shall collect line intercept data along all 30 temporary transects and all 20 permanent transects during each monitoring event (Table 5).

3.2.2.3 Net Hardbottom Acreage Calculation

For each monitoring event, the net acreage of each mitigative reef shall be calculated as the product of gross acreage (delineated artificial reef area) and the percentage of hardbottom within the delineated area. Gross hardbottom acreage is determined by the in-situ delineation of the edge of each mitigative reef (Section 3.2.2.1). The percentage of hardbottom within the delineated area is based on the mean measured ratio of hardbottom to gaps (spaces/sand between boulders) as determined by the line-intercept surveys along transects (Section 3.2.2.2). The percentage of linear area covered by artificial hardbottom (boulders/concrete) along each transect shall be averaged across all transects to calculate mean percentage hardbottom. For each mitigative reef, this mean value (mean percent hardbottom) shall be multiplied by the delineated gross acreage of the reef to arrive at an estimate of net hardbottom acreage for each monitoring event. For each monitoring event, the estimated post-construction net acreage shall be compared to the documented pre-construction net acreage in Table 1 for each of the three mitigative reefs. Delineated gross acreages and net acreage estimates along with all raw data used in calculations (i.e., results of in situ artificial reef delineation and line-intercept surveys) shall be provided to the FDEP following each post-construction artificial reef monitoring event.

3.2.2.4 Video Survey

Divers will record video along specific permanent mitigative artificial reef transects on the 1993, 2005, and 2011 Artificial Reefs (Figure 2) during each monitoring event using the methodology detailed in Section 2.1.4. For the 1993 Artificial Reef, divers shall collect video data along the four (4) shore facing permanent transects (Transects 93-AR 1 to 93-AR 4) during each monitoring event (Tables 3 and 6). For the 2005 Artificial Reef, divers shall collect line-intercept data and video data along all six (6) permanent transects during each monitoring event (Tables 4 and 6). For the 2011 Artificial Reef, divers shall collect video data along 11 shore facing transects (Transects 1, 2, 4, 7, 9, 11, 13, 14, and 15, 16, 17) (Tables 5 and 6).

Table 6. Shore facing permanent transects along which video surveys shall be conducted.

Mitigative Reef	Transect
1993	93-AR 1
	93-AR 2
	93-AR 3
	93-AR 4
2005	05-AR 1
	05-AR 2
	05-AR 3
	05-AR 4
	05-AR 5
	05-AR 6
2011	11-AR 1
	11-AR 2
	11-AR 4
	11-AR 7
	11-AR 9
	11-AR 11
	11-AR 13
	11-AR 14
	11-AR 15
	11-AR 16
	11-AR 17

4.0 LONGBOAT KEY MONITORING PROTOCOL

When sand dredged from the Longboat Pass Navigational Maintenance Dredging Project is placed on the Longboat Key fill placement area (Figure 1), pre- and post-construction natural hardbottom and artificial reef biological monitoring will be required. This section describes the natural hardbottom and artificial reef resources located adjacent to the Longboat Key fill placement area, and details how the methods in Section 2.0 will be implemented. The monitoring and reporting schedule is summarized in Section 5.0.

4.1 Existing Hardbottom Resources

4.1.1 Natural Hardbottom

Nearshore hardbottom habitat is present along the northern portion of the Longboat Key project area shoreline (Figure 3). In 2002, CPE conducted a sidescan sonar survey of the nearshore region adjacent to Longboat Key between FDEP survey control monuments R-42 (Longboat Pass in Manatee County) and R-29.5 (New Pass in Sarasota County), along approximately 10 miles of shoreline. The survey documented three hardbottom formations located in the nearshore between R-49 and R-51.5 representing approximately 14 ac. The hardbottom formations are generally low relief (< 1 ft) and likely ephemeral in nature. As part of the 2005/06 Longboat Key Beach Renourishment Project, the permit-required biological monitoring program included in situ diver delineation of the hardbottom formation that occurred inshore of the equilibrium toe of fill (ETOF) (between R-49 and R-49.5) (Figure 3) as well as characterization of the benthic community found there. Quantitative analysis between 2006 and 2009 revealed a community dominated by turf and macroalgae species (CPE, 2010). The macroalgae community primarily consisted of *Hypnea, Gracilaria*, Codium, and Sargassum species. *Dictyota, Caulerpa*, and *Padina* were also frequently observed (CPE, 2010). Coral cover in the nearshore benthic community was generally less than 1% of the total cover assessed. *Leptogorgia virgulata* and *Leptogorgia hebes* were the only octocoral species observed. The stony coral community was dominated by *Solenastrea* spp., but also included *Siderastrea siderea*, *Phyllangia americana*, *Oculina robusta*, and *Cladocora arbuscula*.

4.1.2 Artificial Reefs

In addition to the natural nearshore hardbottom resources adjacent to Longboat Key, there are artificial reefs in the nearshore marine environment seaward of the permitted ETOF. The Town of Longboat Key constructed a series of three artificial reef installations, totaling 1.5 acres of mitigation, in 2005 and 2006 to offset anticipated impacts to 1.5 acres of hardbottom between R-49.5 and R-51.5 from the Town of Longboat Key's 2005/06 Beach Renourishment Project (Figure 3). These reefs were constructed from July 2005 to August 2006. Limestone boulders 3.5 ft in diameter were placed in an area of sand between two natural hardbottom habitats offshore of northern Longboat Key in water depths of 4 m to 6 m (12 ft to 15 ft). To determine the effectiveness of active management techniques (transplantations) and coral recruitment enhancers (larval attractants and grazers) in establishing target epibenthic communities and reducing the temporal lag in habitat function, macroalgae, coral colonies, and urchins were transplanted to designated areas of the artificial reef. Pursuant to FDEP Permit No. 0202209-001-JC, these artificial reefs were monitored for five years to document success.

4.2 Monitoring Methods

Monitoring for the Longboat Pass Navigational Maintenance Dredging Project will occur on the nearshore hardbottom that is located within and immediately south of the Longboat Key project template. Additional transects will be established on the artificial reef to ensure that the project does not affect the mitigation already in place. Hardbottom edge mapping will also track any changes in exposed hardbottom (natural and artificial).

4.2.1 Natural Hardbottom Monitoring Transects

A total of nine (9) permanent nearshore hardbottom transects will be monitored adjacent to the Longboat Key sand placement area. The eight transects previously monitored for the 2005/2006 Longboat Key Nourishment Project will be monitored for the proposed project, including five outside the ETOF and three within the ETOF. Three of the previously monitored transects (TS4, TS5, and TS7) will be extended to terminate at the seaward extent of the hardbottom, and an additional transect (TS9) will be established beyond the ETOF for future monitoring (Figure 4, Table 7).

Ten (10) permanent quadrats (those established to monitor the 2005/2006 Longboat Key Nourishment project) shall be used to sample the entire length of transects TS6, TS7 and TS8 and to sample the original 30 m lengths of TS4 and TS5; the additional transect lengths established along transects TS4, TS5, and TS7 will be sampled at a ratio of 1 quadrat per every 10 m of transect line. These quadrats will be placed to avoid any areas of 100% sand cover (i.e., quadrat placement will be biased to include hardbottom). The location of each permanent quadrat will be recorded and marked by the installation of two pins.

The additional transect that will be established (TS9) will start at the shoreward edge of hardbottom (but not within the ETOF) and will continue to the seaward extent of hardbottom in the immediate area. Permanent quadrats (0.5 m^2 each) shall be installed at a ratio of 1 quadrat per every 3 m of transect line. Quadrats will be distributed along the entire length of the transects, starting from meter 0 (shoreward edge). These quadrats will be placed to avoid any areas of 100% sand cover (i.e., quadrat placement will be biased to include hardbottom). The location of each permanent quadrat will be recorded and marked by the installation of two pins.

The following methods, each described in Section 2.1, will be utilized on the seven (6) monitoring transects located outside the Longboat Key ETOF (TS4 – TS9) (Figure 4, Table 7) in order to determine potential project-related impacts:

- Line-Intercept for Sediment
- Interval Sediment Depth

- Benthic Characterization: BEAMR
- Video Documentation

The three (3) transects located within the ETOF (TS1 – TS3) will be monitored only through collection of video data (described in Section 2.2). These transects (Figure 4, Table 7) are located within the anticipated impact area and impacts to these resources from previous projects have already been offset through construction of mitigative artificial reefs. As such, this information will not be used to determine project impacts, but may help better understand the movement of sand following construction of beach nourishment projects.

Table 7. Longboat Key nearshore hardbottom transects monitoring methodology. Unless otherwise noted, all transects were established and monitored for the Longboat Key 2005/06 Beach Renourishment Project.

Transect	Line-Intercept and Interval Sediment Depth	BEAMR	Video
Outside ETOF			
TS 4[1]	X	X	X
TS 5[1]	X	X	X
TS 6	X	X	X
TS 7[1]	X	X	X
TS 8	X	X	X
TS 9[2]	X	X	X
Within ETOF			
TS 1			X
TS 2			X
TS 3			X

[1] Transects will be extended to include full extent of hardbottom observed during the pre-construction survey.
[2] New (proposed) transects will be established during the pre-construction survey based on the location and extent of hardbottom observed.

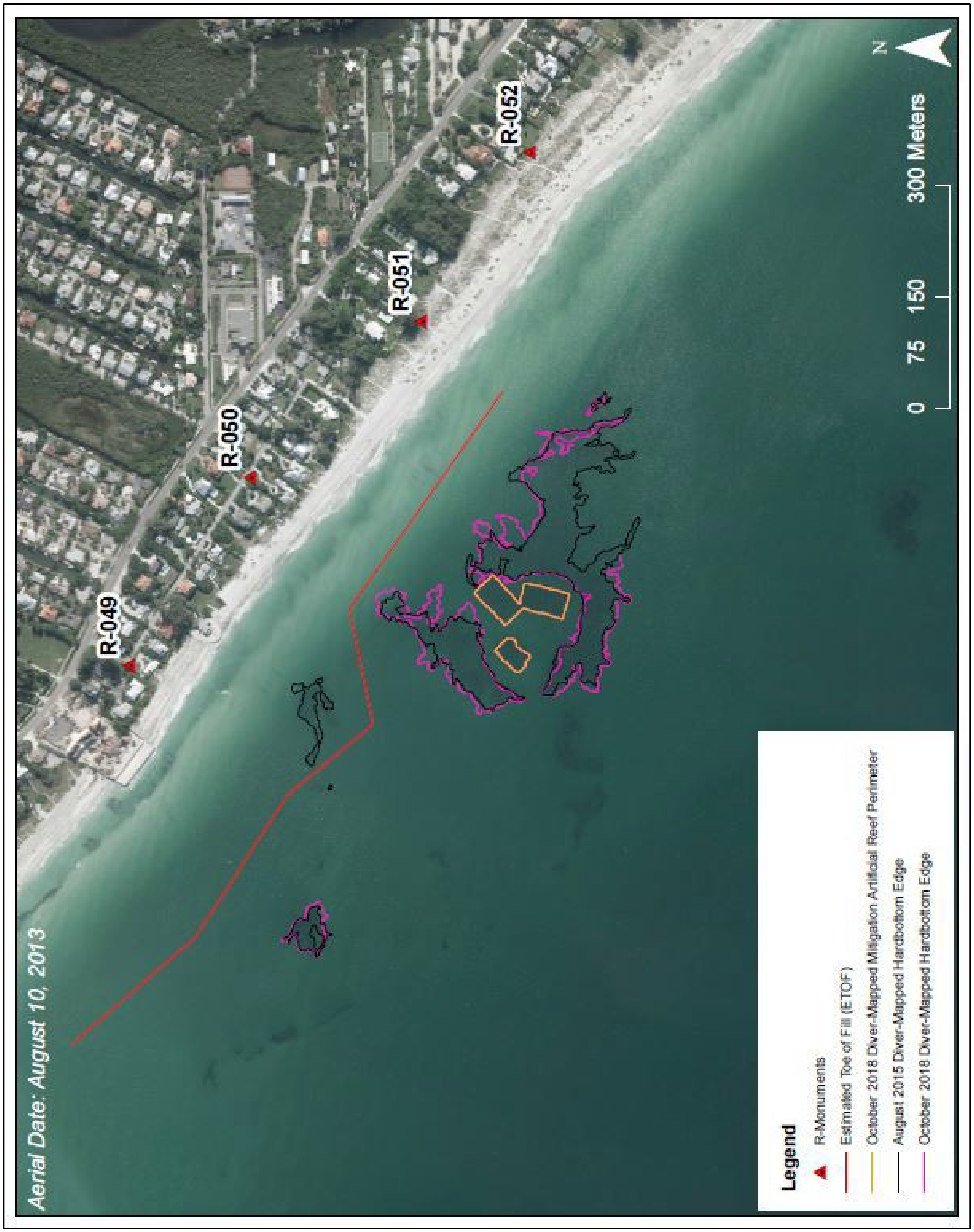

Figure 3. Nearshore hardbottom and artificial reefs located between R-49.5 and R-51.5 on Longboat Key.

Figure 4. Locations of permanent nearshore hardbottom biological and video only monitoring transects and permanent mitigative reef transects in the area between R-49.5 and R-51.5.

4.2.2 Artificial Reef Monitoring Transects

The Longboat Key Artificial Reef will be monitored in order to determine any potential additional and unmitigated impacts as a result of the Longboat Pass Navigational Maintenance Dredging Project. The following methods, each described in Section 2.1, will be utilized on the artificial reef transects:

- Line-Intercept
- Video Documentation

Twenty-seven (27) transects will be monitored on the Longboat Key Artificial Reef during each survey, including 21 temporary transects and six (6) permanent transects. All transects will be 30 m in length. Line-intercept data will be collected along all 27 transects. Video will be collected only along the six permanent transects. Preceding each survey, locations of the 21 30-m temporary artificial reef transects will be determined by randomly generating the start points and degree headings for each transect. Divers will use the GPS coordinates to locate each transect when conducting the survey. The six permanent transects will be installed during the pre-construction survey.

4.2.3 In-Situ Hardbottom and Artificial Reef Delineation

Divers will delineate the edge of nearshore natural hardbottom and the artificial reef during each monitoring survey using the methodology detailed in Section 2.3. The gross acreage (area within the delineated boundary) shall be determined for each mitigative reef following delineation.

4.2.4 Artificial Reef Net Acreage Calculation

For each mitigative reef, net acreage shall be calculated as the product of the gross acreage and the mean percentage of hardbottom within the delineated boundary. Gross acreage is obtained through in-situ boundary delineation. The percentage of hardbottom (measured ratio of hardbottom to sand/gaps) within the delineated boundary of each mitigative reef is obtained through line intercept surveys along permanent and temporary transects. Once collected, the percentage of hardbottom along each permanent and temporary transect must be averaged across all transects within a mitigative reef to arrive at the mean percentage of hardbottom within the mitigative reef. For each mitigative reef, the respective mean value (percentage of hardbottom) shall be multiplied by the respective measured gross acreage to arrive at net acreage.

5.0 MONITORING TEAM AND SCHEDULE

5.1 Monitoring Team Requirements

The names and qualifications of staff performing biological monitoring surveys shall be submitted by the Permittee or their Agent to the FDEP for review and approval. Biological monitoring surveys shall be conducted by staff with previous experience in monitoring hardbottom communities and with scientific knowledge of local benthic marine ecosystems and flora and fauna. All in-water crew members responsible for in situ quadrat data collection shall participate in cross training to verify correct species identification and survey practices as Quality Assurance/Quality Control (QA/QC) procedures at the beginning of each monitoring event. QA/QC results shall reflect consistency of 90% for percent cover and identification of functional groups between observers.

5.2 Monitoring Schedule

The Longboat Pass Navigational Maintenance Dredging Project will include dredging of a navigation channel in Longboat Pass with sediment placement along the adjacent Manatee County shorelines on the southern Anna Maria Island shoreline between R-30 and R-41+305 feet and about 1.4 miles on the north end of Longboat Key between R-43.5 and R-50.5 (Figure 1). The placement location (i.e. Anna Maria Island and/or Longboat Key) will vary between maintenance dredging events depending on the timing and volume removed from the channel, but following each dredge event, dredged material will be placed within either (or both) of the two proposed templates.

In order to address cumulative effects of ongoing/subsequent nourishment, the baseline to which post-construction monitoring will be compared for subsequent nourishments shall remain the pre-construction monitoring event (natural hardbottom and artificial reef) for the first nourishment conducted for the Longboat Pass Navigational Maintenance Dredging Project. A pre-construction (baseline) monitoring event will be required prior to sand placement on the Longboat Key project shoreline. The December 2013/January 2014 pre-construction monitoring event for the 2014 Coquina Beach Nourishment Project (FDEP Permit No. 0281452-001-JC and Modification No. 0281452-005-JN) shall serve as the pre-construction (baseline) condition for the 1993, 2005, and 2011 Artificial Reefs (Table 1) for the Anna Maria Island portion of the project.

Each nourishment conducted for the Longboat Pass Navigational Maintenance Dredging Project shall initiate a complete round of post-construction monitoring. Each round of post-construction artificial reef monitoring for the Anna Maria Island project shoreline shall include a total of three (3) annual monitoring events, at years 1, 2, and 3 post-construction (Table 8). Each round of post-construction monitoring for the Longboat Key project shoreline shall include four (4) monitoring events for nearshore hardbottom and artificial reefs: one initial post-construction monitoring event (within six months of project completion), and three annual post-construction monitoring events (Years 1, 2, and 3) (Table 8). All monitoring shall be conducted in summer months (May 1 through September 30), although the pre-construction (baseline) monitoring event for Longboat Key may be conducted outside of this window if necessary, to accommodate the construction schedule. If the pre-construction monitoring event on Longboat Key is collected in non-summer months, then subsequent post-construction monitoring events shall be conducted in the same time of year as the pre-construction monitoring event. In some cases, the dredged sand may be placed alternately between the Anna Maria and Longboat Key shorelines, and on some occasions the sand may be split between the two shorelines during the same dredge/fill event. Regardless of whether both beach sections (Anna Maria Island and Longboat Key) are nourished together or independent of one another, nourishment shall initiate a complete round of post-construction monitoring for the areas that are nourished. The Anna Maria Island and Longboat Key biological monitoring shall be conducted and reported on independently.

Table 8. Longboat Pass Navigational Maintenance Dredging Project monitoring summary and schedule.

<table>
<tr><th>Project Area</th><th>Survey</th><th>Survey Type</th><th>Monitoring Period</th><th>Deliverables</th></tr>
<tr><td rowspan="3">Anna Maria</td><td rowspan="2">Artificial Reef Physical</td><td>In-situ Delineation</td><td rowspan="3">Post-Construction (N=3 per placement event) Years 1, 2, and 3</td><td>Shapefiles</td></tr>
<tr><td>Line-Intercept (Permanent and Temporary transects)</td><td>Excel spreadsheet, PDF of field sheets</td></tr>
<tr><td>Artificial Reef Video</td><td>Video (Permanent transects only)</td><td>Video</td></tr>
<tr><td rowspan="9">Longboat Key</td><td>Natural Hardbottom within ETOF</td><td>Video (Transects)</td><td rowspan="9">Pre-Construction (N=1): once prior to first fill placement.

Post-Construction (N=4 per fill placement event) Immediately (within 6 months) and years 1, 2, and 3).</td><td>Video</td></tr>
<tr><td rowspan="5">Natural Hardbottom Seaward of ETOF</td><td>In-situ HB Delineation</td><td>Shapefiles</td></tr>
<tr><td>Line-Intercept</td><td rowspan="3">Excel spreadsheets, PDF of field sheets</td></tr>
<tr><td>Interval Sediment Depth</td></tr>
<tr><td>Quadrats (BEAMR)</td></tr>
<tr><td>Video</td><td>Video</td></tr>
<tr><td rowspan="3">Artificial Reef Physical</td><td>In-situ Delineation</td><td>Shapefiles</td></tr>
<tr><td>Line-Intercept (Permanent and Temporary transects)</td><td>Excel spreadsheet, PDF of field sheets</td></tr>
<tr><td>Video (Permanent transects only)</td><td>Video</td></tr>
</table>

6.0 REPORTING REQUIREMENTS

6.1 Notification of Commencement, Progress, and Completion of Work

Commencement dates of monitoring events will be reported via email to the FDEP JCP Compliance Officer (JCPCompliance@dep.state.fl) and to staff in the Beaches, Inlets, and Ports program roughly seven (7) days prior to the start of monitoring and the day that monitoring begins. Brief monitoring progress reports will be submitted (emailed) weekly to the JCP Compliance Officer until completion of the monitoring event, and the JCP compliance officer shall be notified as soon as monitoring activities have ended that the monitoring event has been completed.

6.2 Monitoring Data Submissions

Raw data shall be submitted to FDEP within 45 days following completion of each pre- and post-construction monitoring event. To be eligible for state cost sharing, all benthic monitoring data and statistical analysis must be provided directly and concurrently from the monitoring firm to the FDEP, Permittee, Consultant(s), and Local Sponsor(s) in order to comply with the Florida Auditor General report 2014-064 and to be consistent with Section 287.057(17)(a)(1), F.S. Raw data provided to the FDEP shall consist of the following, each of which is described below: video and photographs, hardbottom edge survey data, raw transect survey data, and field datasheets.

6.2.1 In-situ Hardbottom and Mitigative Artificial Reef Delineations

Hardbottom and artificial reef boundary/perimeter data shall be supplied as separate collections of shapefiles (e.g., as ESRI file geodatabases). Polygons shall represent the in situ mapped boundaries/perimeters of hardbottom areas and mitigative artificial reefs for data obtained from each monitoring event. Polygons representing the baseline (pre-construction or other specified event) in situ mapped hardbottom and artificial reef boundaries/perimeters shall be provided with each collection of shapefiles. For nearshore hardbottom, a line representing the permitted ETOF shall also be provided with each post-construction collection of shapefiles.

6.2.2 Transect Survey Data

Interval sediment depth measurements, line-intercept data, and BEAMR quadrat data collected along transects shall be supplied in Excel format. Separate Excel workbooks shall be supplied for nearshore hardbottom data and for mitigative artificial reefs.

6.2.3 Video Data

Video data collected along transects shall be supplied to the FDEP. Separate folders shall be used to differentiate data collected along hardbottom transects (within and outside ETOF) and along mitigative reef transects. This BMP does not incorporate post collection analysis of video documentation, but relies on in situ surveys (hardbottom edge mapping, sediment depth measurements, line-intercept data, and quadrat monitoring [BEAMR data]) to provide the basis for comparative analyses and effect determinations. However, if visual signs of impact are recorded and/or in situ surveys demonstrate impacts, video survey data could be used for additional data collection and analysis in order to refine assessment of impact area, as video surveys have the advantage (over quadrat surveys) of providing continuous information along transects. In such a case, frame grabbing and application of PointCount procedures to video records may be requested. These data would be reviewed and compared between surveys in order to document qualitative and quantitative changes along transects over time for the purpose of refining impact area assessment. In recognition of the reduced visibility often encountered in the project vicinity, FDEP would need to determine if the quality of the video facilitates use of video analysis.

6.2.4 Field Datasheets

Copies (photographs or scans) of field datasheets shall be submitted in pdf format.

6.3 Monitoring Report Submissions

Monitoring reports shall be submitted to FDEP for review within 90 days of completion of each post-construction monitoring event beginning with the immediate post-construction monitoring event for Longboat Key. The Anna Maria Island and Longboat Key biological monitoring will be conducted and reported on independently. Data shall be analyzed to determine any potential additional and unmitigated impacts to natural hardbottom and/or mitigative artificial reefs due to the Longboat Pass Navigational Maintenance Dredging Project. These reports shall compare the nearshore natural hardbottom and artificial reefs on temporal scales (pre- vs. post-construction). The immediate post-construction report and all following (post-construction) reports shall compare data to the initial baseline (pre-construction or other specified monitoring event). Parametric and non-parametric statistical analyses shall be used to determine if and where changes occurred to natural and artificial hardbottom areas and communities. Notable observations regarding benthic community conditions will be documented to supplement the statistical data analysis.

Annual monitoring reports shall include:

- A map including the Longboat Pass Navigational Maintenance Dredging Project Area and adjacent hardbottom resources and monitoring transects overlaid onto recent, clear aerial photographs;
- A detailed description of monitoring methods and statistical analyses used;
- Graphical representation and analysis of sedimentation on the hardbottom transects outside the ETOF based on line-intercept data, interval sediment depth measurement data, and benthic data from quadrats;

- Analysis of sedimentation on the artificial reef transects based on line-intercept data;
- Graphical representation of dynamics of major benthic groups and sediment cover;
- Multivariate analysis of benthic data from transects located outside the ETOF, including nearshore hardbottom and artificial reefs (*e.g.*, percent cover by corals, octocoral, sponges, and algae);
- A general description of the condition (*e.g.,* exposed or buried) of transects or portions of transects located within the ETOF;
- A comparison of post-construction monitoring results to pre-construction monitoring results;
- A map comparing the most recent annual hardbottom and artificial reef delineation and all previous hardbottom delineations;
- Comparison of pre- vs. post-construction net hardbottom acreage;
- Copies of all transect video submitted on DVDs;
- All raw data in the format that was used for the analysis.

7.0 LITERATURE CITED

Coastal Planning & Engineering, Inc. (CPE). 2010. Town of Longboat Key, Florida, 2005/06 Beach Renourishment Project Fourth Post-Construction Hardbottom Monitoring and Mitigation Report (FDEP Permit No. 0202209-001-JC). January 2012.

Coastal Planning & Engineering, Inc. (CPE). 2012. Coquina Beach Restoration Project, 2011 Artificial Reef Line-Intercept Survey, Field Observation Report, October 11, 2012.

Lybolt, M. and R. Baron. 2006. BEAMR (Benthic Ecological Assessment for Marginal Reefs): a preferred replacement for AGRRA and similar benthic assessment methods tailored for marginal reefs. Proceedings from the 2006 ISRS European Meeting. Bremen,Germany.

APPENDIX A - PERMITS

USACE PERMIT - BIOLOGICAL OPINION:
USFWS STATEWIDE PROGRAMMATIC BIOLOGICAL OPINION (SBPO) (13 MAR 2015)

242 PAGES

SAJ-2014-00606 (SP-MEP)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Service Log Number: 41910-2011-F-0170

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Dear Colonel Dodd:

This letter transmits the U.S. Fish and Wildlife Service's revised Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) Civil Works and Regulatory sand placement activities in Florida and their effects on the following sea turtles: Northwest Atlantic Ocean distinct population segment (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat; green (*Chelonia mydas);* leatherback (*Dermochelys coriacea*); hawksbill (*Eretmochelys imbricata*); and Kemp's ridley (*Lepidochelys kempii*) ; and the following beach mice: southeastern (*Peromyscus polionotus niveiventris*); Anastasia Island (*Peromyscus polionotus phasma*); Choctawhatchee (*Peromyscus polionotus allophrys*); St. Andrews (*Peromyscus polionotus peninsularis*); and Perdido Key (*Peromyscus polionotus trissyllepsis*) and their designated critical habitat. It does not address effects of these activities on the non-breeding piping plover (*Charadrius melodus*) and its designated critical habitat or for the red knot (*Calidris canutus rufa*). Effects of Corps planning and regulatory shore protection activities on the non-breeding piping plover and its designated critical habitat within the North Florida Ecological Services office area of responsibility and the South Florida Ecological Services office area of responsibility are addressed in the Service's May 22, 2013, Programmatic Piping Plover Biological Opinion. Effects of shore protection activities for the piping plover in the Panama City Ecological Services office area of responsibility will be addressed on a project by project basis.

Each proposed project will undergo an evaluation process by the Corps to determine if it properly fits within a programmatic approach. The project description will determine if the project is appropriate to apply to this programmatic consultation. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the SPBO are applicable to the project, it will be covered by this programmatic consultation. If not, the Corps will consult separately on individual projects that do not fit within this programmatic approach.

We will meet annually during the fourth week of August to review the sand placement projects, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this SPBO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions.

The entire programmatic consultation will be reviewed every five years or sooner if new information concerning the projects or protected species occurs. Reinitiation of formal consultation is also required 10 years after the issuance of this SPBO.

We are available to meet with agency representatives to discuss the remaining issues with this consultation. If you have any questions, please contact Peter Plage at the North Florida Ecological Services Office at (904) 731-3085, Jeffrey Howe at the South Florida Ecological Services Office at (772) 469-4283, or Lisa Lehnhoff at the Panama City Ecological Services Office at (850) 769-0552, extension 241.

Sincerely,

for Larry Williams
State Supervisor

Shore Protection Activities along the Coast of Florida

Statewide Programmatic Biological Opinion

(Revised)

February 27, 2015

Prepared by:
U.S. Fish and Wildlife Service

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Acronyms

ABM	Alabama Beach Mouse
Act	Endangered Species Act
AFB	Air Force Base
AIBM	Anastasia Island Beach Mouse
ASP	Anastasia State Park
BO	Biological Opinion
CBM	Choctawhatchee Beach Mouse
CBRA	Coastal Barrier Resources Act
CCAFS	Cape Canaveral Air Force Station
CFR	Code of Federal Regulations
CH	Critical Habitat
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Corps	U.S. Army Corps of Engineers
DOI	U.S. Department of the Interior
DTRU	Dry Tortugas Recovery Unit
F	Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FMNM	Fort Matanzas National Monument
FR	*Federal Register*
FWC	Florida Fish and Wildlife Conservation Commission

FWC/FWRI	Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute
GCRU	Greater Caribbean Recovery Unit
GINS	Gulf Islands National Seashore
GTMNERR	Guana Tolomato Matanzas National Estuarine Research Reserve
HCP	Habitat Conservation Plan
IMA	Important Manatee Areas
INBS	Index Nesting Beach Survey
IPCC	Intergovernmental Panel on Climate Change
ITP	Incidental Take Permit
K	Carrying Capacity
MANLAA	May Affect, but is Not Likely to Adversely Affect
MHW	Mean High Water
MHWL	Mean High Water Line
MMPA	Marine Mammal Protection Act
mtDNA	Mitochondrial Deoxyribonucleic Acid
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
NWAO DPS	Northwest Atlantic Ocean Distinct Population Segment
NWR	National Wildlife Refuge
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Elements

PFRU	Peninsular Florida Recovery Unit
PHVA	Population and Habitat Viability Analysis
PKBM	Perdido Key Beach Mouse
PKSP	Perdido Key State Park
PSI	Per Square Inch
PVA	Population Viability Analysis
SABM	St. Andrews Beach Mouse
SAJ	South Atlantic Jacksonville
SAM	South Atlantic Mobile
SAV	submerged aquatic vegetation
SEBM	Southeastern Beach Mouse
Service	U.S. Fish and Wildlife Service
SNBS	Statewide Nesting Beach Survey
SPBO	Statewide Programmatic Biological Opinion
SR	State Road
TED	Turtle Excluder Device
TEWG	Turtle Expert Working Group
U.S.C.	United States Code
U.S.	United States

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Federal Activity No:	41910-2010-F-0284
Applicant:	U.S. Army Corps of Engineers
Date Started:	May 30, 2007
Project Title:	Shore Protection Activities
Ecosystem:	Florida Coastline
Counties:	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia.

Dear Colonel Dodd:

This document is the U.S. Fish and Wildlife Service's (Service) Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities in Florida and their effects on the Northwest Atlantic Ocean distinct population (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat, green (*Chelonia mydas)*, leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles, and southeastern (*Peromyscus polionotus niveiventris*), Anastasia Island (*Peromyscus polionotus phasma*), Choctawhatchee (*Peromyscus polionotus allophrys*), St. Andrews (*Peromyscus polionotus peninsularis*), and Perdido Key (*Peromyscus polionotus trissyllepsis*) beach mice and designated critical habitat (CH) for the Perdido Key beach mouse (PKBM), Choctawhatchee beach mouse (CBM), and St. Andrews beach mouse (SABM) **(Table 1)**. This SPBO is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We have assigned Service Federal Activity number 41910-2010-F-0284 for this consultation.

The Corps determined that the proposed project "may affect and is likely to adversely affect the above listed species (**Table 1)**. The Corps also has determined that the proposed project "may affect, but is not likely to adversely affect" (MANLAA) the West Indian (Florida) manatee (*Trichechus manatus latirostris*), the roseate tern (*Sterna dougallii dougallii*), the beach jacquemontia (*Jacquemontia reclinata*), and the Garber's spurge (*Chamaesyce garberi*) **(Table 2)**. Based on our review of the project plans and the incorporation of the minimization measures listed in the final Programmatic Biological Assessment (PBA) as conditions of the projects where these species are known to exist, we concur with these determinations.

Table 1. Status of federally listed species within the Action Area that may be adversely affected by the shore protection activities.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH
Mammals		
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered(CH)
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered (CH)
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered (CH)
Birds		
Piping Plover*	*Charadrius melodus*	Threatened
Red Knot*	*Calidris canutus rufa*	Proposed
Reptiles		
Green sea turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle (Northwest Atlantic Ocean population)	*Caretta caretta*	Threatened (CH)

* Not covered by the revised SPBO

Table 2. Species and critical habitat evaluated for effects and those where the Service has concurred with a "may affect, not likely to adversely affect (MANLAA)" determination.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH	PRESENT IN ACTION AREA	MANLAA
Florida manatee	*Trichechus manatus latirostris*	Endangered (CH)	Yes	Yes
Roseate tern	*Sterna dougallii dougallii*	Threatened	Yes	Yes
Beach jacquemontia	*Jacquemontia reclinata*	Endangered	Yes	Yes
Garber's spurge	*Chamaesyce garberi*	Threatened	Yes	Yes

Florida Manatee

For all dredging activities, including offshore dredging activities associated with submerged borrow areas and navigational channel maintenance:

The Corps has determined that the proposed projects "may affect, but are not likely to adversely affect" the Florida manatee. The Service has reviewed the draft PBA and concurs that, if the 2011 Standard Manatee In-water Construction Conditions are made a condition of the issued permit or Corps project plan and implemented, these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed. The web link to these conditions: http://www.fws.gov/northflorida/Manatee/Manate_Key_Programmatic/20130425_gd_Appendix%20B_2011_Standard%20Manatee%20Construction%20Conditions.pdf.

For all dredging activities within estuaries and adjacent to the shore, inlets, and/or inshore areas including channels associated with submerged borrow areas and navigational channels:

If the 2011 Standard Manatee In-water Construction Conditions and the following additional conditions are made a condition of the issued permit or Corps project plan and implemented, the Service would be able to concur with a determination by the Corps that these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed.

Additional conditions:

1. Barges shall install mooring bumpers that provide a minimum 4-foot standoff distance under maximum compression between other moored barges and large vessels, when in the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate.

2. Pipelines shall be positioned such that they do not restrict manatee movement to the maximum extent possible. Plastic pipelines shall be weighted or floated. Pipelines transporting dredged material within the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate shall be weighted or secured to the bottom substrate as necessary to prevent movement of the pipeline and to prevent manatee entrapment or crushing.

3. In the event that such positioning has the potential to impact submerged aquatic vegetation (SAV) or nearshore hardbottom, the pipeline may be elevated or secured to the bottom substrate to minimize impacts to SAV.

For dredging activities located within Important Manatee Areas (IMAs), including Warm Water Aggregation Areas (WWAAs):

Important Manatee Areas (IMAs) are areas where large numbers of manatees occur because of the presence of warm water sites (including power plants, springs, etc.), feeding sites, drinking water sites, and other attractants. Manatees congregate at these sites to shelter from the cold, rest, feed and drink, travel, and engage in other activities. Current IMA maps, including maps of Warm Water Aggregation Areas (WWAAs) and areas of inadequate protection (AIPs), can be found at the Corps' weblink: http://www.saj.usace.army.mil/Missions/Regulatory/SourceBook.aspx.

Dredging activities that occur within the IMA sites (including WWAAs) are not included in this SPBO. For dredging activities within IMAs, the Corps shall contact the appropriate FWS Ecological Services Office for project-specific conditions. See Table 3.

Table 3. FWS Ecological Services (ES) offices and areas of responsibility (counties).

County	Service ES Office	Address	Telephone
Brevard, Citrus, Dixie, Duval, Flagler, Hernando, Hillsborough, Levy, Manatee, Nassau, Pasco, Pinellas, St Johns, Taylor, Volusia	North Florida ES Office	7915 Baymeadows Way Jacksonville, FL 32256	(904) 731-3336
Broward, Charlotte, Collier, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, St Lucie, Sarasota	South Florida ES Office	1339 20th Street Vero Beach, FL 32960	(772) 562-3909
Bay, Escambia, Franklin, Gulf, Jefferson, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton,	Panama City ES Office	1601 Balboa Avenue Panama City, FL 32405	(850) 769-0552

Although this does not represent a biological opinion for the manatee as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required regarding manatees. It also fulfills the requirements of the MMPA. If modifications are made in the programmatic action or additional information becomes available, re-initiation of consultation may be required.

Loggerhead Terrestrial Critical Habitat

The Corps has determined that the proposed projects “may affect, but are not likely to adversely affect” the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population. The Service concurs with the Corps’ determination and furthermore concludes that the proposed projects will not adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.Designated Critical Habitat: The Service has designated terrestrial critical habitat for Northwest Atlantic loggerhead population on July 10, 2014. NOTE: The proposed rule was dated March 25, 2013 (78 FR 18000) and the notice of availability of the economic analysis for the proposed rule (78 FR 42921) was dated July 18, 2013. The final rule of terrestrial critical habitat includes 88 units encompassing approximately 1,102 kilometers (685 miles) of mapped shoreline along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi: http://www.fws.gov/northflorida/SeaTurtles/2014_Loggerhead_CH/Maps/2014_NWA_Loggerhead_Terrestrial_CH_index_maps.pdf.

Table 4. List of NWAO DPS loggerhead critical habitat in the terrestrial habitat Florida and ownership.

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-01: South Duval County Beaches–County line at Duval and St. Johns Counties	11.5 (7.1)	0 (0)	0 (0)	11.5 (7.1)
LOGG-T-FL-02: Fort Matanzas National Monument, St. Johns County	1.4 (0.9)	1.4 (0.9)	0 (0)	0 (0)
LOGG-T-FL-03: River to Sea Preserve at Marineland — North Peninsula State Park, Flagler and Volusia Counties	31.8 (19.8)	0 (0)	6.1 (3.8) North Peninsula State Park, Washington Oaks Garden State Park (in Guana Tolomato Matanzas NERR), and Gamble Rogers Memorial State Recreation Area at Flagler Beach	25.7 (16.0)
LOGG-T-FL-04: Canaveral National Seashore North, Volusia County	18.2 (11.3)	18.2 (11.3) Canaveral National Seashore	0 (0)	0 (0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-05: Canaveral National Seashore South — Merritt Island NWR-Kennedy Space, Brevard County	28.4 (17.6)	28.4 (17.6) includes Canaveral National Seashore (Brevard portion) and Merritt Island NWR/KSC	0 (0)	0 (0)
LOGG-T-FL-06: Central Brevard Beaches, Brevard County	19.5 (12.1)	0 (0)	0 (0)	19.5 (12.1)
LOGG-T-FL-07: South Brevard Beaches, Brevard County	20.8 (12.9)	4.2 (2.6) Archie Carr NWR	1.5 (1.0) Sebastian Inlet State Park	15.0 (9.3)
LOGG-T-FL-08: Sebastian Inlet — Indian River Shores, Indian River County	4.1 (2.5)	0.9 (0.6) Archie Carr NWR	3.2 (2.0) Sebastian Inlet State Park	0 (0)
LOGG-T-FL-09: Fort Pierce Inlet — St. Lucie Inlet, St. Lucie and Martin Counties	35.2 (21.9)	0 (0)	0 (0)	35.2 (21.9)
LOGG-T-FL-10: St. Lucie Inlet — Jupiter Inlet, Martin and Palm Beach Counties	24.9 (15.5)	4.8 (3.0) Hobe Sound NWR	3.7 (2.3) St. Lucie Inlet Preserve State Park	16.4 (10.2)
LOGG-T-FL-11: Jupiter Inlet — Lake Worth Inlet, Palm Beach County	18.8 (11.7)	0 (0)	2.5 (1.5) John D. MacArthur Beach State Park	16.3 (10.1)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-12: Lake Worth Inlet — Boynton Inlet, Palm Beach County	24.3 (15.1)	0 (0)	0 (0)	24.3 (15.1)
LOGG-T-FL-13: Boynton Inlet — Boca Raton Inlet, Palm Beach County	22.6 (14.1)	0 (0)	0 (0)	22.6 (14.1)
LOGG-T-FL-14: Boca Raton Inlet — Hillsboro Inlet, Palm Beach and Broward Counties	8.3 (5.2)	0 (0)	0 (0)	8.3 (5.2)
LOGG-T-FL-15: Long Key, Monroe County	4.2 (2.6)	0 (0)	4.2 (2.6) Long Key State Park	0 (0)
LOGG-T-FL-16: Bahia Honda Key, Monroe County	3.7 (2.3)	0 (0)	3.7 (2.3) Bahia Honda Key State Park	0 (0)
LOGG-T-FL-17: Longboat Key, Manatee and Sarasota Counties	16.0 (9.9)	0 (0)	0 (0)	16.0 (9.9)
LOGG-T-FL-18: Siesta and Casey Keys, Sarasota County	20.8 (13.0)	0 (0)	0 (0)	20.8 (13.0)
LOGG-T-FL-19: Venice Beaches and Manasota Key, Sarasota and Charlotte Counties	26.0 (16.1)	0 (0)	1.9 (1.2) Stump Pass Beach State Park	24.1 (15.0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-20: Knight, Don Pedro, and Little Gasparilla Islands, Charlotte County	10.8 (6.7)	0 (0)	1.9 (1.2) Don Pedro Island State Park	8.9 (5.5)
LOGG-T-FL-21: Gasparilla Island, Charlotte and Lee Counties	11.2 (6.9)	0 (0)	1.5 (1.0) Gasparilla Island State Park	9.6 (6.0)
LOGG-T-FL-22: Cayo Costa, Lee County	13.5 (8.4)	0 (0)	13.2 (8.2) Cayo Costa State Park	0.3 (0.2)
LOGG-T-FL-23: Captiva Island, Lee County	7.6 (4.7)	0 (0)	0 (0)	7.6 (4.7)
LOGG-T-FL-24: Sanibel Island West, Lee County	12.2 (7.6)	0 (0)	0 (0)	12.2 (7.6)
LOGG-T-FL-25: Little Hickory Island, Lee and Collier Counties	8.7 (5.4)	0 (0)	0 (0)	8.7 (5.4)
LOGG-T-FL-26: Wiggins Pass — Clam Pass, Collier County	7.7 (4.8)	0 (0)	2.0 (1.2) Delnor-Wiggins Pass State Park	5.7 (3.6)
LOGG-T-FL-27: Clam Pass — Doctors Pass, Collier County	4.9 (3.0)	0 (0)	0 (0)	4.9 (3.0)
LOGG-T-FL-28: Keewaydin Island and Sea Oat Island, Collier County	13.1 (8.1)	0 (0)	12.4 (7.7) Rookery Bay NERR	0.7 (0.5)
LOGG-T-FL-29: Cape Romano, Collier County	9.2 (5.7)	0 (0)	7.2 (4.5) Rookery Bay NERR	2.0 (1.2)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-30: Ten Thousand Islands North, Collier County	7.8 (4.9)	2.9 (1.8) Ten Thousand Islands NWR	4.9 (3.1) Rookery Bay NERR	0 (0)
LOGG-T-FL-31: Highland Beach, Monroe County	7.2 (4.5)	7.2 (4.5) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-32: Graveyard Creek — Shark Point, Monroe County	0.9 (0.6)	0.9 (0.6) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-33: Cape Sable, Monroe County	21.3 (13.2)	21.3 (13.2) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-34: Dry Tortugas, Monroe County	5.7 (3.6)	5.7 (3.6) Dry Tortugas National Park	0 (0)	0 (0)
LOGG-T-FL-35: Marquesas Keys, Monroe County	5.6 (3.5)	5.6 (3.5) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-36: Boca Grande Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-37: Woman Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-38: Perdido Key, Escambia County	20.2 (12.6)	11.0 (6.8) Gulf Islands National Seashore	2.5 (1.6) Perdido Key State Park	6.7 (4.2)
LOGG-T-FL-39: Mexico Beach and St. Joe Beach, Bay and Gulf Counties	18.7 (11.7)	0 (0)	0 (0)	18.7 (11.7)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-40: St. Joseph Peninsula, Gulf County	23.5 (14.6)	0 (0)	15.5 (9.7) T.H. Stone Memorial St. Joseph Peninsula State Park and St. Joe Bay State Buffer Preserve	8.0 (4.9)
LOST-T-FL-41: Cape San Blas, Gulf County	11.0 (6.8)	0 (0)	0.1 (0.1) St. Joseph Bay State Buffer Preserve	10.8 (6.7)
LOGG-T-FL-42: St. Vincent Island, Franklin County	15.1 (9.4)	15.1 (9.4) St. Vincent NWR	0 (0)	0 (0)
LOGG-T-FL-43: Little St. George Island, Franklin County	15.4 (9.6)	0 (0)	15.4 (9.6) Apalachicola NERR	0 (0)
LOGG-T-FL-44: St. George Island, Franklin County:	30.7 (19.1)	0 (0)	14.0 (8.7) Dr. Julian G. Bruce St. George Island State Park	16.7 (10.4)
LOGG-T-FL-45: Dog Island, Franklin County	13.1 (8.1)	0 (0)	0 (0)	13.1 (8.1)
Florida State Totals	**637.1 (396.4)**	**130.3 (81.0)**	**117.4.0 (72.9)**	**390.3 (242.6)**

The primary constituent elements (PCEs) for loggerhead terrestrial critical habitat are those specific elements of the biological and physical features (BPF) that provide for the species' life-history processes and are essential to the conservation of the species. PBFs include those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. The PBFs and PCEs are described as follows:

Physical and Biological Features (PBF):

PBF 1: Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

PBF 2: Habitats Protected from Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

Primary Constituent Elements (PCE):

(1) Suitable nesting beach habitat that has (a) relatively unimpeded nearshore access from the ocean to the beach for nesting females and from the beach to the ocean for both post-nesting females and hatchlings and (b) is located above MHW to avoid being inundated frequently by high tides.

(2) Sand that (a) allows for suitable nest construction, (b) is suitable for facilitating gas diffusion conducive to embryo development, and (c) is able to develop and maintain temperatures and a moisture content conducive to embryo development.

(3) Suitable nesting beach habitat with sufficient darkness to ensure nesting turtles are not deterred from emerging onto the beach and allows hatchlings and post-nesting females to orient successfully to the sea.

(4) Natural coastal processes or artificially created or maintained habitat mimicking natural conditions.

Substantial amounts of sand are deposited along Gulf of Mexico and Atlantic Ocean beaches to protect coastal properties in anticipation of preventing erosion and to mimic what otherwise would be natural processes of overwash and island migration. Constructed beaches tend to differ from natural beaches in several important ways for sea turtles. They are typically wider, flatter, and more compacted, and the sediments are moister than those on natural beaches (Nelson *et al*. 1987; Ackerman *et al.* 1991; Ernest and Martin 1999).

Regarding PCE 1 and PCE 4 for sand placement projects, construction on the beach during sea turtle nesting and hatching season can obstruct nesting females from accessing the beach and hatchlings from entering the water unimpeded. To minimize these impacts, the Corps has agreed to avoid construction during peak nesting and hatching season in the higher density beaches within the entire NWAO DPS of the loggerhead sea turtle as described. This SPBO includes required terms and conditions that minimize incidental take of turtles and reduces the impacts to the PCE 3 by limiting activities at night and placing equipment and staging areas off the nesting beach.

More nests are washed out on the wide, flat beaches resulting from sand placement than narrower steeply sloped natural beaches. This phenomenon may persist through the second postconstruction year and results from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping occur as the beach equilibrates to a more natural contour.

A study performed for the Florida Department of Environmental Protection (FDEP) promoted the test construction of a more “turtle-friendly” beach. The Service, along with the National Fish and Wildlife Foundation and the Florida Fish and Wildlife Conservation Commission (FWC), began a study to determine if statistically significant improvements in nesting success, nest densities, and/or hatchling production can be achieved through modifications to the traditional construction template for beach nourishment projects. It is anticipated that a more natural beach profile will reduce the incidence of scarping, improve nesting success, and reduce the proportion of nests placed along the seaward portion of the berm (those at increased risk of being lost to erosion during profile equilibration), relative to a traditionally built beach. The Corps remains committed to incorporating the results of this study into future design templates.

A significantly larger proportion of turtles emerging on engineered beaches abandon their nesting attempts than turtles emerging on natural or prenourished beaches, even though more nesting habitat is available (Trindell *et al*. 1998; Ernest and Martin 1999; Herren 1999), with nesting success approximately 10 to 34 percent lower on nourished beaches than on control beaches during the first year post-nourishment. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics (beach profile, sediment grain size, beach compaction, frequency and extent of escarpments) associated with the nourishment project (Ernest and Martin 1999). This directly impacts PCE 2 above; however, on severely eroded sections of beach, where little or no suitable nesting habitat exists, and sand placement can result in increased nesting (Ernest and Martin 1999). The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than the eroding beach it replaces.

Regarding PCE 3, during construction, any lights directly visible on the beach during the nesting and hatching seasons are minimized by shielding and directing the lights downward and away from the nesting beach as required in the Terms and Conditions of this SPBO.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher probability of hatchling mortality due to disorientation. Changing to sea turtle compatible lighting can be accomplished at the local level through voluntary compliance or by adopting appropriate regulations. The Terms and Conditions in the Biological Opinion require a lighting survey prior to construction and post construction to determine the additional level of impacts as a result of the proposed project. The Terms and Conditions include working with the local sponsor to minimize the impacts of lighting as a result of the proposed project.

The Service has determined that with the incorporation of the conservation measures as described above, that the proposed projects will not adversely affect nor adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.

Migratory Birds

In order to comply with the Migratory Bird Treaty Act (16 U.S.C. 701 *et seq*.) and reduce the potential for this project to impact nesting shorebirds, the Corps or the Applicant should follow the latest Florida Fish and Wildlife Conservation Commission (FWC) standard guidelines to protect against impacts to nesting shorebirds during implementation of this project during the periods from February 15 to August 31.

Consultation History

<u>1980s and 1990s</u> Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s. During that time, sea turtle protection measures were developed based on research findings available at that time. These measures addressed sand compaction, escarpment formation, and timing restrictions for projects in six south Florida counties with high nesting densities. In the mid-1990s, a sea turtle Biological Opinion (BO) template was developed that included protection measures and information on the status of sea turtles. In 1995, an expanded version of the sea turtle template BO was developed to incorporate new guidance on the required format for BOs and a biological rationale for the Terms and Conditions to be imposed. This document underwent review by four State conservation agencies and the Corps, and was subsequently revised. The primary purposes of the template BO were to: (1) incorporate a standardized format and language required for use in all BOs based on guidance from the Service's Washington Office, (2) assist Service biologists in the preparation of BOs, (3) increase consistency among Service field offices, and (4) increase consistency between the Service and the State agencies.

<u>March 7 and 8, 2006</u> The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of that meeting was to begin discussions about a regional consultation for sand placement activities along the coast of Florida and preparation of a PBA for sand placement activities in Florida. In addition to sea turtles, other Federal and state protected species were included in the discussions. At that meeting, the following topics were discussed:

1. Sand placement activities;
2. Sand source and placement methods;
3. Species and habitat;
4. Geographic scope;
5. Information availability; and
6. Minimization of impacts.

<u>July 13, 2006</u> A second meeting was held to further discuss the draft PBA. The Service provided the Corps with copies of the latest BO templates for each species to be considered. The Service held conference calls with the species recovery leads during August 2006.

October 16, 2006 The Service received the draft PBA via email from the Corps for sand placement activities along the coast of Florida.

October 27, 2006 The Service provided the Corps with draft comments on the PBA via email.

October 31, 2006 The Corps provided a response to the Service's comments on the PBA via email.

November 9, 2006 The Service and the Corps held a conference call to discuss the comments.

December 20, 2006 The Service sent the Corps a letter with the final comments on the draft PBA.

September 18 and 19, 2007
The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of this meeting was to discuss the Terms and Conditions to be included in the BO.

October 5, 2007 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous meeting.

November 1, 2007 The Corps provided the Service with comments via email on the revised Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

March 31, 2008 The Service revised the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice. The Service also revised the minimization measures for the manatee. The revisions were sent to the Corps.

September 16, 2008 The Service sent the Corps via mail the draft SPBO.

October 2, 2008 The Corps provided the Service via email with a summary of the remaining issues concerning the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

October 15, 2008 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous email.

<u>March 11, 2009</u>	The Service received via email examples of previous agreements between the Corps and the local sponsor to carry out the Terms and Conditions in previous BOs.
<u>April 7, 2009</u>	The Service sent an email to the Corps with an update of the progress of our analysis of including piping plovers in the SPBO.
<u>August 26, 2009</u>	The Service sent to the Corps via email the latest Terms and Conditions for sea turtles and beach mice.
<u>September 17, 2009</u>	The Corps sent an email to the Service describing the actions to be taken for the completion and submittal of the PBA.
<u>January 6, 2010</u>	The Corps and the Service participated in a meeting to finalize the draft SPBO.
<u>January 21, 2010</u>	The Corps sent to the Service via email the revised draft PBA.
<u>March 25, 2010</u>	The Corps and the Service participated in an implementation meeting and submittal of the final PBA.
<u>February 22, 2011</u>	The Corps submitted the final PBA to the Service.
<u>April 18, 2011</u>	The Service sent the final Statewide PBO to the Corps.
<u>June 21, 2010</u>	The Corps provided written concerns with the final Statewide PBO
<u>June 30, 2011</u>	The Service revised the final Statewide PBO.
<u>July 18, 2011</u>	The Corps provided written agreement with the changes that were made and asked for additional changes.
<u>July 22, 2011</u>	The Service made additional revisions per the Corps request.
<u>July 25, 2011</u>	The Corps provided written agreement with the additional revisions.
March 25, 2013	The Service published the proposed rule for loggerhead terrestrial critical habitat.
March 3, 2014	The Corps contacted the Service on revising the SPBO to include loggerhead critical habitat in the terrestrial environment.
August 25, 2014	The Service provided the Corps with a Draft Revised SPBO

September 4, 2014	The Corps and Service met and discussed the Draft Revised SPBO at the annual SPBO meeting.
October 23, 2014	The Service received a letter from the Corps requesting the SPBO be revised to include loggerhead critical habitat.
November 3, 2014	The Service sent a draft Revised SPBO to the Corps for review and comment
November 20, 2014	The Corps agreed with the changes made to the draft Revised SPBO
November 24, 2014	The Corps submitted proposed section 7(a)(1) conservation recommendations
January 30, 2014	The Corps and Service agreed on proposed section 7(a)(1) conservation recommendations and finalized draft revised SPBO

This SPBO is based on the PBA, and information provided during meetings and discussions with the Corps' representatives and information from the Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute (FWC/FWRI) sea turtle databases. A complete administrative record of this consultation is on file in the Service's North Florida, Panama City, and South Florida Ecological Services Offices.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes all activities associated with the placement of compatible sediment on beaches of the Atlantic and Gulf coasts of Florida encompassing both South Atlantic Jacksonville (SAJ) and South Atlantic Mobile (SAM) Corps Districts. Additionally, the proposed action includes the replacement and rehabilitation of groins that are included as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This SPBO includes projects authorized through the Corps Regulatory Program, and funded or carried out as part of its Civil Works program. Corps Regulatory activities may include the involvement of other Federal agencies, such as the Department of Defense, Bureau of Ocean Energy Management, and the Federal Emergency Management Agency (FEMA). The shore protection activities covered in the SPBO encompass the following shore protection activities:

1. Sand placement originating from Dredged Material Management Areas (DMMAs), offshore borrow sites, and other compatible sand sources;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management;

3. Sand washed onto the beach from being placed in the swash zone;
4. Sand by-passing/back-passing (sand discharge on beach);
5. Current Operations and Maintenance (O&M) dredging of navigation channels with beach disposal (does not include new navigation projects or expansion (deepening or widening) of existing authorized navigation projects); and
6. Groins and jetty repair or replacement.

For nearshore borrow sites, the Corps must provide information to the Service on the sand flow when this sand is removed from these nearshore areas. If removal of sand from these nearshore areas is shown to cause increased erosion on the adjacent beach, a separate consultation will be required.

A detailed description of each activity is found in the final PBA. The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future beach placement actions addressed in this SPBO may include maintenance of these existing projects or beaches that have not experienced a history of beach placement activities.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment and the shoreline updrift and downdrift area of the project.

Corps Commitments as listed in the final PBA

The following paragraph from the final PBA summarizes the Corps' Commitments as listed below:

"For Corps projects, please note that "fish and wildlife enhancement" activities (which are beyond mitigation of project impacts) must be authorized as a project purpose or project feature or must be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 Jun 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority (ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)), authorization and funding for such is not expected."

<u>Sea Turtles</u>

1. Avoid construction during the peak nesting and hatching season in the higher density beaches, and to the maximum extent practicable during all other nesting times and locations;

2. Except for O&M disposal actions, implement sea turtle nest monitoring and relocation plan during construction if nesting window cannot be adhered to;

3. Except for O&M disposal actions, escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the Service. For Corps Civil Works projects, leveling of escarpments would be limited to the term of the construction or as otherwise may be authorized and funded;

4. Placement of pipe parallel to the shoreline and as far landward as possible so that a significant portion of available nesting habitat can be utilized, nest placement is not subject to inundation or washout, and turtles do not become trapped landward of the pipe;

5. Temporary storage of pipes and equipment will be located off the beach to the maximum extent possible;

6. The Corps will continue to work with the FDEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop and implement alternative design criteria that may minimize these impacts;

7. Except for O&M disposal actions, Service compaction assessment guidelines will be followed and tilling will be performed where appropriate. For Corps Civil Works projects, assessment of compaction and tilling will be limited to the term of the construction or as otherwise may be authorized and funded; and

8. All lighting associated with project construction will be minimized to the maximum extent possible, through reduction, shielding, angling, etc., while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements.

<u>Beach Mice</u>

1. Pipeline routes for beach construction projects will avoid identified primary constituent elements for beach mouse critical habitat to the maximum extent practicable;

2. Implementation of a trapping and relocation plan if avoidance alternatives of occupied habitat are not practical; and

3. Implementation of a lighting plan to reduce, shield, lower, angle, etc. light sources in order to minimize illumination impacts on nocturnal beach mice during construction.

Action Area

The Service has described the action area to include sandy beaches of the Atlantic Coast of Florida (Key West to Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State

Line) for reasons that will be explained and discussed in the "EFFECTS OF THE ACTION" section of this consultation.

Underlying Dynamics of a Barrier Island

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). The southeast coast of Florida consists of continuous, narrow, sandy barrier islands bordering a narrow continental shelf (Wanless and Maier 2007). The dynamics of the east coast shoreline are due to the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. More erosion events can also occur during late September through March due to nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Northwest (panhandle) and Southwest Florida beaches are considered to be low energy beaches with a gradual offshore slope and low sloped fine grained quartz sand beaches. As along the east coast of Florida, the shoreline dynamics are shaped by tropical storms and hurricanes. Although Gulf beaches may experience winter erosion, they are largely protected from the severe nor'easters.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of seven feet at the Florida-Georgia line to less than two feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than three feet (microtidal) except in the extreme south where it ranges from three to four feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Microtidal coasts have a high vulnerability to sea level rise and barrier islands respond by migrating landward. Migration occurs as a result of overwash from extreme storms that flatten topography and deposit sand on the backside of the island, extending the island landward (Young 2007). Significant widening can occur from a single storm event. For example, Dauphin Island, a barrier island in Alabama, has nearly doubled its width following Hurricanes Ivan and Katrina in 2004 and 2005, respectively.

Sea level has risen globally approximately 7.1 inches in the past century (Douglas 1997). Climate models predict a doubling of the rate of sea level rise over the next 100 years (Pendleton *et al.* 2004). Recent studies indicate a trend toward increasing hurricane number and intensity (Emanuel

2005, Webster *et al.* 2005). Barrier islands need to be able to move and respond to these conditions. By locking in a barrier island's location with infrastructure, the island loses its ability to migrate to higher elevations which can lead to its eventual collapse (Moore 2007).

Overwash from less intense storms can positively affect island topography. Low natural berms can develop along beach fronts, but generally can be exceeded by overwash from frontal storms. The berm is an accretionary feature at the landward extreme of wave influence. Sediment is transported over the berm crest and is deposited in a nearshore overwash fan and in breach corridors. Overwash deposition provides source sand for re-establishing dunes. Onshore winds transport the sediment from overwash fans to the dunes, gradually building back dune elevation during storm-free periods.

The interaction between the biology and geomorphology of barrier islands is complex. Just as the barrier island undergoes a process of continual change, so do the ecological communities present. Vegetation zones gradually re-establish following storms, and in turn affect physical processes such as sand accretion, erosion, and overwash. The beach front, dunes, and overwash areas all provide important habitat components. Many barrier island species are adapted to respond positively to periodic disturbance. As the island widens, new feeding habitat (sand/mud flats) is created for shorebirds such as the piping plover. The beaches provide nesting habitat for sea turtles. Early colonizer plants are favored as a food source by beach mice. These barrier island habitats are becoming increasingly rare as our Nation's coastlines rapidly develop and are stabilized.

SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. Five species of sea turtles are analyzed in this SPBO: the loggerhead, green, leatherback, hawksbill, and Kemp's ridley.

Loggerhead Sea Turtle

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 *Federal Register* [*FR*] 32800). The Service and the National Marine Fisheries Service (NMFS) listed the Northwest Atlantic Ocean distinct population segment (DPS) of the loggerhead sea turtle as threatened on September 22, 2011 (76 *FR* 58868). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NMFS 2009a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas.

Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al*. 1983, Dodd 1988, Weishampel *et al*. 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al*. 2003, NMFS and Service 2008).

Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

<u>Green Sea Turtle</u>

The green sea turtle was federally listed on July 28, 1978 (43 *FR* 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters.

The green sea turtle grows to a maximum size of about four feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2009b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Santa Rosa County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC 2009a).

Most green turtles spend the majority of their lives in coastal foraging grounds. These areas include fairly shallow waters both open coastline and protected bays and lagoons. While in these areas, green turtles rely on marine algae and seagrass as their primary diet constituents, although some populations also forage heavily on invertebrates. These marine habitats are often highly dynamic and in areas with annual fluctuations in seawater and air temperatures, which can cause the distribution and abundance of potential green turtle food items to vary substantially between seasons and years (Carballo *et al.*, 2002). Many prey species that are abundant during winter and spring periods become patchy during warm summer periods. Some species may altogether vanish during extreme temperatures, such as those that occur during El Niño Southern Oscillation events (Carballo *et al.*, 2002).

Open beaches with a sloping platform and minimal disturbance are required for nesting.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

<u>Leatherback Sea Turtle</u>

The leatherback sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). Leatherbacks have the widest distribution of the sea turtles; nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Foraging leatherback excursions have been documented into higher-latitude subpolar waters. They have evolved physiological and anatomical adaptations (Frair *et al.* 1972, Greer *et al.* 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving.

The adult leatherback can reach four to eight feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NMFS 2009c). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. This is the largest, deepest diving of all sea turtle species.

Leatherback turtle nesting grounds are distributed worldwide in the Atlantic, Pacific and Indian Oceans on beaches in the tropics and sub-tropics. The Pacific Coast of Mexico historically supported the world's largest known concentration of nesting leatherbacks.

The leatherback turtle regularly nests in the U.S. Caribbean in Puerto Rico and the U.S. Virgin Islands. Along the U.S. Atlantic coast, most nesting occurs in Florida (NMFS and Service 1992). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990, FWC 2009a); and in southwest Florida a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990). Nesting has also been reported in Georgia, South Carolina, and North Carolina (Rabon *et al.* 2003) and in Texas (Shaver 2008).

Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 Code of Federal Regulations (CFR) 17.95).

Hawksbill Sea Turtle

The hawksbill sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean.

Data collected in the Wider Caribbean reported that hawksbills typically weigh around 176 pounds or less; hatchlings average about 1.6 inches straight length and range in weight from 0.5 to 0.7 ounces. The carapace is heart shaped in young turtles, and becomes more elongated or egg-shaped with maturity. The top scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The head is elongated and tapers sharply to a point. The lower jaw is V-shaped (NMFS 2009d).

Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992, Meylan *et al.* 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was federally listed as endangered on December 2, 1970 (35 *FR* 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland.

Adult Kemp's ridleys, considered the smallest sea turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan 1994). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

<u>Loggerhead Sea Turtle</u>

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet (200 meters). The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon *et al.* 1993, Heppell 1998, Crouse 1999, Heppell *et al.* 1999, 2003, Musick 1999).

The generalized life history of Atlantic loggerheads is shown in **Figure 1** (from Bolten 2003).

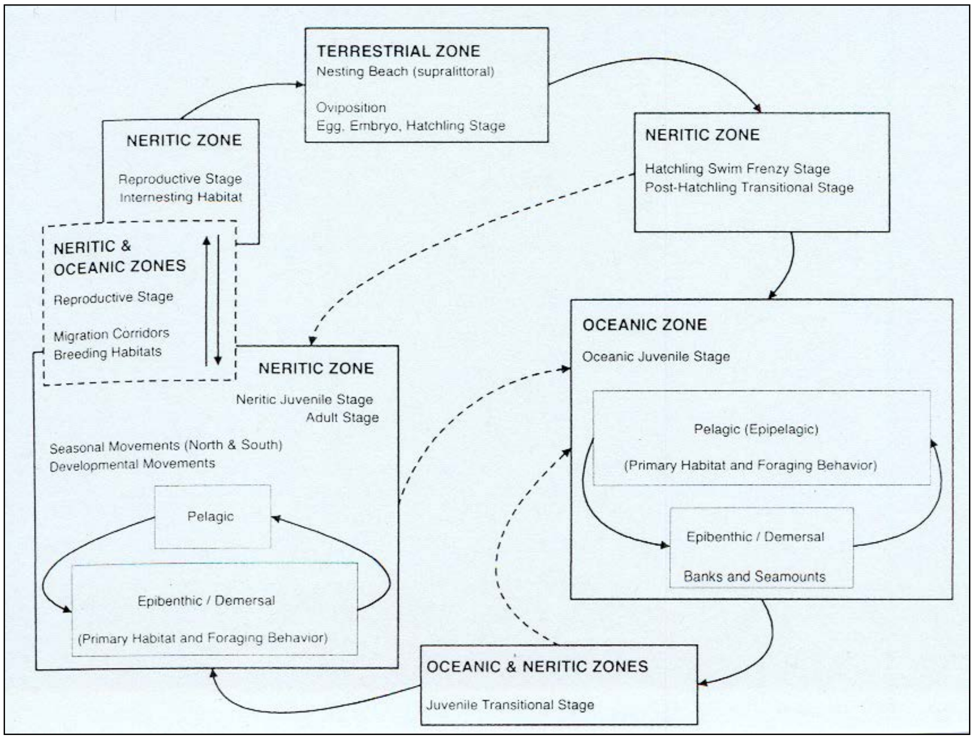

Figure 1. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al*. 2002). **Table 4** summarizes key life history characteristics for loggerheads nesting in the U.S.

Table 5. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).

Life History Trait	**Data**
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	84˚F[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70 percent[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<34 inches Curved Carapace Length) sex ratio	65-70 percent female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

1 Dodd (1988).
2 Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
3 Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 865).
4 National Marine Fisheries Service (2001); Foley (2005).
5 Mrosovsky (1988).
6 Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 1,680).
7 Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al*. 2005; Scott 2006.
8 Caldwell (1962), Dodd (1988).
9 Richardson *et al.* (1978); Bjorndal *et al.* (1983).
10 Snover (2005).
11 Dahlen *et al.* (2000).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington

1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Mortimer 1982; Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a one to three day interval and move upward and out of the nest over a two to four day interval (Christens 1990). The time from pipping to emergence ranges from four to seven days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al.* 1990). Moran *et al*. (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon *et al.* 1992, Witherington and Martin 1996, Witherington 1997, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mitochondrial deoxyribonucleic acid (mtDNA), oceanic juveniles show no structure, neritic juveniles show moderate structure and nesting colonies show strong structure (Bowen *et al*. 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al*. 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

Green Sea Turtle

Green sea turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two or more years intervene between breeding seasons (NMFS and Service 1991). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about nine to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in six to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss *et al.* 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Kemp’s Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as “arribadas or arribazones,” to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal *et al.* 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Clutch size averages 100 eggs and eggs typically take 45 to 58 days to hatch depending on temperatures (Marquez-Millan 1994, Rostal 2007).

Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.1 nests per nesting season. Interannual remigration rate for female ridleys is estimated to be approximately 1.8 (Rostal 2007) to 2.0 years (Marquez-Millan *et al.* 1989). Age at sexual maturity is believed to be between 10 to 17 years (Snover *et al*. 2007).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin *et al.* 2003, Ehrhart *et al.* 2003, Kamezaki *et al.* 2003, Limpus and Limpus 2003, Margaritoulis *et al.* 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in Florida, where 90 percent of nesting occurs, has fluctuated between 52,374 and 98,602 nests per year from 2009-2013 (FWC 2014, http://myfwc.com/media/2786250/loggerheadnestingdata09-13.pdf). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder *et al.* 2003, Foley *et al.* 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (Possardt 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

The majority of nesting occurs along the Atlantic coast of eastern central Florida, with an average of 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998b). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus *et al.* 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila *et al.* (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila *et al.* (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in 1980s, but during the 2003-2004 seasons a total of 120 nests was recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (TEWG 2007). In Florida, the number of nests has been increasing since 1979 (Stewart *et al.* 2011). The average annual number of nests in the 1980s was 63 nests, which rose to 263 nests in the 1990s and to 754 nests in the 2000s (Stewart *et al.* 2011). In 2012, 1,712 nests were recorded statewide (http://myfwc.com/research/wildlife/sea-turtles/nesting/).

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (TEWG 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80 percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, annual population growth rate was estimated to be 1.10 percent (TEWG 2007). Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001 (Garner *et al*. 2005). In the British Virgin Islands, annual nest numbers have increased in Tortola from zero to six nests per year in the late 1980s to 35 to 65 nests per year in the 2000s (TEWG 2007).

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon during the 1999-2000 nesting season (Billes *et al*. 2000). Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea) (Fretey *et al*. 2007). .

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2009, 16,273 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 21,144 (Service 2009). In 2010, a total of 13,302 nests were documented in Mexico (Service 2010). In addition, 207 and 153 nests were recorded during 2009 and 2010, respectively, in the U.S., primarily in Texas.

Status and distribution

Loggerhead Sea turtle

Five recovery units have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries (NMFS and Service 2008). Recovery units are subunits of a listed species that are geographically or otherwise identifiable and essential to the recovery of the species. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species. The five recovery units identified in the Northwest Atlantic (**Figure 2**) are:

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range);

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida;

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida;

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas; and

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

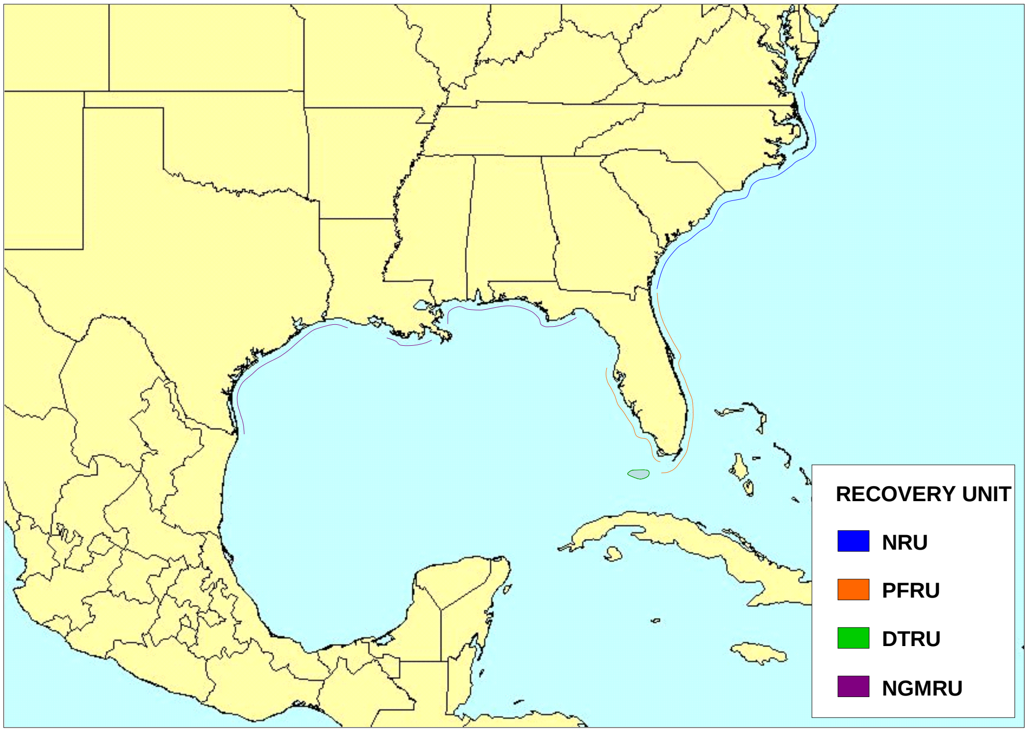

Figure 2. Map of the distribution of the loggerhead recovery units.

The mtDNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989, Foote *et al.* 2000, NMFS 2001, Hawkes *et al.* 2005). Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the GCRU that nest at Quintana Roo, Mexico (Encalada *et al.* 1999, Nielsen *et al*. 2012).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U.S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson *et al.* 1998, NMFS 2001, Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005, Wyneken *et al.* 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken *et al.* (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (NMFS and Service 2008), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline (NMFS and Service 2008).

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years (FWC 2009b). Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

INBS nest counts from 1989–2010 show a shallow decline. However, recent trends (1998–2010) in nest counts have shown a 25 percent decline, with increases only observed in the most recent 6-year period, 2008–2013 although there was no trend observed (FWC/FWRI 2014). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 187 miles) and 23 representative zones on Florida's southern Gulf coast (total length = 14.3 miles). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70 percent of statewide loggerhead nesting activity between 1989 and 2010.

The NGMRU is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 186 miles of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984; FWC 2008d). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-2008) of Florida INBS data for the NGMRU (FWC 2008d). A log-linear regression showed a significant declining trend of 4.7 percent annually (NMFS and Service 2008).

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (nine years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). Surveys after 2004 did not include principal nesting beaches within the recovery unit (*i.e*., Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. There are nine years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend (NMFS and Service 2008).

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo and Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita *et al.* 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (NMFS and Service 2008). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

<u>Recovery Criteria (only the Demographic Recovery Criteria are presented below; for the Listing Factor Recovery Criteria, please see NMFS and Service 2008)</u>

1. Number of Nests and Number of Nesting Females
   a. Northern Recovery Unit
      i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is 2 percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is North Carolina =14 percent [2,000 nests], South Carolina =66 percent [9,200 nests], and Georgia =20 percent [2,800 nests]); and

ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

b. Peninsular Florida Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (one percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

c. Dry Tortugas Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

d. Northern Gulf of Mexico Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is Florida= 92 percent [3,700 nests] and Alabama =8 percent [300 nests]); and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

e. Greater Caribbean Recovery Unit
   i. The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, Bahamas) has increased over a generation time of 50 years; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. Trends in Abundance on Foraging Grounds
   A network of in-water sites, both oceanic and neritic, across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance
   Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle was signed in 2008 (NMFS and Service 2008), and the Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle was signed in 1998 (NMFS and Service 1998e).

Green Sea Turtle

Annual nest totals documented as part of the Florida SNBS program from 1989-2008 have ranged from 435 nests laid in 1993 to 12,752 in 2007. The nest count for 2013 was more than twice the count from 2007 with a total of 36,195 nests recorded (http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/). Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, green turtle nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). Green sea turtle nesting in Florida is increasing based on 19 years (1989-2009) of INBS data from throughout the state (FWC 2009a). The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the Act afforded complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in State waters; (4) the likelihood that the majority of Florida green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data must be based on standardized surveys;

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) is in public ownership and encompasses at least 50 percent of the nesting activity;

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for U.S. Population of Atlantic Green Turtle was signed in 1991 (NMFS and Service 1991), the Recovery Plan for U.S. Pacific Populations of the Green Turtle was signed in 1998 (NMFS and Service 1998b), and the Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle was signed in 1998 (NMFS and Service 1998a).

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al.* (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200, and an upper limit of about 42,900. This is less than one-third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al.* (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (FWC 2009a, Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (FWC 2009b, TEWG Group 2007).

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting if the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Islands, and along the east coast of Florida;

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership; and.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1992 (NMFS and Service 1992), and the Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle was signed in 1998 (NMFS and Service 1998d).

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics.

Recovery Criteria

The U.S. Atlantic population of hawksbills can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument;

2. Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands and Puerto Rico is protected in perpetuity;

3. Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, U.S. Virgin Islands, and Florida; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for the Hawksbill Turtle in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1993 (NMFS and Service 1993), and the Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle was signed in 1998 (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the U.S. and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it can reduce egg viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the MMPA, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Continuation of complete and active protection of the known nesting habitat and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national protection project;

2. Elimination of mortality from incidental catch in commercial shrimping in the U.S. and Mexico through the use of TEDs and achievement of full compliance with the regulations requiring TED use;

3. Attainment of a population of at least 10,000 females nesting in a season; and

4. Successful implementation of all priority one recovery tasks in the recovery plan.

The Recovery Plan for the Kemp's Ridley Sea Turtle was signed in 1992 (Service and NMFS 1992). Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been completed by the Service and NMFS. The Bi-National Recover Plan for the Kemp's Ridley Sea turtle (2011) provides updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions.

Common threats to sea turtles in Florida

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion; armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants (*Solenopsis* spp.), feral hogs (*Sus scrofa*), dogs (*Canis familiaris),* and an increased presence of native species (e.g., raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and opossums (*Didelphis virginiana*)), which raid nests and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching and fishery interactions. On April 20, 2010, an explosion and fire on the Mobile Offshore Drilling Unit *Deepwater Horizon* MC252 occurred approximately 50 miles southeast of the Mississippi Delta. A broken well head at the sea floor resulted in a sustained release of oil, estimated at 35,000 and 60,000 barrels per day. On July 15, the valves on the cap were closed, which effectively shut in the well and all sub-sea containment systems. Damage assessment from the sustained release of oil is currently ongoing and the Service does not have a basis at the present time to predict the complete scope of effects to sea turtles range-wide.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Analysis of the species/critical habitat likely to be affected

The threatened loggerhead sea turtle, the endangered green sea turtle, the endangered leatherback sea turtle, the endangered hawksbill sea turtle, and the endangered Kemp’s ridley sea turtle are currently listed because of their reduced population sizes caused by overharvest and habitat loss with continuing anthropogenic threats from commercial fishing, disease, and degradation of remaining habitat. The proposed action has the potential to adversely affect nesting females of these species, their nests, and hatchlings on all nesting beaches where shore protection activities (including the placement of compatible sediment, repair or replacement of groins and jetties, and navigation channel maintenance on the beaches of the Atlantic and Gulf coasts of Florida) occur.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment.

In accordance with the Act, the Service completes consultations with all Federal agencies for actions that may adversely affect sea turtles on the nesting beach. The Service's analysis only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS assesses and consults with Federal agencies concerning potential impacts to sea turtles in the marine environment, including updrift and downdrift nearshore areas affected by sand placement projects on the beach.

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment as a result of construction activities in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches; disorientation of hatchling turtles resulting from project lighting on beaches adjacent to the construction area as they emerge from the nest and crawl to the water; disorientation that occurs after project construction due to landward lights impacting the elevated berm; and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion.

Some individuals in a population are more "valuable" than others in terms of the number of offspring they are expected to produce. An individual's potential for contributing offspring to future generations is its reproductive value. Because of delayed sexual maturity, reproductive longevity, and low survivorship in early life stages, nesting females are of high value to a population. The loss of a nesting female in a small recovery unit would represent a significant loss to the recovery unit. The reproductive value for a nesting female has been estimated to be approximately 253 times greater than an egg or a hatchling (NMFS and Service 2008). However, the SPBO includes avoidance and minimization measures that reduce the possibility of mortality of a nesting female on the beach as a result of the project. Therefore, we do not anticipate the loss of any nesting females on the beach as a result of the activities listed in this SPBO.

Sand placement projects are anticipated to result in decreased nesting and loss of nests that do get laid within the project area for two subsequent nesting seasons following the completion of the proposed sand placement. However, it is important to note that it is unknown whether nests that would have been laid in a project area during the two subsequent nesting seasons had the project not occurred are actually lost from the population or if nesting is simply displaced to adjacent beaches. Regardless, eggs and hatchlings have a low reproductive value; each egg or hatchling has been estimated to have only 0.004 percent of the value of a nesting female (NMFS and Service

2008). Thus, even if the majority of the eggs and hatchlings that would have been produced on the project beach are not realized for up to 2 years following project completion, the Service would not expect this loss to have a significant effect on the recovery and survival of the species, for the following reasons: 1) some nesting is likely just displaced to adjacent non-project beaches, 2) not all eggs will produce hatchlings, and 3) destruction and/or failure of nests will not always result from a sand placement project. A variety of natural and unknown factors negatively affect incubating egg clutches, including tidal inundation, storm events, and predation.

During project construction, direct mortality of the developing embryos in nests within the project area may occur for nests that are missed and not relocated. The exact number of these missed nests is not known. However, in two separate monitoring programs on the east coast of Florida where hand digging was performed to confirm the presence of nests and thus reduce the chance of missing nests through misinterpretation, trained observers still missed about 6 to 8 percent of the nests because of natural elements (Martin 1992, Ernest and Martin 1993). This must be considered a conservative number, because nests missed during surveys are not always discovered after hatching. In another study, Schroeder (1994) found that even under the best of conditions, about 7 percent of nests can be misidentified as false crawls by highly experienced sea turtle nest surveyors. Missed nests are usually identified by signs of hatchling emergences in areas where no nest was previously documented. Signs of hatchling emergence are very easily obliterated by the same elements that interfere with detection of nests.

In the U.S., consultations with the Service have included military missions and operations, beach nourishment and other shoreline protection projects, and actions related to protection of coastal development on sandy beaches along the coast. Much of the Service's section 7 consultation involves beach nourishment projects. A list of the Service's consultations completed over the last 5 years is included in Appendix A. The Act does not require entities conducting projects with no Federal nexus to apply for a section 10(a)(1)(B) permit. This is a voluntary process and is applicant driven. Section 10(a)(1)(A) permits are scientific permits that include activities that would enhance the survival and conservation of a listed species. Those permits are not listed as they are expected to benefit the species and are not expected to contribute to the cumulative take assessment.

A list of completed NMFS consultations is included in Appendix B.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

INBS nest counts represent approximately 69 percent of known loggerhead nesting in Florida, 74 percent of known green turtle nesting, and 34 percent of known leatherback nesting (FWC 2009a). The INBS program was established with a set of standardized data-collection criteria to measure seasonal nesting, and to allow accurate comparisons between both beaches and years. The reliability of these comparisons results from the uniformity of beach-survey effort in space and time, and from the specialized annual training of beach surveyors. Under the core INBS program, 178 miles of nesting beach have been divided into zones, known as core index zones, averaging 0.5 mile in length. These beaches are monitored daily beginning May 15 and ending August 31. On all index beaches, researchers record nests and nesting attempts by species, the location of each nest, and the date each nest was laid.

Nesting surveys begin at or just before sunrise. Turtle crawls are identified as a true nesting crawl or false crawl (*i.e.*, nonnesting emergence). Nests are marked with stakes and some are surrounded with surveyor flagging tape and, if needed, screened or caged to prevent predation. The marked nests are monitored throughout the incubation period for storm damage, predation, hatching activity and hatching and emerging success. Nest productivity surveys may continue into mid-November depending on nest incubation periods. All monitoring is conducted in accordance with the FWC's Marine Turtle Conservation Guidelines.

<u>Loggerhead Sea Turtle</u>

Five loggerhead sea turtle recovery units have been identified in the Northwest Atlantic (NMFS and Service 2008). Mitochondrial DNA analyses show that there is limited exchange of females among these recovery units (Foote *et al*. 2000, NMFS 2001, Hawkes *et al*. 2005). However, nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001). The NRU and NGMRU are believed to play an important role in providing males to mate with females from the more female-dominated recovery units.

Two (NGMRU and PFRU) of the five nesting subpopulations occur within the proposed Action Area. Northwest Florida, which accounts for 92 percent of the NGMRU in nest numbers, consists of approximately 234 miles of nesting shoreline. The PFRU makes up 1,166 miles of shoreline and consists of approximately was 69,982 nests per year (2008 to 2012)..

Recovery Units	**Nesting Range**
NGMRU	Escambia through Franklin Counties
PFRU	Pinellas through Nassau Counties

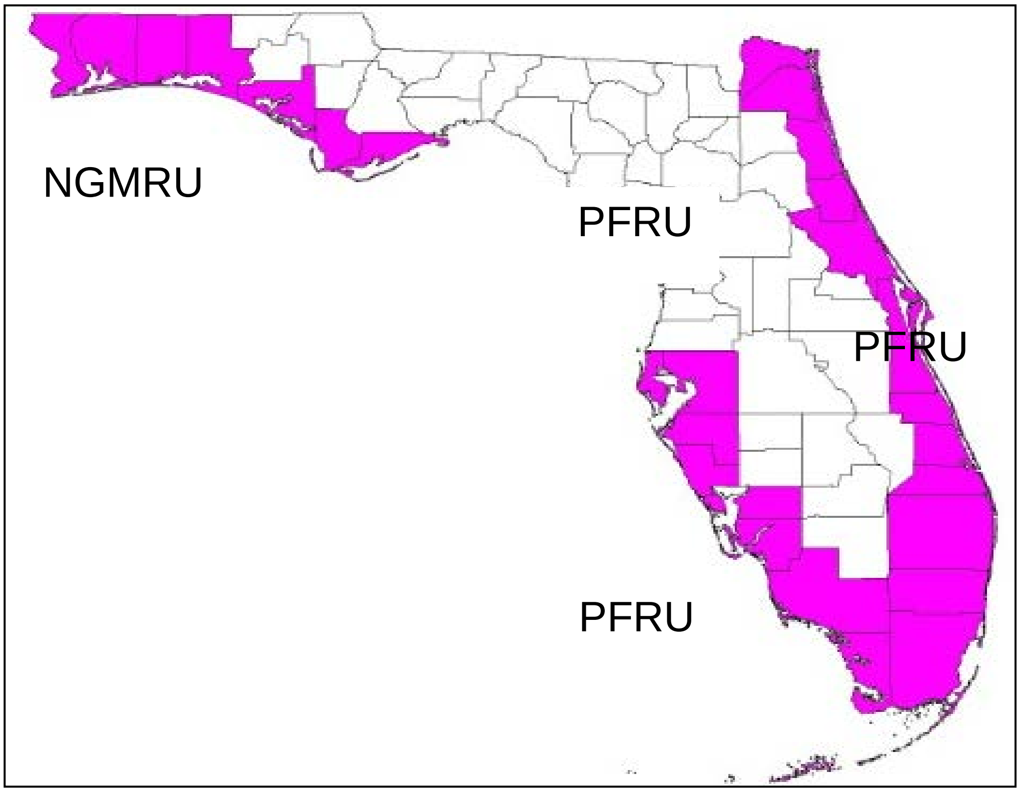

Figure 3. Distribution of loggerhead sea nesting in the PFRU and NGMRU in Florida.

The main loggerhead sea turtle nesting and hatching season throughout Florida is shown in **Table 5.**

Table 6. Loggerhead sea turtle nesting and hatching season for Florida.

AREA	**COUNTIES**	**SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON**
Northern Gulf of Mexico	Escambia through Pasco	May 1 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	April 1 through November 30
Southern Florida Atlantic	Brevard through Miami-Dade	March 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through November 30

An updated analysis by FWC/FWRI reveals a shallow decline in loggerhead nest numbers around the State of Florida based on INBS nest counts from 1989 through 2010 (FWC/FWRI 2010). Analysis of nest counts over the last six years (2009 through 2013) have found no trend, although when added to the data from 1989, the overall change is an increase in loggerhead nests since 1989 (FWC/FWRI 2014). The five year average (2008 to2012) for the PFRU was 69,982 nests. The five-year average (2008 to 2012) for the NGMRU was 966 nests.

Sea turtles play a vital role in maintaining healthy and productive ecosystems. Nesting sea turtles introduce large quantities of nutrients from the marine ecosystem to the beach and dune system (Bouchard and Bjorndal 2000). In the U.S., loggerheads play a particularly important role in this regard due to their greater nesting numbers. The nutrients they leave behind on the nesting beaches in the form of eggs and eggshells play an important role for dune vegetation and terrestrial predator populations (Bouchard and Bjorndal 2000). In a study at Melbourne Beach, Florida, Bouchard and Bjorndal (2000) estimated that only 25 percent of the organic matter introduced into nests by loggerheads returned to the ocean as hatchlings. They found that 29-40 percent of all nutrients were made available to detritivores, decomposers, and plants, while 26-31 percent of all nutrients were consumed by nest predators. Thus, all loggerhead recovery units play a vital role in the maintenance of a healthy beach and dune ecosystem within their geographic distribution.

Green Sea Turtle

Green turtle nest numbers are increasing in Florida with a record number of nests being recorded during the 2013 season (FWC 2014). The five year average (2008 to 2012) for green turtles within the action area was 10,384 nests. The number of green turtle nests recorded in Florida during the 2013 nesting season was a record high of 36,195.

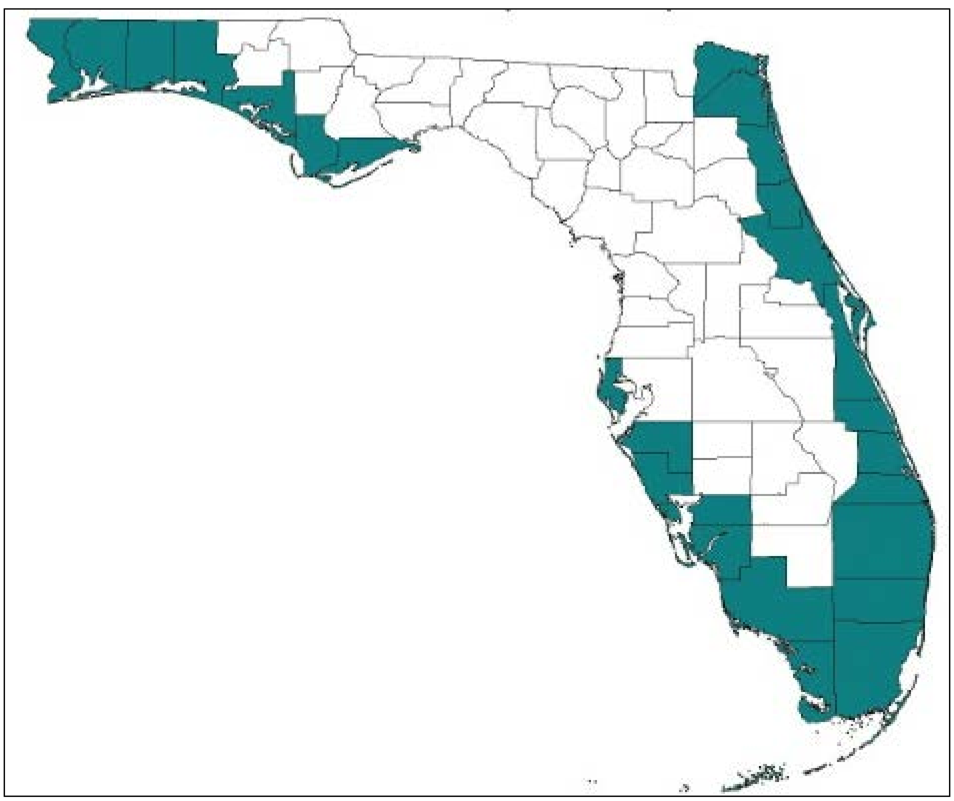

Figure 4. Distribution of green sea turtle nesting in Florida.

The main green sea turtle nesting and hatching season throughout Florida is shown in **Table 6**.

Table 7. Green sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 15 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	May 15 through October 31
Southern Florida Atlantic	Brevard through Miami-Dade	May 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	May 15 through November 15

Leatherback Sea Turtle

Leatherback nest numbers are increasing in Florida with a record number of leatherback nests recorded during the 2009 season (FWC 2009a). The five year average (2008 to 2012) for leatherback sea turtles within the action area was 1,435 nests with a total of 896 nests recorded in 2013.

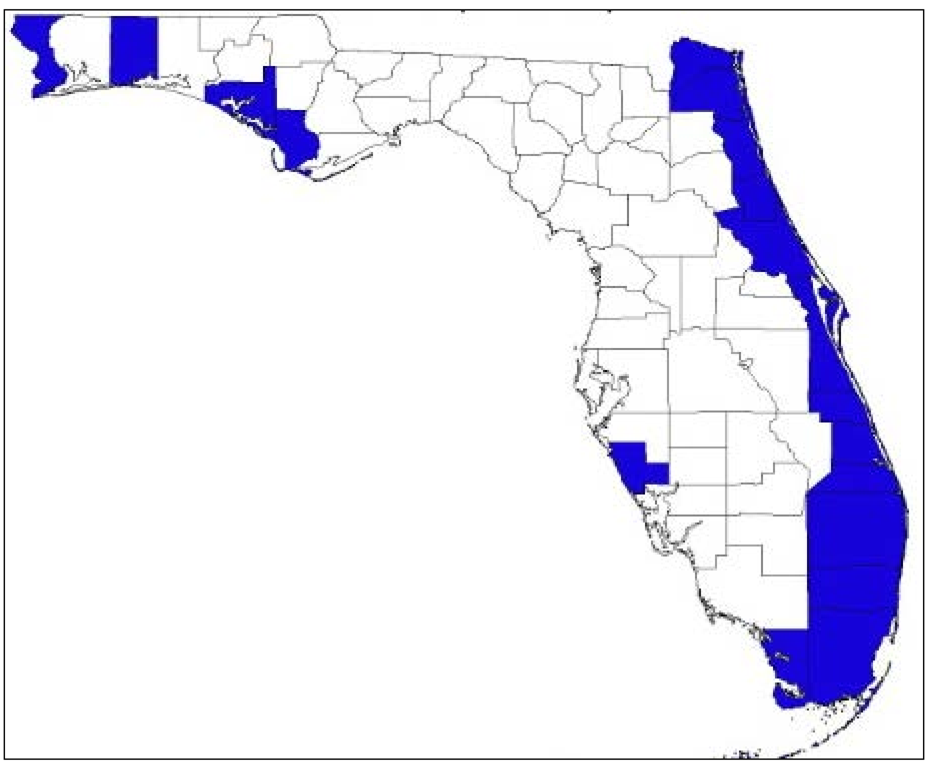

Figure 5. Distribution of leatherback sea turtle nesting in Florida.

The main leatherback sea turtle nesting and hatching season throughout Florida is shown in **Table 7**.

Table 8. Leatherback sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through September 30
Southern Florida Atlantic	Brevard through Miami-Dade	February 15 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through September 30

Hawksbill Sea Turtle

Forty-six hawksbill nests have been documented in Florida from 1979-2013 in Volusia, Martin, Palm Beach, Broward, Miami-Dade, Monroe, and Manatee counties (FWC/FWRI 2014a). The hawksbill sea turtle nesting and hatching season throughout Florida is shown in **Table 8**.

Table 9. Hawksbill sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Southern tip of Florida	Monroe	June 1 through December 31
Southern Florida Atlantic	Brevard through Miami-Dade	June 1 through December 31
Northeast Florida	Volusia	June 1 through December 31
Southwest Florida	Manatee	June 1 through December 31

Kemp's Ridley Sea Turtle

Eighty Kemp's ridley nests have been documented in Florida from 1979-2013 in Duval, Flagler, Volusia, Brevard, Martin, Palm Beach, Lee, Charlotte, Sarasota, Pinellas, Franklin, Gulf, Walton, Okaloosa, Santa Rosa, and Escambia counties (FWC/FWRI 2014).

Factors affecting species habitat within the action area

In accordance with the Act, the Service completes consultations with all federal agencies for actions that may adversely affect sea turtles. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development on sandy beaches of Florida's Atlantic Coast (Key West to

Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State Line) (**Appendix A**).

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in Florida. Beachfront development not only causes the loss of suitable nesting habitat, but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach emergency berm construction and repair, and beach nourishment which cause changes in, additional loss of, or impact to, the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain, which can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action, inundation or “drowning” of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat in a natural state with no development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a loss of nesting habitat.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

A common question is whether the 2004 and 2005 hurricane seasons contributed to reduced loggerhead nest numbers observed from 2004-2007. Although Florida has been subject to numerous hurricanes in recent years, these storm events cannot account for the recent decline (1998-2010) observed in the number of loggerhead nests on Florida beaches. The hurricanes have a very limited effect on nesting activity of adult female turtles. Because loggerheads that hatch on Florida beaches require some 20 to 30 years to reach maturity, storm impacts would not manifest themselves for many years. Moreover, hurricane impacts to nests tend to be localized and often occur after the main hatching season for the loggerhead is over (FWC 2008a).

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Management Funding Assistance Program http://www.dep.state.fl.us/beaches/programs/becp/index.htm. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2009). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976, Mann 1977, Witherington and Martin 1996). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators, or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 to 2010 sea turtle nesting seasons in Florida, turtle hatchlings that were documented as being disoriented ranged from 44,828 to more than 64,000 hatchlings per year (**Table 9**) (FWC/FWRI 2014b). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (FWC 2007a).

Table 10. Documented disorientations along the Florida coast (FWC 2007a).

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1,192	49,623	62
2009	1,274	44,828	42
2010	1,513	46,978	82

Predation

Predation of sea turtle eggs and hatchlings by native and introduced species occurs on almost all nesting beaches. Predation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U.S. are ghost crabs (*Ocypode quadrata*), raccoons, feral hogs, foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos, and fire ants (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U.S., raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980, Talbert *et al*. 1980, Schroeder 1981, Labisky *et al.* 1986). In response to increasing predation of sea turtle nests by coyotes, foxes, hogs, and raccoons, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by interrupting or striking a female turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over nests or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach which interfere with hatchlings crawling to the ocean. Hatchlings appear to become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

The physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward. Since the vehicles also inhibit plant growth, and open the area to wind erosion, dunes may become unstable, and begin to migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches or low dunes on an eroding beach may cause an accelerated rate of overwash and beach erosion (Godfrey *et al.* 1978). If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly reestablish provided the mechanical impact is removed.

In 1985, the Florida Legislature severely restricted vehicular driving on Florida's beaches, except that which is necessary for cleanup, repair, or public safety. This legislation also allowed an exception for five counties to continue to allow vehicular access on coastal beaches due to the availability of less than 50 percent of its peak user demand for off-beach parking. The counties affected by this exception are Volusia, St. Johns, Gulf, Nassau, and Flagler Counties, as well as limited vehicular access on Walton County beaches for boat launching.

Climate Change

The varying and dynamic elements of climate science are inherently long term, complex, and interrelated. Regardless of the underlying causes of climate change, glacial melting and expansion of warming oceans are causing sea level rise, although its extent or rate cannot as yet be predicted with certainty. At present, the science is not exact enough to precisely predict when and where climate impacts will occur. Although we may know the direction of change, it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007a) describes changes in natural ecosystems with potential widespread effects on many organisms, including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the U.S. Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007c).

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases relative to the effects of global climate change on sea turtles and its designated critical habitat, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Florida is one of the areas most vulnerable to the consequences of climate change. Sea level rise and the possibility of more intense hurricanes are the most serious threats to Florida potentially from climate change. Florida has over 1,350 miles of coastline, low-lying topography, and proximity to the hurricane-prone subtropical mid-Atlantic Ocean and Gulf of Mexico.

One of the most serious threats to Florida's coasts comes from the combination of elevated sea levels and intense hurricanes. Florida experiences more landings of tropical storms and hurricanes than any other state in the U.S. Storm surges due to hurricanes will be on top of elevated sea levels, tides, and wave action. As a result, barrier islands and low-lying areas of Florida will be more susceptible to the effects of storm surge. An important element of adaptation strategy is how to protect beaches, buildings and infrastructure against the effects of rising seas and wind, wave action, and storm surge due to hurricanes while maintaining viable nesting habitat along Florida's coasts.

Temperatures are predicted to rise from 1.6^{o}F to 9^{o}F for North America by the end of this century (IPCC 2007a,b). Alterations of thermal sand characteristics could result in highly female-biased sex ratios because sea turtles exhibit temperature dependent sex determination (e.g., Glen and Mrosovsky 2004, Hawkes *et al*. 2008).

Along developed coastlines, and especially in areas where shoreline protection structures have been constructed to limit shoreline movement, rising sea levels will cause severe effects on nesting females and their eggs. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting females from reaching suitable nesting sites (National Research Council

1990a). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation or washout by waves and tidal action.

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles and their designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or their designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on nesting sea turtles, nests, eggs, and hatchling sea turtles within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term and permanent impacts could include a change in the nest incubation environment from the sand placement activities. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the nesting or hatching period, from changes in the physical characteristics of the beach from the placement of the sand including the profile and from sediment-induced changes in the nest incubation environment.

Proximity of action: Sand placement activities would occur within and adjacent to nesting habitat for sea turtles and dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead, green, leatherback, hawksbill, and Kemp's ridley nesting females, their nests, nesting habitat, and hatchling sea turtles.

Distribution: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur along Gulf of Mexico and Atlantic Ocean coasts.

Timing: The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles when conducted between March 1 and November 30.

Nature of the effect: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles, diminish nesting success, and reduce hatching and emerging success. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in Florida.

Duration: The sand placement activity may be a one-time activity or a multiple-year activity and each sand placement project may take between three and seven months to complete. Thus, the direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

Disturbance frequency: Sea turtle populations in Florida may experience decreased nesting success, hatching success, and hatchling emergence success that could result from the sand placement activities being conducted at night during one nesting season, or during the earlier or later parts of two nesting seasons. Disturbance due to alterations of the incubation substrate and beach profile could persist for several years, depending on continued presence of placed sand in the nesting beach.

Disturbance intensity and severity: Depending on the amount (including post-disaster work) and the timing of the sand placement activities during sea turtle nesting season, effects to the sea turtle populations of Florida, and potentially the U.S. populations, could be important.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach nourishment can have adverse effects on nesting female sea turtles and hatchlings and sea turtle nests. Results of monitoring sea turtle nesting and beach nourishment activities provide additional information on how sea turtles respond to nourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach nourishment monitoring is used to manage beach nourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach nourishment can be accomplished. Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles. Because of the long history of sea turtle monitoring in Florida, it is not necessary to require studies on each project beach to document those effects each time.

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although sand placement activities may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement activities during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about seven percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al.* 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

In a 1994 Florida study comparing loggerhead hatching and emerging success of relocated nests with nests left in their original location, Moody (1998) found that hatching success was lower in relocated nests at nine of 12 beaches evaluated. In addition, emerging success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach nourishment may persist over time. These direct effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, repair/replacement of groins and jetties and future sand migration.

Equipment

The use of heavy machinery on beaches during a construction project may also have adverse effects on sea turtles. Equipment left on the nesting beach overnight can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a female turtle on the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over nesting females or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al*. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

Depending on when the dune project is completed, dune vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey *et al.* 1978). Driving along the beachfront should be limited to between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, work areas for the truck transport and bulldozer/bobcat equipment should be designated and marked.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976, Mann 1977, FWC 2007a). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of selected nourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent the first nesting season after project construction and up to 542 percent the second year compared to prenourishment reports (Trindell *et al.* 2005).

Specific examples of increased lighting disorientations after a sand placement project include Brevard and Palm Beach Counties, Florida. A sand placement project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the nourished area. Disorientations on beaches in the County that were not nourished remained constant (Trindell 2007). This same result was also documented in 2003 when another beach in Brevard County was nourished and the disorientations increased by 480 percent (Trindell 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including nourished beaches. A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida, between August 1997 and April 1998. Lighting disorientation events increased after nourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the nourished area in 1998 and 66 percent of the reports were in the nourished area in 1999 (Howard and Davis 1999).

While the effects of artificial lighting have not been specifically studied on each beach that is nourished in Florida, based on the experience of increased artificial lighting disorientations on other Florida beaches, impacts are expected to potentially occur on all nourished beaches statewide.

Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting appropriate regulations. Of the 27 coastal counties in Florida where sea turtles are known to nest, 21 have passed beachfront lighting ordinances in addition to 58 municipalities (http://myfwc.com/media/418420/seaturtle_lightordmap.pdf). Local governments have realized that adopting a lighting ordinance is the most effective method to address artificial lighting along the beachfront.

<u>Indirect Effects</u>

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

Increased susceptibility to catastrophic events

Nest relocation within a nesting season may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al.* 1998).

Increased beachfront development

Pilkey and Dixon (1996) stated that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987, Nelson 1988).

Beach nourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 6**).

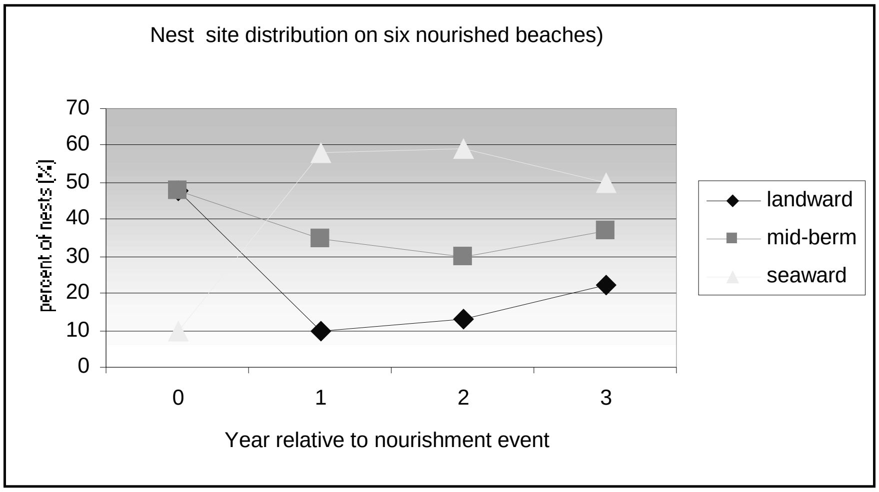

Figure 6. Review of sea turtle nesting site selection following nourishment (Trindell 2005).

Beach compaction and unnatural beach profiles resulting from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e.*, false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to one year. Multi-year beach compaction monitoring and, if necessary, tilling would ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments should resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along the water line interface as the beach adjusts from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Construction of groins and jetties

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979, Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983, Pilkey *et al.* 1984, National Research Council 1987), a process that results in degradation of sea turtle nesting habitat. As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983).

Jetties are placed at ocean inlets to keep transported sand from closing the inlet channel. Together, jetties and inlets are known to have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Witherington *et al.* (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting. Following construction, the presence of groins and jetties may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation.

Escarpments may develop on beaches between groins as the beaches equilibrate to their final profiles. These escarpments are known to prevent females from nesting on the upper beach and can cause them to choose unsuitable nesting areas, such as seaward of an escarpment. These nest sites commonly receive prolonged tidal inundation and erosion, which results in nest failure (Nelson and Blihovde 1998). As groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites and trap both hatchlings and nesting turtles.

Species' response to a proposed action

The following summary illustrates sea turtle responses to and recovery from a nourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or prenourished beaches. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural conditions. However, tilling (minimum depth of 36 inches) is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year monitoring and result from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occur as the beach equilibrates to a more natural contour.

The principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicated that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

BEACH MICE

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The formal taxonomic classification of beach mouse subspecies follows the geographic variation in pelage and skeletal measurements documented by Bowen (1968). This peer-reviewed, published classification was also accepted by Hall (1981). Since the listing of the beach mice, further research concerning the taxonomic validity of the subspecific classification of beach mice has been initiated and/or conducted. Preliminary results from these studies support the separation of beach mice from inland forms, and support the currently accepted taxonomy (Bowen 1968) (*i.e.*, each beach mouse group represents a unique and isolated subspecies). Recent research using mitochondrial DNA data illustrates that Gulf Coast beach mouse subspecies form a well-supported and independent evolutionary cluster within the global population of the mainland or inland old field mice (Van Zant and Wooten 2006).

The old-field mouse (*Peromyscus polionotus)* is different in form and structure as well as being genetically diverse throughout its range in the southeastern U.S. (Bowen 1968, Selander *et al.* 1971). Currently there are 16 recognized subspecies of old-field mice (Hall 1981). Eight subspecies occupy coastal rather than inland habitat and are referred to as beach mice (Bowen 1968). Two existing subspecies of beach mouse and one extinct subspecies are known from the Atlantic coast of Florida and five subspecies live along the Gulf coast of Alabama and northwestern Florida.

Rivers and various inlets bisect the Gulf and Atlantic beaches and naturally isolate habitats in which the beach mice live. The outer coastline and barrier islands are typically separated from the mainland by lagoons, swamps, tidal marshes, and flatwood areas with hardpan soil conditions. However, these dispersal barriers are not absolute; sections of sand peninsulas may from time to time be cut off by storms and shift over time due to wind and current action. Human development has also fragmented the ranges of the subspecies. As a consequence of coastal development and the dynamic nature of the coastal environment; beach mouse populations are generally comprised of various disjunct populations.

<u>Atlantic Coast beach mice</u>

The southeastern beach mouse (SEBM) was listed as a threatened species under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for this subspecies. SEBM is also listed as threatened by the State of Florida. The original distribution of the SEBM was from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami in Miami-Dade County. It is currently restricted to Volusia, Brevard, and Indian River Counties. Formerly, this subspecies occurred along about 175 miles of Florida’s southeast coast; it now occupies about 50 miles, a significant reduction in range (**Figure 7**).

This subspecies uses both beach dunes and inland areas of scrub vegetation. The most seaward vegetation typically consists of sea oats (*Uniola paniculata*), bitter panicgrass (*Panicum amarum*), railroad vine (*Ipomoea pes-caprae*), beach morning-glory (*Ipomoea stolonifera*), and camphorweed (*Heterotheca subaxillaris*). Further landward, vegetation is more diverse, including beach tea (*Croton punctatus*), pricklypear (*Opuntia humifusa*), saw palmetto (*Serenoa repens)*, wax myrtle (*Myrica cerifera)*, and sea grape (*Coccoloba uvifera*).

Anastasia Island beach mice

The Anastasia Island beach mouse (AIBM), was listed as endangered under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for the subspecies. AIBM is also listed as an endangered species by the State of Florida. The distribution of the AIBM has declined significantly, particularly in the northern part of its range. AIBM was historically known from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Frank and Humphrey 1996). Included in their range, AIBM populations are found along 14.5 miles of Anastasia Island, mainly on 3.5 miles at Anastasia State Park (ASP) and one mile at Fort Matanzas National Monument (FMNM). AIBM have been found at low densities in dunes on the remainder of the island. Beach mice have also been located along sections of the 4.2 miles of dune habitat at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)-Guana River. Anastasia Island is separated from the mainland of Florida to the west by extensive salt marshes and the Mantazas River, to the north by the St. Augustine Inlet, and to the south by the Matanzas Inlet which are both maintained and open. This has restricted the range of AIBM to 14.5 mile length of Anastasia Island and sections of GTMNERR-Guana River (**Figure 8**).

In 1992 to 1993, the Service funded the reintroduction of AIBM to GTMNERR in St. Johns County where historical habitat for the subspecies existed (Service 1993). GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) is nine miles north of the existing population of beach mice at ASP. Fifty-five mice (27 females and 28 males) were trapped at FMNM and ASP from September 24, to November 12, 1992, and placed in soft-release enclosures at the state park on September 27, and November 12, 1992. During follow-up trapping conducted in February 1993, beach mice occupied the entire 4.2-mile length of the park; 34 were captured and it was estimated that the population totaled 220. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss alteration from storms or habitat conditions. Sneckenberger 2001 indicates that the scrub habitat found in the tertiary dunes provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level, which may be an issue for this population as A1A Highway separates/bisects the primary dune from the secondary dunes and scrub dune habitats.

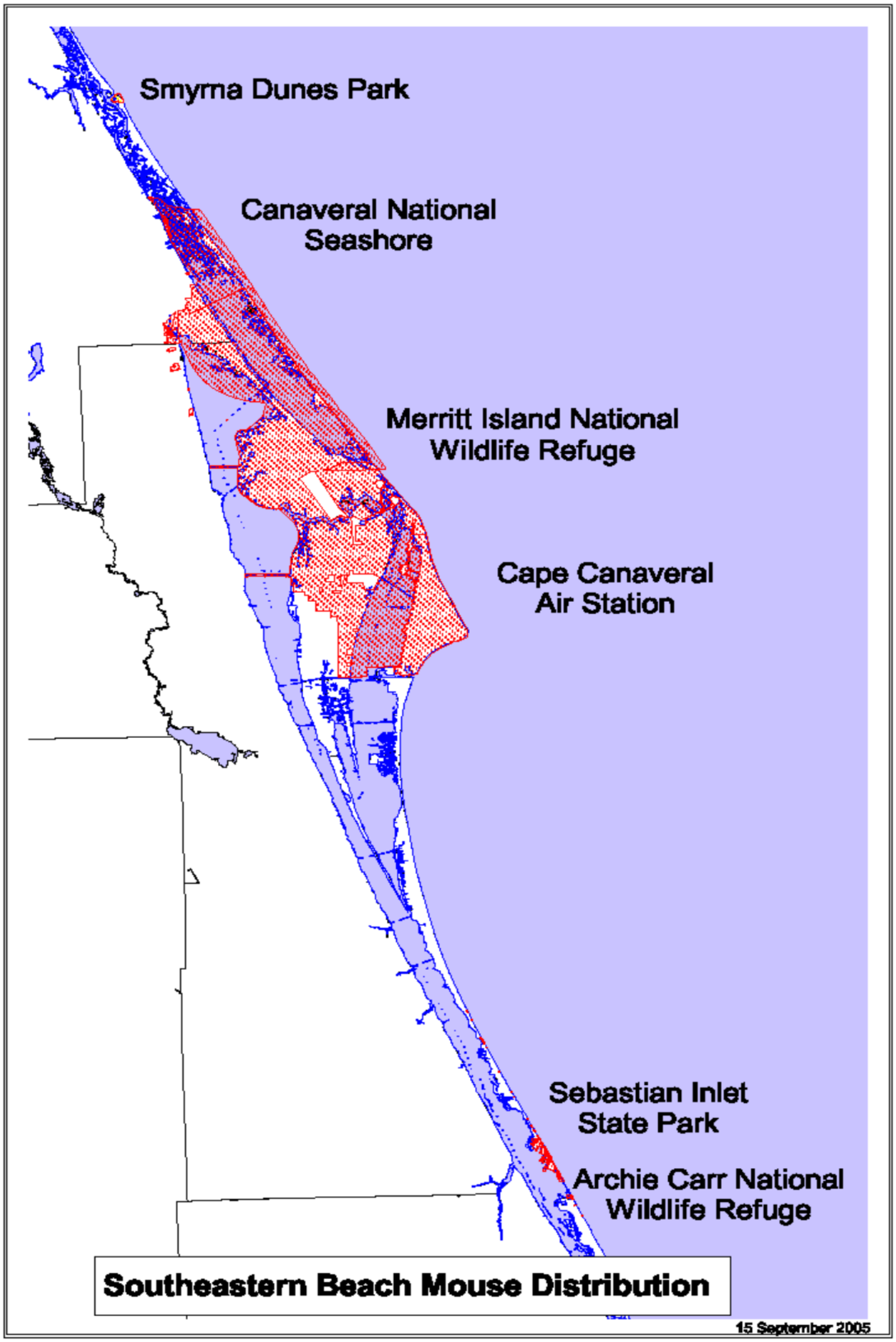

Figure 7. The distribution of the southeastern beach mouse.

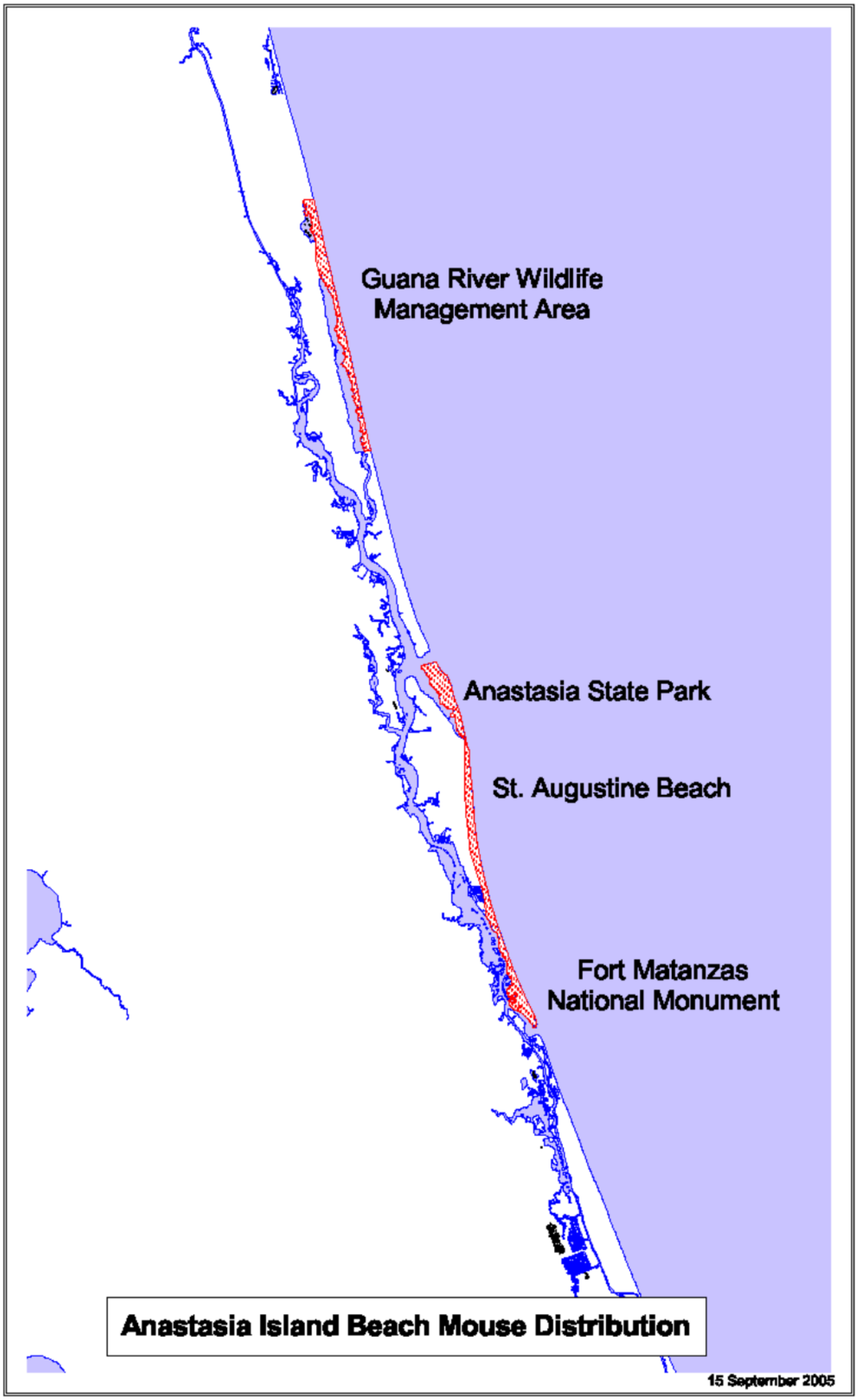

Figure 8. The distribution of the Anastasia Island beach mouse.

Gulf Coast Beach Mice

The CBM and the PKBM were listed with the Alabama beach mouse (ABM) (*Peromyscus polionotus ammobates*), as endangered species under the Act in 1985 (50 *FR* 23872). The SABM was listed under the Act in 1998 (63 *FR* 70053). CBM, SABM, and PKBM are also listed as endangered species by the State of Florida (FWC 2010). Critical habitat was designated for the CBM, and PKBM at the time of listing; however, critical habitat was revised in 2006 (71 *FR* 60238). Critical habitat was also designated for the SABM in 2006 (71 *FR* 60238).

The historical range of the CBM extended 53 miles between Destin Pass, Choctawhatchee Bay in Okaloosa County and East Pass in St. Andrew Bay, Bay County, Florida. PKBM historically ranged along the entire length of Perdido Key for 16.9 miles between Perdido Bay, Alabama (Perdido Pass) and Pensacola Bay, Florida (Bowen 1968). The historical range of the SABM extended 38 miles between Money Bayou in Gulf County, and Crooked Island at the East Pass of St. Andrews Bay, Bay County, Florida including the St. Joseph peninsula and the coastal mainland adjacent to St. Joseph Bay, Florida (**Figure 9**).

Critical habitat

Since the listing of the PKBM and CBM in 1985, research has refined previous knowledge of Gulf Coast beach mouse habitat requirements and factors that influence their use of habitat. Based on the current knowledge of the life history, biology, and ecology of the subspecies and the requirements of the habitat to sustain the essential life history functions of the subspecies, the primary constituent elements (PCE) of critical habitat for Gulf Coast beach mice consist of:

1. A contiguous mosaic of primary, secondary scrub vegetation, and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites;

2. Primary and secondary dunes, generally dominated by sea oats that despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes provide abundant food resources, burrow sites, and protection from predators;

3. Scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane induced storm surge;.

4. Functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas; and

5. A natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth and viability of all life stages.

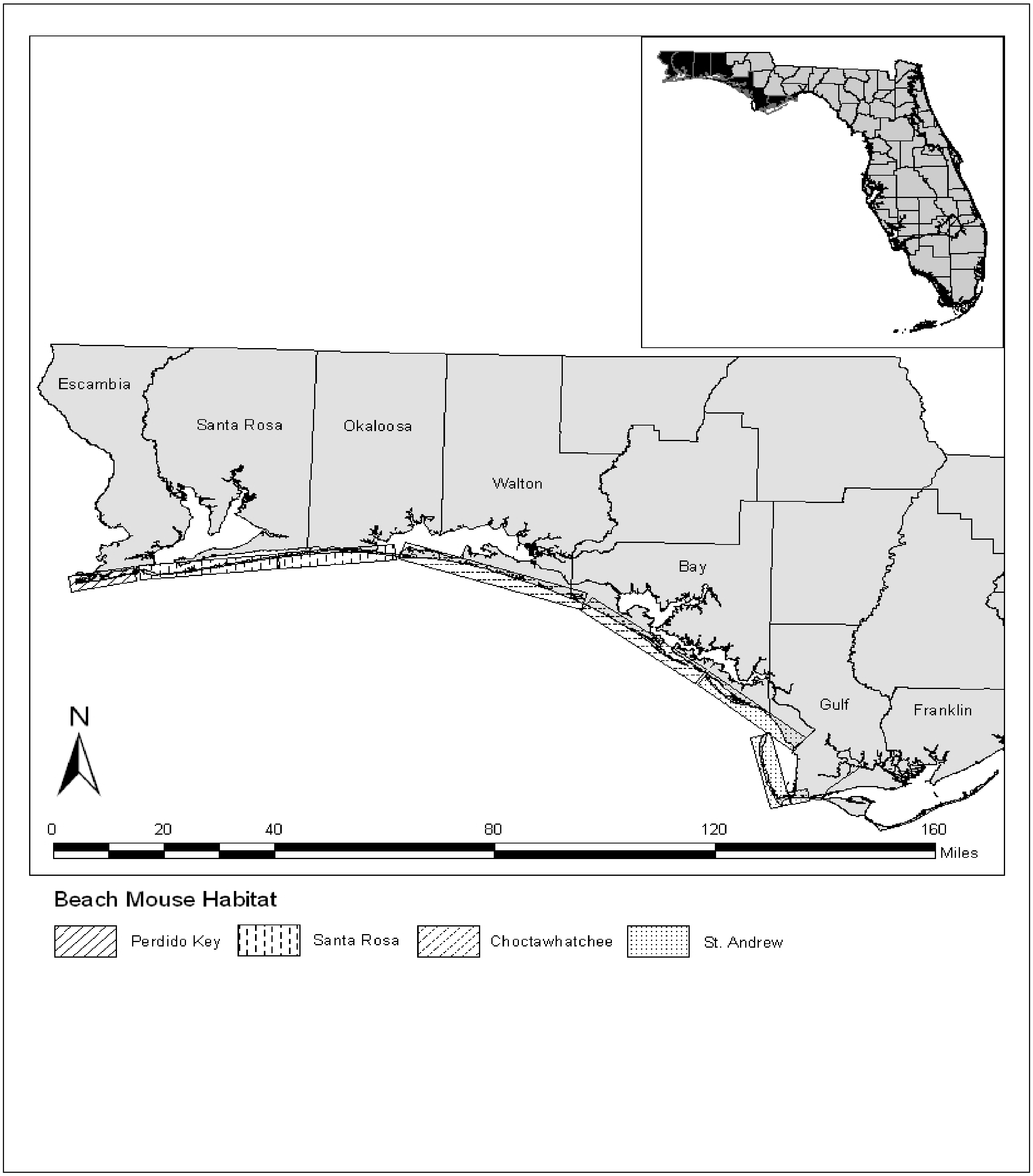

Figure 9. Historical range of Gulf Coast beach mouse subspecies.

Thirteen coastal dune areas (critical habitat units) in southern Alabama and the panhandle of Florida have been determined to be essential to the conservation of PKBM, CBM, and SABM and are designated as critical habitat (**Figures 10 through 12**). These 13 units include five units for PKBM, five units for CBM, and three units for the SABM. These units total 6,194 acres of coastal dunes, and include 1,300 acres for the PKBM in Escambia County, Florida and Baldwin County, Alabama (**Table 10**); 2,404 acres for the CBM, in Okaloosa, Walton, and Bay Counties, Florida (**Table 11**); and 2,490 acres for the SABM in Bay and Gulf Counties, Florida (**Table 12**).

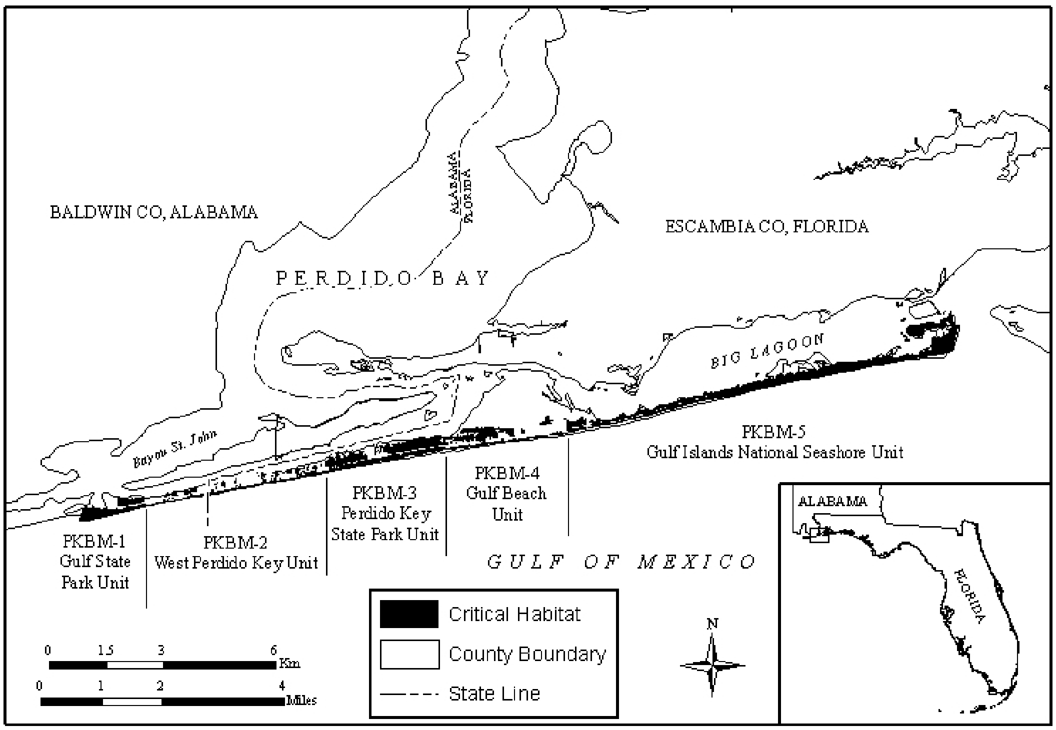

Figure 10. Critical habitat units designated for the Perdido Key beach mouse.

Table 11. Critical habitat units designated for the Perdido Key beach mouse.

Perdido Key Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Gulf State Park Unit	0	115	0	115
2. West Perdido Key Unit	0	0	147	147
3. Perdido Key State Park Unit	0	238	0	238
4. Gulf Beach Unit	0	0	162	162
5. Gulf Islands National Seashore Unit	638	0	0	638
Total	638	353	309	1300

Gulf State Park

The Gulf State Park Unit (PKBM-1) consists of 115 acres of PKBM habitat in southern Baldwin County, Alabama, on the westernmost region of Perdido Key. PKBM were known to inhabit this unit during surveys in 1979 and 1982, and by 1986 this was the only known existing population of the subspecies (Humphrey and Barbour 1981; Holler *et al*. 1989). This population of less than 30 individuals was the donor for the reestablishment of PKBM into Gulf Islands National Seashore in 1986. This project ultimately saved Perdido Key beach mice from extinction as the population at Gulf State Park was considered extirpated in 1998 due to tropical storms and predators (Moyers *et al*. 1999). In 2010, captive bred mice are released at Gulf State Park. This reintroduction was deemed a success and the population has continued to increase. The track tube monitoring was established at GSP in 2010, which began with only a 9 percent occurrence rate and the end of the year yielded an 83 percent occurrence rate, 2011 started with an 85 percent occurrence rate and continued to increase slightly until September 2011 which yielded a 73 percent occurrence rate in the tracking tubes (FWC 2012a and FWC 2014b). A 3-day trapping effort the week of May 7, 2012, continued to find PKBM distributed throughout habitat south of Highway 182. Two reproductively-active male PKBM were found north of Highway 182 (J. Gore pers. comm. 2012). The release appears to have been a success and PKBM are occupying all three public lands for the first time since being listed as endangered. Recent track tube data for 2013 shows an average of 93 percent occurrence of PKBM in the tracking tubes at GSP (FWC 2013a and FWC 2013b).

Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Because scrub habitat is separated from the frontal dunes by a highway in some areas, the population inhabiting this unit can be especially vulnerable to hurricane impacts, and therefore further linkage to scrub habitat and/or habitat management would improve connectivity. This unit is managed by the Alabama Department of Conservation and Natural Resources and provides primary constituent elements (PCEs) 2, 3, 4, and 5. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit, which contains interior scrub habitat as well as primary and secondary dunes, serves as a re-designation and expansion of the original critical habitat designation (50 *FR* 23872). The original designation did not include scrub habitat which we now know is necessary for the long-term persistence of beach mouse populations.

The West Perdido Key Unit (PKBM-2) consists of 114 acres in southern Escambia County, Florida, and 33 acres in southern Baldwin County, Alabama. This unit encompasses essential features of beach mouse habitat from approximately 1.0 mile west of where the Alabama-Florida State line bisects Perdido Key east to 2.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands and ultimately includes essential features of beach mouse habitat between Perdido Key State Park (Unit 3) and GSP (Unit 1). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and provides PCEs 2, 3, and 4.

Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. This area was not known to be occupied at the time of listing. While no trapping has been conducted on these private lands to determine presence, sign of beach mouse presence was confirmed by the Service in 2013 and 2014 through observations of beach mouse burrows and tracks, and this unit is contiguous with two occupied units. Therefore, we have determined this unit to be currently occupied. This unit provides essential connectivity between two core population areas (PKBM-3 and PKBM-1), provides habitat for expansion, natural movements, and re-colonization, and is therefore essential to the conservation of the species. Specifically, this unit may have historically provided for the re-colonization of GSP (PKBM-1) and/or may facilitate similar re-colonization in the future as the habitat recovers from recent hurricane events.

The Perdido Key State Park Unit (PKBM-3) consists of 238 acres in southern Escambia County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of PKSP from approximately 2.0 miles east of the Alabama–Florida State line to 4.0 mile east of the State line and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. This unit provides PCEs 2, 3, 4, and 5 and is essential to the conservation of the species. Improving and/or restoring habitat connections would increase habitat quality and provide more functional connectivity for dispersal, exploratory movements, and population expansion. This unit is managed by the Florida Park Service. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit serves as a redesignation and expansion of a zone included in the initial critical habitat designation (50 *FR* 23872); however, the zone did not include scrub habitat, which we now know is necessary for the long-term persistence of beach mouse populations.

Trapping efforts in this area were limited in the past. In 2000, a successful relocation program reestablished mice at PKSP. In 2004 and 2005, hurricane/tropical storm damage to the habitat at PKSP dropped PKBM detection to only 10 percent of the available habitat, indicating low densities (Loggins 2007). In 2005, the FWC started monitoring the presence of PKBM on public lands by tracking tubes. The Service and other land managers have relied on this data as a means of tracking the presence of PKBM in GSP, PKSP, and GINS. Tracking data from June 2006 indicated that about 25 percent of the available habitat was occupied at PKSP (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 found no mice on PKSP (J. Himes pers. comm. 2008). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands.

The number of track tubes visited by mice has increased over the past several years and recent years indicate almost all track tubes contain PKBM tracks. This is likely due to the fact that the storm-impacted coastal habitats have basically recovered and development and predator pressures have decreased. Data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b).

There were effects to the Unit resulting from the overwash and inundation by storm surge that occurred several times during the 2004 and 2005 storm seasons. Blow outs occurred on the west and east portions of the PKSP. Two sections of the Hwy 292 were washed out. Park facilities were destroyed. Dune vegetation was significantly impacted, but has been restored passively and actively. Park facilities have been reconstructed in accordance with protected species guidelines.

The Gulf Beach Unit (PKBM-4) consists of 162 acres in southern Escambia County, Florida. This unit includes essential features of beach mouse habitat between GINS and Perdido Key State Park from approximately 4.0 miles east of the Alabama–Florida State line to 6.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. While not known to be occupied at the time of listing, a single beach mouse was trapped within the unit as a result of trapping efforts in 2004 (Service 2004). There have been no data collected within this unit to confirm either absence or presence since this single trapping event in 2004. However, Service personnel have observed burrows and tracks indicating PKBM are occupying the area. This unit provides PCEs 2, 3, and 4 and is essential to the conservation of the species. This unit includes high-elevation scrub habitat and serves as a refuge during storm events and as an important repopulation source if storms extirpate or greatly reduce local populations. This unit currently provides essential connectivity between two core populations GINS (PKBM-5) and PKSP (PKBM-3) and provides essential habitat for expansion, natural movements, and recolonization (PCE 4).

The Gulf Islands National Seashore Unit (Unit 5) consists of 638 acres in southern Escambia County, Florida, on the easternmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of Gulf Islands National Seashore–Perdido Key Area (also referred to as Johnson Beach) from approximately 6.0 miles east of the Alabama–Florida State line to the eastern tip of Perdido Key at Pensacola Bay and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists mainly of primary and secondary dune habitat, but provides the longest contiguous expanse of frontal dune habitat within the historic range of the PKBM. PBKM were known to inhabit this unit in 1979. No beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). However the population was impacted by Hurricane Frederic (1979), and considered unoccupied at the time of listing. However, no beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). In 1986, PKBM were re-established to GINS as part of the State of Florida and Service recovery efforts. In 2000 and 2001, PKBM captured from this site served as donors to re-establish beach mice at PKSP. Due to damage from storm surge during the 2004 and 2005 storm seasons, PKBM are detected on approximately 30 percent of the beach mouse habitat available (Loggins 2007). Tracking data from June 2006 indicated that about 32 percent of the available habitat was occupied at GINS (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

PKBM-5, in its entirety, possesses all five PCEs and is essential to the conservation of the species. However, most of this unit consists of frontal dunes, making the population inhabiting this unit particularly threatened by storm events. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit is managed by the National Park Service–Gulf Islands National Seashore. This unit was included in the initial critical habitat designation (50 *FR* 23872) as well as the 2006 revision (71 *FR* 60238). The majority of this unit was overwashed and inundated by storm surge several times during the 2004 and 2005 storm seasons. Park facilities were destroyed and most of the Park road was destroyed. Dune vegetation was washed away or covered with sand. Habitat has since recovered and was comprised of natural and human facilitated dune restoration by GINS staff. Park structures were reconstructed landward of their former locations and in accordance with protected species guidelines.

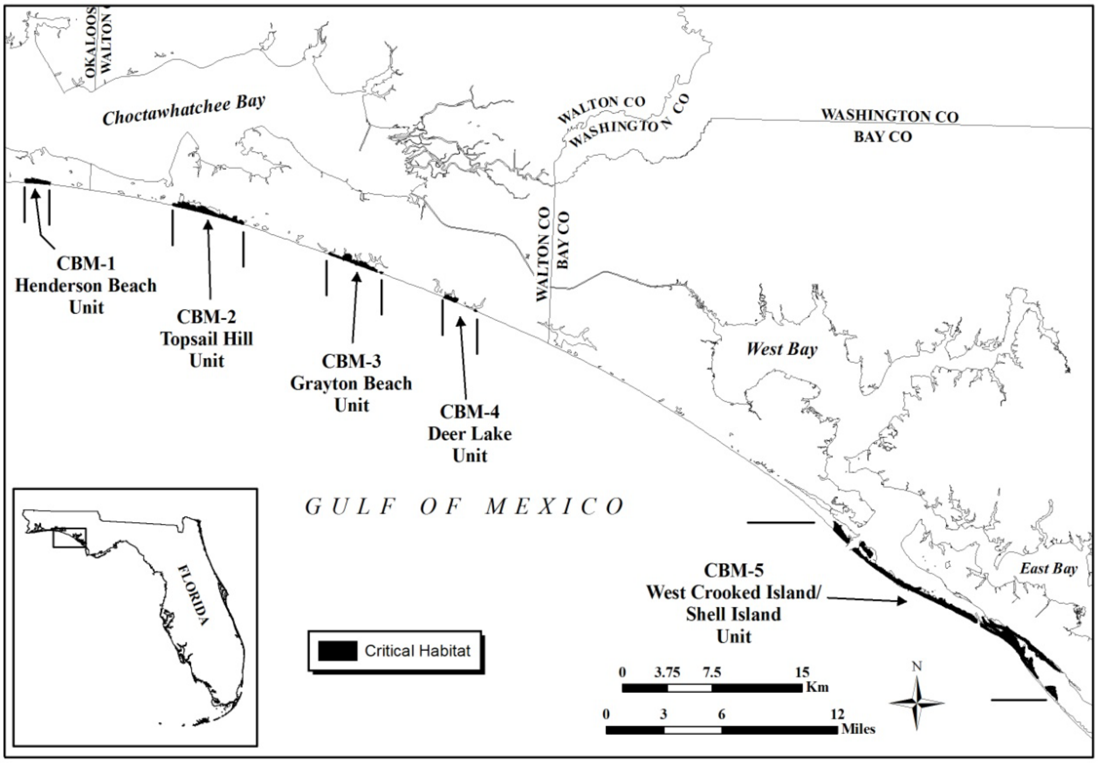

Figure 11. Critical habitat units designated for the Choctawhatchee beach mouse.

Table 12. Critical habitat units designated for the Choctawhatchee beach mouse.

Choctawhatchee Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Henderson Beach Unit	0	96	0	96
2. Topsail Hill Unit	0	277	31	308
3. Grayton Beach Unit	0	162	17	179
4. Deer Lake Unit	0	40	9	49
5. W. Crooked Island/Shell Island Unit	1333	408	30	1771
Total	1333	982	87	2404

The Henderson Beach unit (CBM–1) consists of 96 acres in Okaloosa County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Henderson Beach State Park from 0.5 miles east of the intersection of Highway 98 and Scenic Highway 98 to 0.25 miles west of Matthew Boulevard and the area from the MHWL north to the seaward extent of the maritime forest. This westernmost unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3). This unit is within the historical range of the subspecies; however, it was not known to be occupied at the time of listing and current occupancy is unknown because no recent efforts have been made to document beach mouse presence or absence. Because this unit includes protected, high-elevation scrub habitat, it may serve as a refuge during storm events and as an important source population if storms extirpate or greatly reduce local populations or populations to the east.

This unit is managed by the Florida Park Service and is essential to the conservation of the species. Threats specific to this unit that may require special management considerations include habitat fragmentation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Topsail Hill Unit (CBM–2) consists of 308 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Topsail Hill Preserve State Park, as well as adjacent private lands from 0.1 miles east of the Gulf Pines subdivision to 0.6 miles west of the Oyster Lake outlet and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Its large, contiguous, high-quality habitat allows for natural movements and population expansion. Choctawhatchee beach mice were confirmed present in the unit in 1979 (Humphrey *et al*. 1987), were present at the time of listing, and are still present.

Beach mice have been captured on Stallworth County Park and Stallworth Preserve subdivision, a private development within the unit, and east of the Park (Service 2003a and Yanchis pers comm 2014). The population of Choctawhatchee beach mice inhabiting this unit appears to harbor unique genetic variation and displays a relatively high degree of genetic divergence considering the close proximity of this population to other populations (Wooten and Holler 1999).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include Park and residential development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the Habitat Conservation Plan (HCP) for the Stallworth County Preserve (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Grayton Beach Unit (CBM–3) consists of 179 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Grayton Beach State Park, as well as adjacent private lands and inholdings, from 0.3 mi west of the Alligator Lake outlet east to 0.8 miles west of Seagrove Beach and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity (PCE 4) and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Beach mice were not detected in the unit in 1979 (Holler 1992a); however, they were found to be present in 1995 after Hurricane Opal (Moyers *et al.* 1999). While it seems likely that beach mice were present at the time of listing (and may have been present, but not detected, in 1979), the Service does not have data to confirm this assumption. Therefore, the Service considered this unit to be unoccupied at the time of listing. A program to strengthen and reestablish the population began in 1989 and yielded a persistent population at Grayton Beach State Park. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Beach mice are also known to currently occupy the private lands immediately east of the park.

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include hurricane impacts that may require dune restoration and revegetation, excessive open, unvegetated habitat due to recreational use or storm impacts that may require revegetation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the Choctawhatchee beach mouse within the area covered under the HCP for the Watercolor development (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Deer Lake Unit (CBM–4) consists of 49 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Deer Lake State Park as well as adjacent private lands from approximately one mile east of the Camp Creek Lake inlet west to approximately 0.5 miles west of the inlet of Deer Lake and the area from the MHWL north to the seaward extent of maritime forest or human development. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity to adjacent lands (PCE 4), and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Because live-trapping efforts in this area have been limited to incidental trapping, and beach mice were not detected in 1998 (Moyers *et al*. 1999), the Service considered this unit to be unoccupied at the time of listing. CBM were translocated from Topsail Hill Preserve State Park to private lands adjacent to this unit in 2003 and 2005 (Service 2003b, 2005a, 2005b, 2005c, 2005d). Tracking within the adjacent State park lands have indicated expansion of the population into the park. Recent track tube data from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the HCP/Incidental Take Permit (ITP) for Watersound (71 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act (see Application of Section 4(a)(3) and Exclusions Under Section 4(b)(2) of the Act section below). This excluded area is 0.5 miles west of the Camp Creek Lake inlet to 0.5 miles east of the Camp Creek Lake inlet.

The West Crooked Island/ Shell Island Unit (CBM–5) consists of 1,771 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat within the boundaries of St. Andrew State Park mainland from 0.1 miles east of Venture Boulevard east to the entrance channel of St. Andrew Sound, Shell Island east of the entrance of St. Andrew Sound east to East Pass, and West Crooked Island southwest of East Bay and east of the entrance channel of St. Andrew Sound, and areas from the MHWL north to the seaward extent of the maritime forest. Shell Island consists of State lands, Tyndall Air Force Base (AFB) lands, and small private inholdings. Choctawhatchee beach mice were known to inhabit the majority of Shell Island in 1987 (Holler 1992b) and were again confirmed present in 1998 (Moyers *et al*. 1999), 2002, and 2003 (Lynn 2003a). Because beach mice inhabited nearly the entire suitable habitat on the island less than two years prior to listing and were reconfirmed after listing, the Service considered this area to be occupied at the time of listing. The West Crooked Island population is the result of a natural expansion of the Shell Island population after the two islands became connected in 1998 and 1999, a result of Hurricanes Opal and Georges (Service 2003b). Shell Island was connected to the mainland prior to the 1930s when a navigation inlet severed the connection on the western end. Beach mice were documented at St. Andrew State Park mainland as late as the 1960s (Bowen 1968), though no records of survey efforts exist again until Humphrey and Barbour (1981) and Meyers (1983) at which time beach mice were not detected. Therefore, it seems likely that this area was not occupied at the time of listing. Current beach mouse population levels at this site are unknown, and live-trapping to document the absence of mice has not been conducted. Similar to the original designation, this Park was designated as critical habitat because it has features essential to the CBM. It is also within the historical range of the mouse. This unit supports the easternmost population of CBM, with the next known population 22 miles to the west.

This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Portions of this unit are managed by the Florida Park Service, while the remaining areas are federally (Tyndall AFB) and privately owned.

Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high residential or recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Figure 12. Critical habitat units designated for the St. Andrew beach mouse.

Table 13. Critical habitat units designated for the St. Andrew beach mouse.

St. Andrew Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. East Crooked Island Unit	649	0	177	826
2. Palm Point Unit	0	0	162	162
3. St. Joseph Peninsula Unit	0	1280	222	1502
Total	649	1280	561	2490

The East Crooked Island Unit (SABM–1) consists of 826 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat on East Crooked Island from the entrance of St. Andrew Sound to one mile west of Mexico Beach, and the area from the MHWL to the seaward extent of the maritime forest (not including Raffield Peninsula). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and possesses all five PCEs. SABM were known to inhabit the unit in 1986 and 1989 (James 1992), though the population was presumably extirpated after 1989 due to impacts from hurricanes. The East Crooked Island population was reestablished with donors from St. Joseph State Park in 1997. This unit was occupied at the time of listing. Live-trapping in 2002 confirmed occupation of mice (Moyers and Shea 2002, Lynn 2002a, Slaby 2005). Recent track tube data indicates mice are still present in this unit (FWC 2013a and FWC 2013b). This unit maintains connectivity along the island and this unit is essential to provide a donor population following storm events.

The majority of this unit is federally owned (Tyndall AFB), while the remaining habitat is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational and military use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Palm Point Unit (SABM–2) consists of 162 acres of private lands in Gulf County, Florida. This unit encompasses habitat from Palm Point 1.25 miles northwest of the inlet of the Gulf County Canal to the southeastern boundary of St. Joseph Beach and the area from the MHWL to the seaward extent of the maritime forest. SABM were documented in the area by Bowen (1968) and were considered to have been present in this unit at the time of listing. Since SABM beach mouse habitat is limited to only two other areas, protecting this mainland site located within the species' historical range is needed for the subspecies' long-term persistence. As other viable opportunities are limited or nonexistent, this unit is essential to reduce the threats of stochastic events to this subspecies. Furthermore, as this unit is on the mainland, it is somewhat buffered from the effects of storm events. This area provides frontal and scrub dune habitat (PCEs 2 and 3), but may provide limited connectivity between habitats. Threats specific to this unit that may require special management considerations include habitat fragmentation, habitat loss, artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, and high residential use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The St. Joseph Peninsula Unit (SABM–3) consists of 1,502 acres in Gulf County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of St. Joseph Peninsula State Park (Park) as well as south of the Park to the peninsula's constriction north of Cape San Blas (also known as the "stumphole" region) and area from the MHWL to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat, and provides a relatively contiguous expanse of habitat within the historical range of the SABM. This unit possesses all five PCEs and was occupied at the time of listing. SABM were known to inhabit this unit in 1986 and 1987 (James 1987, 1992, 1995, Gore 1994, Moyers *et al.* 1999, Slaby 2005). In addition, recent trapping and tracking efforts suggest that mice continue to occupy private lands south of the Park (K. Yanchis pers comm., FWS 2012). The Park alone does not provide sufficient habitat to allow for population expansion along the peninsula, which may be necessary for a population anchored by the tip of a historically dynamic peninsula. A continuous presence of beach mice along the peninsula is the species' best defense against local and complete extinctions due to storm events. The population of SABM inhabiting this unit appears to possess unique genetic variation, and displays greater than expected genetic divergence from other populations (Wooten and Holler 1999).

The Florida Park Service manages portions of this unit, while the remaining area is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, habitat fragmentation and habitat loss, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality. The population inhabiting this unit may also be particularly susceptible to hurricanes due to its location within St. Joseph Bay (the peninsula is a thin barrier peninsula with a north–south orientation).

Life history (All subspecies of beach mice)

Beach mice are differentiated from the inland subspecies by the variety of fur (pelage) patterns on the head, shoulders, and rump. The overall dorsal coloration in coastal subspecies is lighter in color and less extensive than on those of the inland subspecies (Sumner 1926, Bowen 1968). Similarly, beach mouse subspecies can be differentiated from each other by pelage pattern and coloration.

The SEBM averages 5.47 inches in total length (average of 10 individuals = 5.07 inches, with a 2.04-inch tail length (Osgood 1909, Stout 1992). Females are slightly larger than males. These beach mice are slightly darker in appearance than some other subspecies of beach mice, but paler than inland populations of *P. polionotus* (Osgood 1909). SEBM have pale, buffy coloration from the back of their head to their tail, and their underparts are white. The white hairs extend up on their flanks, high on their jaw, and within 0.07 to 0.12 inches of their eyes (Stout 1992). There are no white spots above the eyes as with AIBM (Osgood 1909). Their tail is also buffy above and white below. Juvenile SEBM are more grayish in coloration than adults; otherwise they are similar in appearance (Osgood 1909).

The AIBM averages 5.45 inches in total length (average of 10 individuals); with 2.05 inches mean tail length (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The SABM has head and body lengths averaging 2.95 inches, and tail mean lengths averaging 2.05 inches (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath and along the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The PKBM is slightly smaller than the other Gulf coast beach mouse subspecies (Bowen 1968). Head and body length ranges from 2.7 to 3.3 inches (Holler 1992b). The pigmentation of PKBM is gray to gray-brown with the underparts white and coloration on the head is less pronounced. The line between pigmented and unpigmented pelage runs dorsally posterior above the eyes and behind the ears. Pigmentation patterns on the rump are either squared or squared superimposed on a tapered pattern (Bowen 1968). There is no tail stripe.

CBM have head and body lengths ranging from 2.7 to 3.5 inches (Holler 1992a). This beach mouse is distinctly more orange-brown to yellow-brown than the other Gulf coast beach mouse subspecies (Bowen 1968). Pigmentation on the head either extends along the dorsal surface of the nose to the tip, or ends posterior to the eyes leaving the cheeks white. A dorsal tail stripe is either present or absent.

Behavior

Peromyscus polionotus is the only member of the genus that digs an extensive burrow. Beach mice are semifossorial, using their complex burrows as a place to rest during the day and between nightly foraging bouts, escape from predators, have and care for young, and hold limited food caches. Burrows of *P. polionotus* generally consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are usually placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 23.6 to 35.4 inches, and the escape tunnel rises from the nest chamber to within 9.8 inches of the surface (Blair 1951). Nests of beach mice are constructed in the nest chamber of their burrows, a spherical cavity about 1.5 to 2.5 inches in diameter. The nest comprises about one-fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949). Beach mice have been found to select burrow sites based on a suite of biotic and abiotic features including dune slope, soil compaction, vegetative cover, and height above sea level (Lynn 2000a, Sneckenberger 2001). A shortage of potential burrow sites is considered to be a possible limiting resource.

Reproduction and Demography

Studies on *Peromyscus* species in peninsular Florida suggest that these species may achieve greater densities and undergo more significant population fluctuations than their temperate relatives, partially because of their extended reproductive season (Bigler and Jenkins 1975). Subtropical beach mice can reproduce throughout the year; however, their peak reproductive activity is generally during late summer, fall, and early winter. Extine (1980) reported peak reproductive activity for SEBM on Merritt Island during August and September, based on external characteristics of the adults. This peak in the timing and intensity of reproductive activity was also correlated to the subsequent peak in the proportion of juveniles in the population in early winter (Extine 1980). Peak breeding season for Gulf Coast beach mice is autumn and winter, declining in spring, and falling to low levels in summer (Rave and Holler 1992, Blair 1951). However, pregnant and lactating beach mice have been observed in all seasons (Moyers *et al.* 1999).

Sex ratios in beach mouse populations are generally 1:1 (Extine 1980, Rave and Holler 1992).

Beach mice are believed to be generally monogamous (Smith 1966, Foltz 1981, Lynn 2000a). While a majority of individuals appear to pair for life, paired males may sire extra litters with unpaired females. Beach mice are considered sexually mature at 55 days of age; however some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Fleming and Holler 1990). Littering intervals may be as short as 26 days (Bowen 1968).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama have demonstrated that their average life span is about nine months (Swilling 2000). Other research indicated that 63 percent of Alabama beach mice lived (or remained in the trapping area) for four months or less, 37 percent lived 5 months or greater and two percent lived 12 to 20 months (Rave and Holler 1992). Less than half (44 percent) of beach mice captured for the first time were recaptured the next season (Holler *et al*. 1997). Greater than 10 percent of mice were recaptured three seasons after first capture; and four to eight percent were recaptured more than one year after initial capture. Beach mice held in captivity have lived three years or more (Blair 1951, Holler 1995).

Habitat and Movement

Beach mice inhabit coastal dune ecosystems on the Atlantic and Gulf Coasts of Florida and the Gulf Coast of Alabama. The dune habitat is generally categorized as: primary dunes (characterized by sea and other grasses), secondary dunes (similar to primary dunes, but also frequently include such plants as woody goldenrod (*Chrysoma pauciflosculosa*), false rosemary (*Conradina canescens*), and interior or scrub dunes (often dominated by scrub oaks and yaupon (*Ilex vomitoria*). Contrary to the early belief that beach mice were restricted to (Howell 1909, 1921, Ivey 1949), or preferred the frontal dunes (Blair 1951, Pournelle and Barrington 1953, Bowen 1968), recent research has shown that scrub habitat serves an invaluable role in the persistence of beach mouse populations (Swilling *et al.* 1998, Sneckenberger 2001). Beach mice occupy scrub dunes on a permanent basis and studies have found no detectable differences between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling *et al.* 1998, Swilling 2000, Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

The sea oat zone of primary dunes is considered essential habitat of beach mice on the Atlantic Coast (Humphrey and Barbour 1981, Humphrey *et al.* 1987, Stout 1992). The SEBM has also been reported from sandy areas of adjoining coastal strand/scrub vegetation (Extine 1980, Extine and Stout 1987), which refers to a transition zone between the fore dune and the inland plant community (Johnson and Barbour 1990). Beach mouse habitat is heterogeneous, and distributed in patches that occur both parallel and perpendicular to the shoreline (Extine and Stout 1987). Because this habitat occurs in a narrow band along Florida’s coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of several feet.

Primary dune vegetation described from SEBM habitat includes sea oats, bitter panicgrass, railroad vine, beach morning-glory, saltmeadow cordgrass (*Spartina patens*), lamb'squarters (*Chenopodium album*), saltgrass (*Distichlis spicata*), and camphorweed (Extine 1980). Coastal strand and inland vegetation is more diverse, and can include pricklypear, saw palmetto, wax myrtle, Florida rosemary (*Ceratiola ericoides*), sea grape, and sand pine (*Pinus clausa*) (Extine and Stout 1987). Extine (1980) observed this subspecies as far as 0.62 miles inland on Merritt Island; he concluded that the dune scrub communities he found them in represent only marginal habitat for the SEBM. SEBM have been documented in coastal scrub more than a mile from the beach habitat at Kennedy Space Center/Merritt Island National Wildlife Refuge (NWR) and Cape Canaveral Air Force Station (CCAFS) (Stout *et al*. 2006). Extine (1980) and Extine and Stout (1987) reported that the SEBM showed a preference for areas with clumps of palmetto, sea grape, and expanses of open sand.

Essential habitat of the AIBM is characterized by patches of bare, loose, sandy soil (Humphrey and Frank 1992a). Although they are mainly found in the sea oat zone of the primary zone, they will occur in sandy areas with broomsedge (*Andropogon* sp.) (Service 1993). Ivy (1949) reported AIBM to occur in woody vegetation as far as 500 feet inland. Pournelle and Barrington (1953) found this subspecies in scrub as far as 1,800 feet from the dunes. Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of only a few feet. Much of the habitat within the range of the AIBM has been converted to condominiums and housing developments. The majority of the high quality habitat, densely occupied by beach mice, remains along the length of both ASP and FMNM, at either end of Anastasia Island.

Two main types of movement have been identified for small mammals: within home-range activity and long-range dispersal. Such movements are influenced by a suite of factors, such as availability of mates, predation risk, and habitat quality. Movement and home range studies have been conducted for most beach mouse subspecies, but are limited to natural habitat (*i.e*., research has been conducted on public lands within contiguous beach mouse habitat, not within a development or in a fragmented landscape). Novak's (1997) study of the home range of CBM on Shell Island indicated males had a mean home range of 1.0 $\pm$ 4.1 acres and females had a mean home range of 0.81 $\pm$ 2.18 acres. Lynn (2000a) found male and female radio-tagged ABM had a mean home range of 1.68 $\pm$ 0.27 acres and 1.73 $\pm$ 0.40 acres, respectively. Swilling *et al.* (1998) observed one radio-collared ABM to travel over 328 feet during nightly forays after Hurricane Opal to obtain acorns from the scrub dunes. Using radio telemetry, Lynn (2000a) documented an ABM that traveled one mile within a 30-minute period. Moyers and Shea (2002) trapped a male and female CBM that moved about 637 feet and 2,720 feet in one night, respectively. Gore and Schaefer (1993) documented a marked Santa Rosa beach mouse crossing State Road (SR) 399, a two-lane highway. Lynn and Kovatch (2004) through mark and recapture trapping documented PKBM that crossed SR 292, a two-lane highway and right-of-way (100-feet wide).

Sneckenberger (2001) found significant seasonal differences in the movement of ABM, and suggested that this was a result of seasonal fluctuations in food availability, food quality, and nutritional needs. Smith (2003) found that Santa Rosa beach mice demonstrated an increase in movement as habitat isolation increased suggesting that longer travel distances were needed to obtain necessary resources. Smith also found that Santa Rosa beach mice had a preference for vegetation cover and connectivity, which is likely a behavioral response to increased predation risk in open areas. Thus, while beach mice are able and do travel great distances the travel pathways should have vegetated cover and no large gaps or open areas. Previous connectivity research suggests critical thresholds exist for species persistence in fragmented landscapes (With and Crist 1995). As fragmentation increases and connectivity is lost, species' ability to move through and between habitats is reduced in a nonlinear fashion.

Foraging

Beach mice are nocturnal and forage for food throughout the dune system. Beach mice feed primarily upon seeds and fruits, and appear to forage based on availability and have shown no preferences for particular seeds or fruits (Moyers 1996). Beach mice also eat small invertebrates, especially during late spring and early summer when seeds are scarce (Ehrhart 1978, Moyers 1996). Research suggests that the availability of food resources fluctuates seasonally in Gulf Coast coastal dune habitat, specifically that the frontal dunes appear to have more species of high quality foods, but these sources are primarily grasses and annuals that produce large quantities of small seeds in a short period of time. Foods available in the scrub consist of larger seeds and fruits that are produced throughout a greater length of time and linger in the landscape (Sneckenberger 2001). Nutritional analysis of foods available in each habitat revealed that seeds of plant species in both habitats provide a similar range of nutritional quality.

Population dynamics

Population size

Estimating animal abundance or population size is an important and challenging scientific issue in wildlife biology (Otis *et al.* 1978, Pollock *et al.* 1990). A number of different census methods are available to estimate wildlife populations, each with particular benefits and biases. Beach mouse surveys involve live trapping mark-recapture studies, which is a common method with small mammals. A five-night minimum trapping period has been standard practice since 1987 for Gulf Coast beach mice. As the referenced trapping events were not designed similarly or using a standardized sampling techniques, data should not be compared between subspecies or trapping events, nor should densities (mice per 100 trap nights) be inferred beyond the trapping area during that trapping session.

Population densities of beach mice typically reach peak numbers in the late autumn into spring (Rave and Holler 1992, Holler *et al*. 1997). Peak breeding period occurs in autumn and winter, apparently coinciding with the increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and Holler 1992, Holler *et al.* 1997). Food supplementation studies showed that old field mouse populations increased when foods were abundant; thus, populations of old field mice appear to be food-limited (Smith 1971, Galindo-Leal and Krebs 1998). Similar studies have not been conducted with beach mouse populations.

Gulf Coast Beach Mice

In 1979, Humphrey and Barbour (1981) estimated about 515 CBM existed on Topsail Hill and Shell Island. That estimate was used during the Federal listing of the CBM in 1985. Population estimates on Shell Island from February 1993 to March 1994, ranged from 105 to 338 CBM on a 23-acre study area (Novak 1997). Just prior to Hurricane Opal in 1995, it was estimated that Shell Island supported 800 to 1,200 CBM (Gore 1999). Three years following Hurricane Opal in June 1998, one trapping effort at six different sites on Shell Island resulted in a cumulative population estimate of 195 CBM (164 CBM captured) (Moyers *et al*. 1999). The east portion of the island has been trapped from 2000 to 2003. Population estimates have ranged between 24 and 67 CBM (Lynn 2004b). At Topsail Hill Preserve State Park, trapping conducted in March 2003 and March 2005 yielded a population estimate of 190 to 250 CBM (Service 2003a, Sneckenberger 2005). From late 2006 through 2007 results of tracking tubes surveys at Topsail Hill Preserve State Park suggested that the CBM population was not densely distributed (FWC 2008b). Trapping of four 100-trap transects yielded population estimates of 190, 250, less than 10 (too few to estimate), and 87 in 2003, 2005, 2006, and 2007, respectively (Service 2007a). The track and trapping data together indicate that Topsail Hill Reserve State Park currently does not support a high population of beach mice. In 2003 and again in 2005, a total of 26 mice were translocated from Topsail Hill Preserve State Park to the WaterSound private development adjacent to Deer Lake State Park. Trapping has been sporadic on WaterSound but has yielded population estimates of 5 to 46 individuals in 2003 to 2007 (Moyers 2007). Deer Lake State Park has not been trapped; however, tracks have been observed as recently as 2006 (FWC 2008b). Population estimates from trapping at Grayton Beach State Park (main unit) from 1995 to 2000, ranged from 25 to 116 CBM (Moyers *et al.* 1999, Van Zant 2000). The central unit was trapped for three nights in August 2002; however, no mice were captured (Lynn 2002b). Limited tracking surveys were accomplished in 2003, 2004 and 2005 and beach mouse tracks were observed (Kovatch 2003, Toothacker 2004, FWC 2008b). The western area, although it provides CBM habitat, has not been documented as occupied by CBM (Moyers *et al.* 1999, Van Zant 2000). The population estimates for the WaterColor development for the two years prior to and one year following development ranged from 3 to 7 CBM (St. Joe Company 1999). CBM were last captured in February of 2001 at WaterSound; quarterly trapping has continued on the site through mid-2008 without CBM being captured (St. Joe/Arvida 2003). Auburn University trapped West Crooked Island in October 2000, and the Service trapped the area in 2001 to 2003. The population estimate ranged from a low of 174 to a high of 244 CBM (Lynn 2000b, 2002d, 2002e, 2002f, 2002g, 2003b). The Service estimated the total population of CBM in 2003, to be about 600 to 1,000 beach mice. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Recent track tube data from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

Since its listing in 1985, PKBM population estimates never reached more than 400 to 500 individuals until 2003. Before Hurricane Ivan (2004) a population estimate of 500 to 800 was divided between two populations - the Johnson Beach Unit of GINS and PKSP (Service 2004). The status of PKBM at Gulf State Park (GSP) is uncertain, likely extirpated in 1999. In October 2005, following the active hurricane seasons of 2004 and 2005, a trapping effort of less than one-third of the habitat available on public lands yielded captures of less than 30 individuals. Tracking data from June 2006 indicated that about 25 and 32 percent of the available habitat was occupied at PKSP and GINS, respectively (Loggins 2007). Trapping at PKSP and GINS in March 2007, was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (Loggins 2007). With no tracks observed in the tube surveys the PKBM may now be absent from PKSP (FWC 2008b). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands. Recent data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b). At GINS, the number of PKBM has not increased since the initial high levels in winter of 2005-2006 (FWC 2008b). However, population estimates indicate there may be a few hundred PKBM at GINS (Gore 2008). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences at GINS have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

The SABM even at its lowest population probably numbered several hundred individuals (Gore as cited in 63 *FR* 70055). James (1992) estimated that the East Crooked Island subpopulation to be about 150. However, by 1996, SABM were no longer found on East Crooked Island. Following Hurricane Opal in 1995, Mitchell *et al.* (1997) estimated the St. Joe Peninsula State Park population to be between 300 and 500 mice. In November 1997 and January 1998, 19 pairs of St. Andrew beach mice were relocated from St. Joseph Peninsula State Park to East Crooked Island, Tyndall Air Force Base (Moyers *et al.* 1999). Trapping surveys conducted on East Crooked Island in 2000 and 2002 through 2007 indicated that beach mice occupied the entire island (Lynn 2002c, FWC 2008b). Population estimates ranged from 71 to 133 mice (Lynn 2002c). The FWC (2008b) estimates 22 miles of habitat as occupied by SABM throughout the mouse's historical range with population estimates of about 3,000 mice at East Crooked Island and about 1,775 mice in the front dunes at St. Joseph State Park. Data from 2008-2012 on East Crooked Island showed a decrease in SABM, with average track tube occurrences of 97 percent, 97 percent, 96 percent, 87 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). However, recent data from 2013 indicates 95 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b). Surveys conducted from 2008-2012 at Rish Park yielded average track tube occurrence that fluctuated between 79 percent, 91 percent, 76 percent, 79 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). More recent data in 2013 showed an average of 73 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b).

Atlantic Coast Beach Mice

Populations of the SEBM have been estimated to be around 5,000 to 6,000 mice. Recent surveys have confirmed that SEBM are found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Prior to 2006, populations of the SEBM were thought extirpated from both sides of the Sebastian Inlet (Bard 2004). However, during surveys in June 2006, a single mouse was located at the very southern end of the Sebastian Inlet State Park. Mice were also found at Jungle Trail on the Pelican Island National Wildlife Refuge, another area where they where thought extirpated. Additional surveys of other areas south of Brevard County have not located any mice and indicate the distribution of this subspecies in the counties south of Brevard, severely fragmented. SEBM are no longer believed to occur at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

Although the distribution of the AIBM has declined significantly, particularly in the northern part of its range, the populations at ASP and FMNM have continued to fluctuate seasonally between two and 90 mice per acre. It is thought that populations should be characterized by a range rather than a static value (Frank and Humphrey 1996). Quarterly surveys of these two sites have shown that the populations have remained stable. Due to the limited dune habitat at the ASP, this population has not been able to maintain a stable population and it is unknown how many mice remain.

Population variability

Beach mouse populations fluctuate on a seasonal and annual basis. Attempts to explain population dynamics have revealed an incomplete understanding of the species and its population cycles. It is clear that beach mice, like all rodents, are known for high reproductive rates and experience extreme highs and lows in population numbers. Depressed beach mouse populations may be associated with tropical storms and drought, perhaps resulting from reduced habitat and food resources. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling 2000).

<u>Population stability</u>

Population viability analysis (PVA) is essentially a demographic modeling exercise to predict the likelihood a population will continue to exist over time (Groom and Pascual 1997). The true value in using this analytical approach is not to determine the probability of a species' extinction, but to clarify factors that have the most influence on a species' persistence. From 1996 to 1999, the Service funded Auburn University to develop a PVA for beach mice (Holler *et al*. 1999, Oli *et al.* 2001). Four subpopulations of Gulf Coast beach mice subspecies were modeled. They consisted of two subpopulations of PKBM, one at GINS-Perdido Key Area and one at Florida Point, and two subpopulations of ABM, one at Bon Secour NWR and one at Fort Morgan State Park. They used a stochastic (random) differential equation (Wiener-drift) model, applied to long term demographic data. The model is stochastic because it incorporates the variable effects of the environment upon population change. However, it did not model the effects of hurricanes on the habitat or population of beach mice.

The Oli *et al.* (2001) analyses indicated that all four subpopulations were at risk of extinction, with habitat fragmentation as the most influential factor. The GINS-Perdido Key Area had the highest risk for extinction; the PKBM had a 100 percent chance of reaching one individual (becoming functionally extinct) within 21 (mode) or 45 (median) years. At Florida Point, the PKBM had a low risk of becoming functionally extinct (1.3 percent) within 13 to 20 years. However, following Hurricane Opal in 1995, and subsequent predation pressure, the PKBM population at Florida Point was believed extirpated in 1999. This localized extirpation clearly demonstrates that while PVA's are useful in determining significant factors in species survival, they have limited use in predicting the time to extinction for a given species.

More recently, the Conservation Breeding Specialist Group (Traylor-Holzer 2004, 2005, 2006) was contracted by the Service to conduct a population and habitat viability analysis (PHVA) on ABM using the Vortex population simulation model (Lacy 1993). The goal was to develop an ABM population model and use the model to assess the status of the ABM habitat, and populations and projections for continued existence. The PHVA results projects the ABM to have a 26.8 percent $\pm$ 1.0 percent likelihood of extinction over the next 100 years. Much of this risk is due to hurricane impacts on ABM populations and habitat, which can result in population declines. The model suggests that hurricanes are a driving force for ABM populations, both directly and also indirectly as their impacts interact with other factors, including development of higher elevation (scrub) habitat and predation by cats. Due to the similarities in the subspecies and proximal location, it can be inferred that these factors also have a strong influence on the persistence of PKBM populations. When reviewing PHVA results, it is crucial that the actual values for the risk of extinction are not the focus of the interpretation. The true value of a PHVA is the ability to compare management strategies and development scenarios, run sensitivity analyses, and determine the main influence(s) on population persistence.

Similar to the land use arrangement on Perdido Key, the Fort Morgan peninsula (occupied by ABM) consists of three areas of public lands separated by two areas of private lands, which allow for limited (varied) dispersal between the public lands. The current level of dispersal between public lands through private lands is unknown, but is affected by development and habitat degradation. Without dispersal between public lands through private lands, the PHVA results project the ABM to have a 41.2 percent ± 1.1 percent likelihood of extinction. If all privately-owned habitat between the public lands is lost, the likelihood of extinction increases to 46.8 percent ± 1.1 percent. Again, it can be inferred that a similar increase in risk of extinction would occur with the PKBM if dispersal could not occur through private lands.

Despite the similarities in the subspecies, it is important to note that carrying capacity (K), which was found to be a strong influence on the model, would be different in PKBM. For ABM, K was estimated using maximum ABM density estimates (4.5 to 11.6 ABM per acre) and acres of habitat (2,989 acres). As density estimates for PKBM would likely be lower, and remaining PKBM habitat is less than 1,300 acres, the Vortex model for PKBM would likely project a greater likelihood of extinction.

The Service contracted with the Georgia Cooperative Fish and Wildlife Research Unit to critique the PVAs for the ABM accomplished by Oli *et al.* (2001) and Conservation Breeding Specialist Group (Traylor-Holzer 2006). Conroy and Runge (2006) indicated that neither PVA provided reliable estimates of extinction probability for ABM. They recommended that future PVA work should incorporate sampling, temporal, and possibly spatial variance for input variables and should clearly and explicitly express uncertainty in extinction output. Until this can be done, reliable estimates of extinction probability for the ABM (and other beach mouse subspecies) cannot be estimated.

Species that are protected across their ranges have lower probabilities of extinction (Soulé and Wilcox 1980). Beach mouse populations persist naturally through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increase and dispersal occurred from adjacent populated areas. In addition, from a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As human development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline is no longer possible and any hurricane can impact the entire range of each subspecies, the probability of beach mice persisting would be enhanced by the presence of contiguous tracts of suitable habitat occupied by multiple independent populations (Shaffer and Stein 2000). The history of the PKBM alone illustrates the need for multiple populations (a now potentially extirpated population was the source of the two remaining populations of the subspecies) (Holler *et al.* 1989, 71 *FR* 60238). While maintaining multiple populations of beach mouse subspecies provides protection from total loss (extinction), especially when migration and relocations are possible (Oli *et al.* 2001), conservation of each subspecies necessitates protection of genetic variability throughout their ranges (Ehrlich 1988).

Preservation of natural populations is therefore crucial, as the loss of a population of beach mice can result in a permanent loss of alleles (Wooten and Holler 1999). This loss of genetic variability cannot be regained through translocations or other efforts.

Status and Distribution

The distribution of all the beach mouse subspecies is significantly reduced from their historical ranges due to modification and destruction of the coastal dune ecosystem inhabit. Habitat loss and alteration was likely a primary cause of the extinction of one subspecies, the Pallid beach mouse, which was endemic to barrier beach between Matanzas and Ponce de Leon inlets in Volusia and Flagler Counties (Humphrey and Barbour 1981).

<u>Atlantic Coast Beach Mice</u>

The distribution of the SEBM has declined significantly, particularly in the southern part of its range. Historically, it was reported to occur along about 174 miles of Florida's central and southeast Atlantic coast from Ponce (Mosquito) Inlet, Volusia County, to Hollywood Beach, Broward County (Hall 1981). Bangs (1898) reported it as extremely abundant on all the beaches of the east peninsula from Palm Beach at least to Mosquito (Ponce) Inlet. During the 1990s, the SEBM was reported only from Volusia County (Canaveral National Seashore); in Brevard County (Canaveral National Seashore, Kennedy Space Center/Merritt Island NWR, and CCAFS); a few localities in Indian River County (Sebastian Inlet State Park, Treasure Shores Park, and several private properties), and St. Lucie County (Pepper Beach County Park and Fort Pierce Inlet State Park) (Humphrey *et al*. 1987, Robson 1989, Land Planning Group, Inc. 1991, Humphrey and Frank 1992b, Service 1993). The SEBM is geographically isolated from all other subspecies of beach mice.

Populations of the SEBM are still found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Populations from the north side of Sebastian Inlet appear to be extirpated (Bard 2004). SEBM were documented on the south side of Sebastian Inlet in 2006, although none have been found since then.

The status of the species south of Brevard County is currently unknown. The surveys conducted during the mid-1990s indicated the distribution of this subspecies in the counties south of Brevard County was severely limited and fragmented. There are not enough data available to determine population trends for these populations. These surveys revealed that it occurred only in very small numbers where it was found. In Indian River County, the Treasure Shores Park population experienced a significant decline in the 1990s, and it is uncertain whether populations still exist at Turtle Trail or adjacent to the various private properties (Jennings 2004). Trapping efforts documented a decline from an estimated 300 individuals down to numbers in the single digits. In 2006, a population off Jungle Trail at Pelican Island NWR was discovered (Van Zant 2006). No beach mice were found during surveys in St. Lucie County and it is possible that this species is extirpated there. The SEBM no longer occurs at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

The primary reason for the significant reduction in the range of the SEBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated SEBM habitat in the southern part of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a pronounced affect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation and harassment by free-roaming cats and dogs. A healthy population of SEBM on the north side of Sebastian Inlet State Park in Brevard County was completely extirpated by 1972, presumably by free-roaming cats (Bard 2004). Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice (*Mus musculus*) and introduced rats.

The distribution of the beach mouse is limited due to modification and destruction of its coastal habitats due mostly to developmental pressures. One additional Atlantic coast subspecies, the pallid beach mouse (*P. p. decoloratus*), was formerly reported from two sites in Volusia County, but extensive surveys provide substantial evidence that this subspecies is extinct (Humphrey and Barbour 1981).

The distribution of the AIBM has declined significantly, particularly in the northern part of its range. Historically, it was reported to occur from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Humphrey and Frank 1992a). It currently occurs only on Anastasia Island, primarily at the north (ASP) and south (FMNM) ends of the island, although beach mice still occur at low densities in remnant dunes along the entire length of the island (Service 1993). The original distribution consisted of about 50 miles of beach; current populations occupy about 14 miles of beach with possibly only 3 miles supporting viable populations (Service 1993).

In 1992 to 1993, 55 mice (27 females and 28 males) were reintroduced to GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) in St. Johns County. In 1993, the population was estimated at 220 mice. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss or alteration from storms and or habitat conditions.

The primary reason for the significant reduction in the range of the AIBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated AIBM habitat in the northern two-thirds of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a severe effect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation by free-roaming cats and dogs. ASP has successfully reduced feral cat populations at the recreation area and has seen a benefit to the beach mice. Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice and introduced rats.

<u>Gulf Coast Beach Mice</u>

PKBM populations have existed since the late 1970s as isolated populations along its historical range (16.9 miles). The effects of Hurricane Frederic (1979) coupled with increased habitat fragmentation due to human development led to the extirpation of all but one population of PKBM. The less than 30 individuals at Gulf State Park (at the westernmost end of Perdido Key) were once the only known existing population of PKBM (Holler *et al*. 1989). Beach mice from this site were used to reestablish PKBM at Gulf Islands National Seashore (GINS) between 1986 and 1988 (Holler *et al.* 1989). Then in 1999 the population at Gulf State Park was considered extirpated (Moyers *et al.* 1999). In 2000, 10 PKBM (five pairs) was relocated from GINS to PKSP. In February of 2001, this relocation was supplemented with an additional 32 PKBM (16 pairs). The PKBM were released on both north and south sides of SR 292 in suitable habitat. Two years of quarterly survey trapping indicated that the relocations of PKBM to PKSP were successful and this was considered an established population (Lynn and Kovatch 2004). PKBM were also trapped on private land between GINS and PKSP in 2004, increasing documentation of current occurrences of the mouse (Lynn 2004a). Based on the similarity of habitat between these areas and the rest of Perdido Key, as well as the continuity of the habitat, the mouse is believed to inhabit other private properties where suitable habitat exists north and south of SR 292. The PKBM is considered to occur on 42 percent of Perdido Key (1,227 acres of 2,949 acres) (**Table 14**).

Table 14. Perdido Key beach mouse habitat on Perdido Key in Florida and Alabama.

Area	Total in AL & FL		Total in Florida		Total in Alabama	
	Acres	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Perdido Key	2,949	100	2,615	89	334	11
PKBM habitat	**1,292**	100	**1,146**	**88**	148	12
Private lands	1,440	49	1,278	43	162	5
PKBM habitat	**302**	**23**	**270**	**24**	33	3
Public lands	1,509	51	1,337 GINS 1,052 PKSP 285	45	172 GSP 172	6
PKBM habitat	990	76	876 GINS 638 PKSP 238	67	114 GSP 114	9

[1]Data calculated by Service's Panama City, Florida using 2004 Digital Orthophoto Quarter-Quadrangle (DOQQ) aerial photography, 2005 parcel data from Baldwin County, Florida and 2005 parcel data from Escambia County, Florida and revised June 2006.

The listing of PKBM was based on data collected in 1983-84, and at that time the mouse was recovering from the effects of Hurricane Frederick in 1979. Following Hurricane Frederic estimated population numbers based on trapping were 13 PKBM found at one location (Gulf State Park). Just prior to listing, only one PKBM was captured in trapping surveys, this again being at Gulf State Park. Since that time, numbers have fluctuated dramatically based on hurricanes and/or translocation efforts, but were at their highest estimate ever documented just prior to Hurricane Ivan in 2004 at between 500-800 individuals. This was a result of significant partnership efforts and included translocation and habitat restoration on public lands. Even with the destructive hurricanes in 2004 and 2005, current numbers of PKBM, while low (no population estimates are available), are greater than one mouse and mice have been confirmed from two areas (PKSP and GINS). Survey efforts (tracking and trapping) have also been sporadic and inconsistent; therefore, it is difficult to establish long term trend information at this time.

CBM subpopulations currently persist along approximately 15 miles of Gulf of Mexico shoreline consisting of four isolated areas along 11 miles of beachfront within its former range. Another 5 miles outside of the CBM's known historical range has been recently colonized (Lynn, 2000a, 2003a). In the 1950s, the CBM was widespread and abundant at that time according to Bowen (1968). By 1979, Humphrey and Barbour (1981) reported only 40 percent of the original habitat remained undeveloped in noncontiguous areas. They also documented that the CBM had been extirpated from seven of its nine historical localities being restricted to the Topsail Hill area in

Walton County and Shell Island in Bay County. In 1985 when the CBM became federally protected, CBM were still only known from the Topsail Hill area and Shell Island, an area consisting of about 10 miles of coastline (50 *FR* 23872). In 1989, a cooperative interagency effort reintroduced CBM onto the central and west units of Grayton Beach State Park increasing the occupied coastline by another mile (Holler *et al*. 1989). In 1999, with the closing of East Pass and Shell Island connecting to West Crooked Island, CBM increased their range by approximately four miles (Lynn 2000b). CBM are now known to occupy approximately 15 miles of Gulf of Mexico beachfront; 12 of the 15 miles are publicly owned lands.

There are four subpopulations of CBM that exist: 1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands), 2) Shell Island (includes St. Andrew State Park mainland and Shell Island with private inholdings and Tyndall AFB), 3) Grayton Beach (and adjacent eastern private lands), and 4) West Crooked Island. Approximately 96 percent of the lands known to be occupied by CBM are public lands. Translocations to establish a fifth subpopulation of CBM occurred in March of 2003 and 2005. CBM from Topsail Hill Preserve State Park were moved to private lands at Camp Creek/Water Sound in Walton County, Florida (Lynn 2003a, Service 2005a, 2005b, 2005c, 2005d).

Topsail Hill Preserve State Park consists of 1,637 acres of which 262 acres provide CBM habitat; the majority being occupied by CBM. The Florida Park Service prepared a Unit Management Plan for the Preserve that explicitly plans for conservation and protection of CBM habitats (FDEP 2007). Private lands on the east side consist of approximately 9.63 acres. Of that, 7 acres consist of the development known as the Stallworth Preserve. The Service issued an ITP for CBM associated with the Stallworth Preserve HCP in 1995; an amendment to the permit was issued in 1999. The remaining 2.63 acres has been purchased by Walton County with a grant from the Service. Private lands on the west side of the Preserve consist of 24 acres and include Four-Mile Village, a low density single family development, and the Coffeen Nature Preserve managed by the Sierra Club.

Shell Island consists of lands within the St. Andrew State Park, Tyndall AFB, and private lands. The Unit Management Plan for the State Park was completed in 1999. The plan identifies the need for protection and management of the CBM. Tyndall AFB manages their portion of Shell Island under the installation’s Integrated Natural Resources Management Plan. The Service has joined with the State Park and Tyndall AFB since 1995 by providing funding to protect and restore CBM habitats on Shell Island.

The St. Andrew State Park mainland consists of 1,260 acres of which 123 acres are beach mouse habitat. Several tracking efforts looking for signs of CBM on the mainland were made between 1995 and 1998; no evidence was found that indicated the presence of the beach mouse (Moyers 1996, Moyers *et al.* 1999). However, live-trapping to document the absence of the mouse has not been conducted. Reintroduction of this area is considered an action to support recovery of CBM.

The Grayton Beach subpopulation consists of two units in Grayton Beach State Park. The Park is divided into a central and western unit and is currently connected by a narrow band of primary dunes. Total acreage of the Park is 2,236 acres with 153 acres providing suitable CBM habitat. The Unit Management Plan for the Park identified the protection of the CBM as an important component. The Park has requested and received funds from the Service to implement CBM habitat restoration and protection. Portions of private lands (WaterColor and Seaside developments) on the east side of the central unit are occupied by CBM or provide suitable habitat.

West Crooked Island consists of 1,558 acres of which 730 acres provide CBM habitat and remains occupied by CBM (Lynn 2004b). The West Crooked Island subpopulation resulted from its connection to Shell Island in 1998-1999. The construction of the St. Andrew Pass navigation inlet in the early 1930s severed Shell Island from the mainland on its western end. Since then, the original pass, East Pass (or Old Pass) began to close. After passage of Hurricane Opal in 1995, East Pass temporarily closed and reopened; however, after passage of hurricanes Earl and Georges in 1998, the pass closed (Coastal Tech 1999, Middlemas 1999). CBM dispersed onto West Crooked Island from Shell Island colonizing most of the island within two years (Lynn 2004b). East Pass was reopened as a joint venture between Tyndall AFB and Bay County in December of 2001 but has since closed again.

SABM is now known to consist of two subpopulations, East Crooked Island and St. Joseph Peninsula State Park. The majority of the East Crooked Island subpopulation is located on Tyndall AFB and the other on the St. Joseph Peninsula State Park. Other important public lands for the conservation of the mouse would include Eglin Air Force Base lands at Cape San Blas and Billy Joe Rish Park. Private lands adjacent to Tyndall AFB and the State Park are either known to be occupied by SABM or contain habitat. Trapping by St Joe/Arvida on about 111 acres of SABM habitat at East Crooked Island was conducted in 2000, 2001, and 2003. The trapping confirmed existence of SABM on the property (Moyers and Shea 2002). However, trapping their property in St. Joseph Beach did not result in capture of any beach mice (Moyers and Shea 2002). Although SABM is thought to continue to occupy habitat south of St. Joseph Peninsula State Park, only tracking has been conducted to confirm its presence on private lands since the late 1990s. Private lands adjacent to public lands are available for population dispersal and food source during periods of high population and after severe weather events. However, subpopulations on large tracts of private land within the historical range of the subspecies are needed for conservation of the SABM.

Land development has been primarily responsible for the permanent loss of SABM habitat along its approximately 40-mile long historical range. In addition, construction of U.S. highway 98 accelerated the habitat loss from associated development. By the mid 1990’s about 12 linear miles were known to be occupied (Gore 1994, 1995), indicating a 68 percent reduction in it historical distribution (63 *FR* 70053). An effort to re-establish the SABM back into its historical range was initiated around the time of listing (Moyers *et al.* 1999); however, the range reduction described above did not take this into account since the success of the reintroduction was not known at the time (63 *FR* 70053). Similar analyses have not been conducted since.

Our best documentation of the species’ decline can be seen from trapping or tracking surveys conducted at various times throughout its range. By the mid to late 1980’s concerns were raised when trapping efforts failed to result in captures at West Crooked Island (Gore 1987). By 1990 the SABM appeared to only inhabit a small portion (approximately 11 linear miles) of its original range: west end of East Crooked Island and within St. Joseph Peninsula State Park (Gore 1990). SABM's apparent decline continued into the mid-1990's when in 1994, the population on East Crooked Island was "presumed to be extinct" (Wooten and Holler 1999), leaving only one known population on St. Joseph Peninsula (Moyers *et al.* 1999). Subsequent reintroduction efforts in 1997-1998 appeared to have re-established the population on East Crooked Island (Moyers *et al.* 1999).

Recovery Criteria

The Recovery Plan for the SEBM identifies the primary recovery objectives for the subspecies (Service 1993). The SEBM can be considered for delisting if 10 viable, self-sustaining populations can be established throughout a significant portion of its historical range. More specifically, delisting can be considered if the following conditions are met:

1. Viable populations are maintained on the five public land areas where the subspecies currently occurs. Each population should not fluctuate below an effective breeding size of 500 individuals;

2. Five additional viable populations are established throughout the historical range of the subspecies; and

3. These populations should be monitored for at least five years.

The Recovery Plan for the AIBM identifies the primary recovery objectives for the subspecies (Service 1993). The AIBM can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies' historical range has been permanently destroyed, it is not likely that it can be fully recovered or delisted. For the AIBM to be considered for downlisting to threatened, it is required that those populations at the northern and southern end of Anastasia Island continue to be viable. Each population should support a breeding population of 500 individuals. Two additional viable populations shall be established within the mainland portion of the historical range. All of these populations should be monitored for five years.

The Recovery Plan for the PKBM, CBM, and ABM identifies the primary recovery objectives to be the stabilization of present populations by preventing further habitat deterioration, and the reestablishment of populations in areas where they were extirpated (Service 1987). For each of the subspecies to be considered for downlisting to threatened, it is required that there be a minimum of at least three distinct self-sustaining populations in designated critical habitat with at least 50 percent of the critical habitat being protected and occupied by beach mice (Service 1987).

While this is the currently approved Recovery Plan for the three beach mouse subspecies, studies and research since the Recovery Plan publication provided additional information concerning recovery needs for the subspecies. Protection and enhancement of existing populations and their habitat, plus reestablishment of populations in suitable areas within their historical ranges, are necessary for the subspecies survival and recovery. Core beach mouse populations remain isolated and are vulnerable to natural and anthropogenic factors that may further reduce or degrade habitat and/or directly reduce beach mouse population sizes. Maximizing the number of independent populations is critical to species survival. Protection of a single, isolated, minimally viable population risks the extirpation or extinction of a species as a result of harsh environmental conditions, catastrophic events, or genetic deterioration over several generations (Kautz and Cox 2001). To reduce the risk of extinction through these processes, it is important to establish multiple protected populations across the landscape (Soulé and Simberloff 1986, Wiens 1996). Through the critical habitat designation process we are addressing this by designating five independent units for the subspecies spaced throughout its historical range, depending on the relative fragmentation, size, and health of habitat, as well as availability of areas with beach mouse PCEs.

The Service completed a five-year status review of the CBM and PKBM in August 2007 (Service 2007a, 2007b). For both subspecies the following was recommended: designate a beach mouse recovery coordinator; revise the recovery plan; accomplish viable populations, monitor habitat improvement, corridor persistence and hurricane response; conduct genetic studies and translocations as necessary; participate in education and outreach and complete an emergency response plan.

A Recovery Plan for the SABM was finalized in 2010 and the recovery objectives are to reestablish additional populations, threat minimization or removal, habitat protection and/or restoration, and outreach/education to the public. This recovery plan is up to date and includes current threats to SABM.

In accordance with the Act, Federal agencies (including the Service) consult with the Service for actions that may adversely affect beach mice and their designated habitat. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development (**Table 14**).

Table 15. Previous biological opinions within Florida that have been issued for projects that had adverse impact to the nesting beach mice.

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
GINS Dune Protection (PKBM)	2000	0.01 acre (CH)
Translocation to PKSP (PKBM)	2000	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)
Supplemental translocation to PKSP (PKBM)	2003	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
FEMA Berm Orange Beach, AL (PKBM)	2003	0.14 acre non-CH
Service scientific collecting permit program (PKBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
Florencia Development (within Action Area) (PKBM)	2005	3.5 acres (non-CH)
PKSP Re-build (PKBM)	2005	1.99 acres (CH)
FEMA Berm Emergency consultation (within Action Area) (PKBM)	2005	Consultation not complete (non-CH)
GINS road rebuild (PKBM)	2005	1.7 acres (CH)
Magnolia West Development (within Action Area) (PKBM)	2006	5.2 acres (not CH at time of construction, presently CH)
Palazzo Development (PKBM)	2006	0.58 acre (not CH at time of construction, presently CH)
Searinity Development (PKBM)	2006	0.32 acre (not CH at time of construction, presently CH)
Retreat Development (PKBM)	2006	0.21 acre (not CH at time of construction, presently CH)
Bond Residence (PKBM)	2006	0.17 acre (CH)
Three-batch condo (Island Club, Marquesas, Lorelei) (PKBM)	2007	0.95 acres (CH)
Naval Air Station Pensacola Pensacola Pass navigation channel dredging (PKBM)	2007	6.3 miles (CH)
Paradise Island development (PKBM)	2007	0.91 acres (CH)
Calabria condo development (PKBM)	2008	0.33 acres (non-CH)
Escambia County beach nourishment (PKBM)	2008	0.16 acres (partial CH)
Seabreeze Condominiums (PKBM)	2009	0.39 acres
Spanish Key Parking Lot (PKBM)	2009	0.28 acres

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Perdido Key Fire Station (PKBM)	2010	0.43 acres (CH)
Evans Residence	2012	0.21 acre
Stern Residence	2012	0.07 acre
Whalen Residence	2012	0.18 acre
Carbone Residence	2012	0.74 acre
Lost Key	2012	26.1 acre
Stallworth Preserve Development (CBM)	1995	7 acres (CH)
Navy Panama City Beach site 4 construction (CBM)	2000	0.01 acre (CH)
East Pass Re-opening (CBM)	2001	Temporary, indirect take (CH)
WaterColor and WaterSound Developments (CBM)	2000	7.6 acres (non-CH)
Service scientific collecting permit (CBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
FEMA beach berms post hurricane Ivan emergency consultation (CBM)	2005	Consultation not complete (partial CH)
Western Lake Reopening consultation (CBM)	2006	2.7 acres annually for 5 years (CH)
FEMA Statewide post-disaster berm programmatic BO (PKBM, CBM, SABM, AIBM, and SEBM)	2007	75 miles for eroded shoreline(partial CH)
Angelos Development (CBM)	2009	0.42 acres
Bonfire Beach (SABM)	2008	38 acres
Ovation (SABM)	2010	5.41 acres (CH)
Sea Colony Development (AIBM)	1998	0.7 acres (non-CH)
Anastasia State Park beach nourishment (AIBM)	2005	50 linear feet (non-CH)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Service scientific collecting permit program (AIBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
Rodent Control Program on CCAFS (SEBM)	2002	50 beach mice
Cape Canaveral Air Force borrow source (SEBM)	2007	300 linear feet (non-CH)
Service scientific collecting permit program (SEBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
CCAFS Routine Maintenance Programmatic (SEBM)	2008	Temporary loss of habitat during trenching/digging for pipeline installation and repair, roadside mowing, soil remediation, pole placement, wells, soil boring, lines of sight, scrub restoration

Common Threats to Beach Mice in Florida

Habitat Loss or Degradation

Coastal dune ecosystems are continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport and depletion, and fluctuations in sea level. The location and shape of barrier island beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, sand pine scrub, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island.

The quality of the dune habitat (primary, secondary, and scrub) is an important factor in maintaining and facilitating beach mouse recovery. Habitat manipulation is an old and widely used tool in wildlife management. It is especially useful in improving habitat suitability to increase local populations of a species. For beach mice, improving habitat can enhance the abundance and diversity of food resources, increase the chances of meeting a mate, and reduce competition for food and burrow sites.

Long term trapping data has shown that beach mouse densities are cyclic and fluctuate by order of magnitude on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling

2000, Sneckenberger 2001). Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation and extinction, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources.

Habitat loss and fragmentation associated with residential and commercial real estate development is the primary threat contributing to the endangered status of beach mice (Holler 1992a, 1992b, Humphrey and Frank 1992a). Coastal commercial and residential development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by cats), diseases, and competition with house mice, are intensified in small, isolated populations, which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation.

The conservation of multiple large, contiguous tracts of habitat is essential to the persistence of beach mice. At present, large parcels of land exist mainly on public lands. Protection, management, and recovery of beach mice on public areas have been complicated by increased recreational use as public lands are rapidly becoming the only natural areas left on the coast. Public lands and their staff are now under pressure to manage for both the recovery of endangered species and recreational use. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local and complete extinctions due to storms and other stochastic events (Danielson 2005). Protecting multiple populations increases the chance that at least one population within the range of a subspecies will survive episodic storm events and persist while vegetation and dune structure recover.

Habitat connectivity also becomes essential where mice occupy fragmented areas lacking one or more habitat types. If scrub habitat is lacking from a particular tract, adjacent or connected tracts with scrub habitat are necessary for food and burrow sites when resources are scarce in the frontal dunes, and are essential to beach mouse populations during and immediately after hurricanes. Trapping data suggests that beach mice occupying the scrub following hurricanes recolonize the foredune once vegetation and some dune structure have recovered (Swilling *et al*. 1998, Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract and a functional pathway to frontal dune habitat does not exist, beach mice may not be able to attain the resources necessary to expand the population and reach the densities necessary to persist through the harsh summer season or the next storm. Functional pathways may allow for natural behavior such as dispersal and exploratory movements, as well as gene flow to maintain genetic variability of the population within fragmented or isolated areas. To that end, contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

A lack of suitable burrow sites may be a consequence of habitat degradation. Beach mice use burrows to avoid predators, protect young, store food, and serve as refugia between foraging bouts and during periods of rest. Beach mice have been shown to select burrow sites based on a suite of abiotic and biotic factors. A limitation in one or more factors may result in a shortage of suitable sites and the availability of potential burrow sites in each habitat may vary seasonally. Beach mice tend to construct burrows in areas with greater plant cover, less soil compaction, steep slopes, and higher elevations above sea level (Lynn 2000a, Sneckenberger 2001). These factors are likely important in minimizing energy costs of burrow construction and maintenance while maximizing the benefits of burrow use by making a safe and physiologically efficient refuge. Similar to food resources, this fluctuation in availability of burrow sites suggests that a combination of primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

Predation

Beach mice have a number of natural predators including coachwhip (*Masticophis flagellum*) corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox, gray fox, skunk (*Mephitis mephitis*), weasel (*Shallela frenata*), and raccoon (Blair 1951, Bowen 1968, Holler 1992a, Novak 1997, Moyers *et al.* 1999, Van Zant and Wooten 2003). Predation of beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern. However, predation pressure from natural and non-native predators may result in the extirpation of small, local populations of beach mice.

Free-roaming cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978) and are considered to be the main cause of the loss of at least one population of beach mice (Holliman 1983). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers *et al.* 1999). The PHVA for the ABM indicated that if each population had as few as one cat, which ate one mouse a day, rapid extinction would occur in over 99 percent of all iterations (Traylor-Holzer 2005).

In response to increasing depredation of sea turtle nests by coyote, fox, hogs, and raccoon, multi-agency cooperative effort have been initiated and are ongoing throughout Florida, in particular on public lands. These programs also benefit beach mice.

Hurricanes

Hurricanes can severely affect beach mice and their habitat, as tidal surge and wave action overwash habitat, leaving a flat sand surface denuded of vegetation; sand is deposited inland, completely or partially covering vegetation; blowouts between the ocean and bays and lagoons leave patchy landscapes of bare sand; primary dunes are sheared or eroded; and habitat is completely breached, creating channels from the ocean to bays and lagoons. Other effects include direct mortality of individuals, relocation/dispersal, and subsequent effects of habitat alterations (that impact such factors as forage abundance/production and substrate elevation). Habitat impacts can be widespread, encompassing the range of the subspecies.

Until frontal dune topography and vegetation redevelop, scrub habitat maintains beach mice populations and provides the majority of food resources and potential burrow sites (Lynn 2000a, Sneckenberger 2001). While storms temporarily reduce population densities (often severely), this disturbance regime maintains open habitat and retards plant succession, yielding a habitat more suitable for beach mice than one lacking disturbance. The low-nutrient soil of the coastal dune ecosystem often receives a pulse of nutrients from the deposition of vegetative debris along the coastline (Lomascolo and Aide 2001). Therefore, as the primary and secondary dunes recover, beach mice recolonize this habitat readily as food plants develop to take advantage of the newly available nutrients. Recovery times vary depending upon factors such as hurricane characteristics (*i.e.*, severity, amount of associated rain, directional movement of the storm eye, storm speed), successional stage of habitat prior to hurricane, elevation, and restorative actions post hurricane. Depending on these factors, recovery of habitat may take from one to over 40 years.

The impact of hurricanes on plant communities temporarily affects food availability, and hence can limit population densities in impacted habitats soon after storms. Observations indicate that Hurricane Opal (a Category 3 storm in November 1995) caused a decrease in one population of ABM by 30 percent (Swilling *et al.* 1998). However, population densities in scrub habitat typically increased following hurricanes (Swilling *et al.* 1998). Sneckenberger (2001) also found atypical numbers of ABM in scrub following a hurricane. Five months post-storm, "densities (individuals/km) were up to 7.5 times greater in scrub areas than in frontal dune grids." Impacts of the storm may have been apparent as long as 17 months after the storm when scrub densities remained triple those of frontal dunes (Sneckenberger 2001). Moyers *et al.* (1999) found similar results for CBM at Grayton Beach State Park. When frontal and primary dunes sustained extensive damage during Hurricane Opal in 1995, beach mice were captured behind what remained of primary dune habitat. By 1998, however, primary dunes and the immediate habitat inland appeared to support higher numbers of beach mice.

In addition to the overall change in post Hurricane Opal distribution of ABM, Swilling *et al.* (1998) found the mean percent of newly marked individuals increased from 14 percent for the three trapping periods before the storm to an average of 26.7 percent for the same interval post hurricane. The average for the three trapping periods immediately following was even higher, at 42.7 percent of the individuals captured. Swilling *et al.* (1998) concluded that this increased presence of new individuals reflected increased reproduction. A statistical analysis of the data indicated that the number of females exhibiting signs of reproduction was significantly higher than normal (18.9 percent higher). Moyers *et al.* (1999) also found similar results at Topsail Hill Preserve State Park. Four to five months following Hurricane Opal, all female CBM captured were pregnant or lactating. Trapping six months after the hurricane, Moyers *et al.* (1999) noted that 51.5 percent of captured CBM were new unmarked beach mice.

Although hurricanes can significantly alter beach mouse habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes are probably responsible for maintaining coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Holler *et al.* (1999) suggested that hurricanes could function to break up population subgroups and force population mixing. The resultant breeding between members of formerly isolated subgroups increases genetic heterogeneity and could decrease the probability of genetic drift and bottlenecks.

Beachfront Lighting

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. Foraging activities and other natural behaviors are influenced by many factors. Artificial lighting alters behavior patterns causing beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird *et al.* 2004).

The presence of vegetative cover reduces predation risk and perceived predation risk of foraging beach mice, and allows for normal movements, activity, and foraging patterns. Foraging in sites with vegetative cover is greater and more efficient than in sites without cover (Bird 2002). Beach mice have also been found to select habitat for increased percent cover of vegetation, and decreased distance between vegetated patches (Smith 2003).

Genetic variability

Selander *et al.* (1971) conducted an electrophoretic study on 30 populations of *P. polionotus*, including populations of beach mouse subspecies. Based on 30 allozyme loci, they estimated that the level of allozyme variation found in beach mouse populations was at least 40 percent lower than the level of variation in nearby inland populations. This work indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population. Lower levels of heterozygosity has been linked to less efficient feeding, fewer demonstrations of social dominance and exploratory behavior, and smaller body size (Smith *et al.* 1975, Garten 1976, Teska *et al.* 1990). Research focused on inbreeding depression in old-field mice (including one beach mouse subspecies), determined that the effects of inbreeding negatively influenced factors such as litter size, number of litters, and juvenile survivorship (Lacy *et al.* 1995).

In 1995, the Service contracted with Auburn to conduct genetic analysis of: 1) post-reestablishment gene structure in PKBM and CBM; 2) microgeographic patterning and its relevance to alternate management approaches for ABM on the Bon Secour NWR; and 3) if feasible, the historical relationship of SABM from Crooked Island relative to CBM from Shell Island and SABM from St. Joseph Peninsula.

Results of the work for CBM found: 1) founder effects were observed in the Grayton Beach State Park population (fixation of alleles common to the donor population and allele frequency shifts); 2) incongruity in number and size of several alleles was observed between Grayton Beach State Park and Shell Island; 3) overall genetic divergence between the donor and reestablished population was moderate; 4) genetic differences between Topsail Hill Preserve State Park and other CBM sites were higher than expected given the spatial proximity; 5) Topsail Hill Preserve State Park appears to be a reservoir for unique variation within the remaining populations of CBM; and 6) the overall relatedness estimated for Grayton Beach State Park suggested that any mating would involve close relatives (Wooten and Holler 1999).

Wooten and Holler (1999) recommended strategies for management of CBM based on genetics. Management of the Grayton Beach State Park population for genetic characteristics appears to be needed; however, additional genetic analyses will be needed. Relocation of CBM to Grayton Beach State Park from Shell Island should be continued.

Results of the work for PKBM found that: 1) founder effect (from Florida Point to GINS) did impact the GINS-Perdido Key Area subpopulation. Loss of rare alleles and allele frequency shifts were noted; 2) a low to moderate level of overall genetic divergence was observed; 3) data suggests that some effects of genetic drift were mediated by continued transfer of individuals; 4) levels of heterozygosity were unexpected given recent history; 5) average levels of relatedness among individuals is high which may portend future inbreeding related problems (however, no evidence of existing inbreeding was observed in the data); and 6) the overall level of microsatellite variation retained in the GINS-Perdido Key Area subpopulation was higher than anticipated. Wooten and Holler (1999) recommended management of PKBM based on genetics by: 1) preserving the natural population to the maximum extent possible since the loss of the Florida Point subpopulation resulted in the permanent loss of alleles; 2) using the GINS-Perdido Key Area subpopulation as a donor for reestablishment of other populations because of the retention of a substantial amount of genetic variation; and 3) reestablishment plans should include transfers between donor and reestablished subpopulations. In addition, translocations should be accomplished in pairs.

Analysis of genetic work focused on SABM indicated that there are two possible genetic histories for Crooked Island beach mice: 1) the last known beach mice from Crooked Island were derived from CBM or 2) the last known beach mouse from Crooked Island were unique from both CBM found on Shell Island or SABM found on St. Joseph peninsula (Van Zant 2003).

Climate Change (refer to page 49)

Analysis of the Species/Critical Habitat Likely to be Affected

Beach mice are currently federally protected because of their low numbers caused by habitat loss with continuing threats to their habitat (including critical habitat for CBM, PKBM, and SABM) and resulting affects from storm and post-storm events. The primary reason for the significant reduction in their range is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated beach mouse habitat. Coastal urbanization has also increased the recreational use of beachfront areas. Dune habitat maintenance is an important component of beach mouse conservation. Providing a healthy and continuous dune system assures mouse population stability. Integral to this is keeping visitors to the beach off the dunes and replanting as necessary when impacts occur or are observed. The extremely active 2004 and 2005 hurricane seasons also had a severe effect on Florida's beaches and beach mouse habitat.

Critical habitat for three (PKBM, CBM, and SABM) of the five subspecies of beach mice has been designated and will be discussed. No critical habitat has been designated for the other two subspecies (SEBM and AIBM). Therefore, the proposed action would have no effect on designated critical habitat for these two subspecies because none is designated.

Generally, sand placement activities or dredged navigation channel material is not placed on existing beach mouse habitat consisting of vegetated dunes. Typical effects from these activities to beach mice and their habitats consist of the staging and storage of equipment, work vehicles, or materials and beach access for sand placement activities or dredged material placement. These effects may result in the permanent and temporary loss, degradation, or fragmentation of beach mouse habitat and changes in essential life history behaviors (dispersal and movement, foraging, seeking mates, breeding, and care of young). Beach mice spend their entire lives within the dune ecosystem and are nocturnal. Sand placement projects may occur at anytime of the year depending on their location and are usually conducted on a 24/7 schedule. The quality of the placed sand could affect the suitability of the beach and dunes to support beach mouse burrow construction and food sources. The effect of the activities covered under the consultation with incorporation of the proposed conservation measures on beach mice overall survival and recovery are considered in this SPBO.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area (all subspecies of beach mice)

The action area encompasses the entire range of five subspecies of beach mice, and designated critical habitats of three beach mouse subspecies. Therefore, the previous discussion in "Status of the Species" applies here. The known distribution of the five subspecies of beach mice is a result of cursory surveys and intermittent trapping involving different projects. There has not been a systematic trapping study done in order to determine the status of each subspecies throughout their ranges.

Factors affecting the species environment within the action area

Coastal development

Beach mice were listed as endangered and threatened species primarily because of the fragmentation, adverse alteration, and loss of habitat due to coastal development. The threat of development-related habitat loss continues to increase. Other contributing factors include low population numbers, habitat loss from a variety of reasons (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the existing strength or lack of regulations regarding coastal development.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes can impact beach mice either directly (e.g., drowning) or indirectly (e.g., loss of habitat). Depending on their frequency, storms can affect beach mice on either a short-term basis (e.g., temporary loss of habitat) or long term (e.g., loss of food, which in turn may lead to increased juvenile mortality, resulting in a depressed breeding season). How hurricanes affect beach mice also depends on the characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining habitat, frequent or successive severe weather events could compromise the ability of certain populations of beach mice to survive and recover. Beach mice evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed beach mice to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to beach mice survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a major loss of habitat for beach mice.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida’s coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

Beachfront Lighting

Artificial lighting along developed areas of both coastlines continues to cause increase susceptibility to predators, altered foraging and breeding habits which impact beach mouse recovery. While a majority of coastal local governments and counties have adopted beachfront lighting ordinances compliance and enforcement is lacking in some areas. Further, the lighting in areas outside the beachfront ordinance coverage areas continues to be unregulated resulting in urban glow. Even the darker areas of conservation managed lands are subject to surrounding sky glow.

Predation

A major continuing threat to beach mice is predation by free-roaming cats and other nonnative species. The domestic cat is not native to North America and is considered a separate species from its wild ancestral species, *Felis silvestris*. Cats are hunters, retaining this behavior from their ancestors. However, wildlife in the western Hemisphere did not evolve in the presence of a small, abundant predator like the domestic cat, and thus did not develop defenses against them. Cats were introduced to North America a few hundred years ago.

Free-roaming pets prey on small mammals, birds, and other native wildlife. In the U.S., on a nationwide basis, cats kill over a billion small mammals and hundreds of millions of birds each year. Worldwide, cats are second only to habitat destruction in contributing to the extinction of birds. Cats have been documented to take beach mice, sea turtle hatchlings, shorebirds, and migratory birds. A significant issue in the recovery of beach mice is predation by free-ranging pet and feral cats. Beach mice have a number of natural predators including snakes, owls, herons, and raccoons. Predation is part of the natural world. However, predation pressure from both natural and nonnative predators may result in the extirpation of small, local populations of beach mice in a very short time (Bowen 1968, Linzey 1978).

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of beach mice and its designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting beach mice or its designated critical habitat nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

Factors to be considered

Aspects of the sand placement and dredged material placement activities will occur within habitat that is used by beach mice year round. The activities include the storage of equipment, work vehicles, or materials and creation, expansion, or use of beach access points for sand placement activities or dredged material placement. The work, depending on the location, may be conducted any time of the year. Most effects would be expected to be temporary. These short-term and temporary impacts could include loss of foraging habitat, altered beach mouse movement and dispersal activities. Long-term and permanent impacts from the sand placement activities such as excavation of dune habitat and degradation could impact beach mice by fragmentation of their habitat including critical habitat for the PKBM, CBM, and SABM.

There are typically different "levels" of access sites needed for a project. The primary access is a "lay-down" yard, where pipe is delivered and stored, and storage trailers, and other equipment and materials are stored. These are typically big paved parking lots, so that the Corps's trucks can access the area to drop off and pick up equipment. There's typically a beach access at that point to get the pipe and equipment onto the beach and that access is usually at least 50-ft wide (pipe sections are typically 40 to 50 feet long). In NW Florida and Alabama, these yards have been approximately eight miles apart.

“Intermediate areas" are used at about the quarter points of the project length. These are used for the fuel tank, welding equipment, and other items or systems that get used a couple of times a day. These locations can vary from two to three miles apart. In addition, there are access points to allow project vehicles and trucks on and off the beach. Based on previous projects it would be expected to have single-vehicle entry points at one-half to one-mile intervals.

Protective, avoidance, and minimization measures have been incorporated into the project plan to avoid or minimize the potential impacts from the sand placement and dredged material placement activities. However, even with these measures, impacts to beach mice are expected to occur from some aspects of the project activities. The activities are expected to directly or indirectly adversely affect beach mice and/or their habitat including designated critical habitat for the PKBM, CBM, and SABM. The work may occur on public and/or private lands.

Proximity of Action: Some aspects of the sand placement and dredged material placement activities would occur directly in beach mouse habitat. The storage or staging of pipe and other equipment, and vehicles, use or creation of beach access points, and placement of pipe, nourishment or dredged material could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM. Beach mice spend their entire life cycle within the coastal dune system.

Distribution: The storage or staging of pipe and other equipment and vehicles and use of beach access points that could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM may vary depending on the individual project length and existing beach accesses and non-beach mouse habitat that can be used for storage and staging.

Timing: The timing of the activities would directly and indirectly impact beach mice and their habitat depending on the season. Beach mice reproduce year-round with more mice being produced in the late winter and early spring. Impacts could include but would not be limited to disrupting mice seeking mates, constructing nest burrows, foraging for food, caring for their young, and young mice leaving the nest burrow dispersing into new habitat.

Nature of the Effect: The effects of the activities may include the temporary loss of habitat including the loss of a few beach mice from excavation of habitat for beach access and reduction of beach mouse activity including feeding, reproduction, and movement from loss or alteration of habitat. Activities that decrease the amount or quality of dune habitat or movement could affect beach mice by reducing the amount of available habitat and fragmenting the habitat.

Duration: Time to complete the project construction may vary depending on the project length, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). Project work could take as little as a month and as long as a one or two years. Beach mouse habitats would remain disturbed until the project is completed and the habitats are restored. Dune restoration could be complete from 6 to 12 months after the project has been completed. The short generation time of beach mice combined with the time frames provided in this document (projects from 1 month to 2 years, dune restoration 6 to 12 months following project completion) will impact multiple generations of beach mice. The time to complete a project and restore the habitat can be a complete loss of habitat availability and use for multiple generations of beach mice.

Disturbance frequency: Depending on the sand placement activity and dredging project frequency, this could result in impacts to beach mice and their habitats at any time during the year on a minimum cycle of every 2 years. Following initial sand placement, activities could occur every year depending on the project location and erosion events. The actual number of times the sand placement would occur is unknown. Following initial sand placement or dredge material placement, maintenance activities could occur every two to 10 years depending on the project location and situation (erosion, long shore sand transportation, upstream activities, and weather events). Thus, impacts related to the subject activities would be expected to occur no more often than every two to three years. However, while not anticipated, work could occur annually in response to emergency events. The actual number of times the nourishment and dredging material disposal activities is unknown but can be based on previous work.

Disturbance intensity and severity: Depending on the frequency needed to conduct the nourishment and dredged material work and the existence of staging areas and beach access points, effects to the recovery of beach mouse may vary. However, the action area encompasses entire range of each subspecies and the overall intensity of the disturbance is expected to be minimal. The severity is also likely to be slight as few if any mice would be lost and dune habitats can be restored quickly if protected from other impacts (pedestrians and vehicles).

The staging and storage of equipment and materials and beach access points could occur within habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM and could be adjacent to designated critical habitat for the PKBM, CBM, and SABM. Beach mice are permanent inhabitants of the coastal ecosystem conducting all their life cycles in this environment. While the current status of individual beach mouse subspecies is unknown, their general distribution is known.

Analysis for effects of the action

The action area consists of the Atlantic or Gulf beachfront including the wet and dry unvegetated beach, developing foredunes and interdunal swales, and areas that were formerly primary or secondary dunes. Sand placement or dredged material placement work would not occur on existing vegetated primary or secondary dunes. However, construction of or expansion of an existing beach access could be located through scrub, secondary, or primary dunes. Beach mice would generally be found inhabiting stable primary, secondary, and scrub dunes on a permanent basis with other habitats being used periodically on a daily or seasonal basis for feeding and movement. Some of these areas also include critical habitat.

Direct and Indirect Impacts

Direct impacts are effects of the action on the species occurring during project implementation and construction (sand placement or dredged material placement). Direct loss of individual beach mice may occur during the creation or expansion of beach access points when heavy equipment clears the habitat and packs the sand. In general the length of time between project maintenance work is expected to be sufficient for beach mouse habitat to be restored. Thus, it is not anticipated that the nourishment and dredged material placement activities would result in permanent beach mouse habitat destruction (including critical habitat). However, habitat for all the beach mouse subspecies and critical habitat for the PKBM, CBM, and SABM that provides food or cover may be temporarily destroyed or altered from the activities.

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. The indirect effect of the sand placement and dredged material placement activities would be newly created or expanded existing beach access points that act as barriers to beach mouse movement for foraging, or population expansion or dispersal. Maintaining the connectivity among habitats is vital to persistence of beach mice recovery. Recovery actions needed to assure the connectivity include restoration and maintenance of the dune system following project completion.

For the Service to determine if the project impacts on designated critical habitat would be an adverse modification, the Service shall determine if the impact on the habitat appreciably diminishes the capability of the critical habitat to satisfy essential requirements of beach mice. The long-term maintenance of the beach mouse populations in the project areas could be compromised if the sand placement and dredged material placement activities occur too frequently resulting in a long-term barrier to mice movement. However, our evaluation indicates the impacts to critical habitat should be temporary in nature based on past history of nourishment projects. In addition, the area to be directly affected within the individual subspecies would be a small percentage of the overall critical habitat and would not be expected to reduce the carrying capacity of the recovery unit or appreciably diminish the ability of the PCE's to provide for the essential functions of the critical habitat units.

Species' response to a proposed action

This SPBO is based on effects that are anticipated to beach mice (all life stages) as a result of the temporary physical disturbance of beach mice habitat from beach nourishment or dredged material placement and associated activities. Some individual beach mice (all life stages) may be lost during the initial construction or expansion of beach accesses where heavy equipment destroys dune habitat and compacts the sand within the access corridor. Any mice that survive the initial construction may move outside of the disturbed area and construct burrows elsewhere in the vicinity. This will result in increased exposure to predation due to the removal of their burrows.

Following access construction, a bare gap of sand could form a barrier to limit beach mouse movement within the area altering regular movement patterns. The bare areas could not be used for foraging, breeding or sheltering. These impacts are expected to be limited to the construction phase of the project (one month to two years). As the life span of a beach mouse is estimated to be approximately nine months, the loss of individual mice or the temporary loss of habitat could affect several generations of beach mice, but because beach mice can reproduce rapidly with adequate resources, colonization or recolonization of the restored habitat would be expected.

Beach mice have evolved to adapt to catastrophic weather events. Additional factors such as surrounding development pressure and nonnative predators may affect the species' ability to recover from the loss of individuals. However, the temporary loss of the habitat itself is not expected to permanently impact the populations as all beach mouse habitat within the project areas not permanently destroyed would be restored or maintained as part of the conservation measures committed to by the Corps or the Applicant. The temporary nature of the impacts to dune habitats is not expected to alter the function and conservation role of the remaining beach mouse habitat including designated critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this SPBO. Future Federal actions that are unrelated to the proposed project are not considered in this opinion and require separate consultation pursuant to section 7 of the Act.

It is reasonably certain to expect that coastal development, human occupancy and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. Redevelopment along with new developments following the hurricane seasons of 2004 and 2005 are occurring as allowed by local zoning standards. It is unknown how much influence a nourished beach would contribute to the development and recreational use of the shoreline. Any projects that are within endangered or threatened species habitat will require section 7 consultation or section 10(a) (1)(B) permitting from the Service.

In recognizing the importance of coastal barrier islands along the Atlantic and Gulf coasts, Congress passed the Coastal Barrier Resources Act (CBRA) of 1982 and Coastal Barrier Improvement Act in 1991. The purpose of CBRA is "…to minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts by restricting future Federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers." Congress established the Coastal Barrier Resources System units that apply to the CBRA.

Escambia County is currently in the final permitting stages of a beach nourishment project for Perdido Key. The project would cover approximately 4 miles of beachfront along county and private lands, not including state and Federal lands. The Service completed an endangered species consultation for the project in 2008. The project construction is expected to begin in late 2009-2010. The beach nourishment project is likely to enhance beach mouse habitat by providing an additional buffer to the dune habitats from storm events.

The Pensacola Naval Air Station has proposed to dredge their navigation channel resulting in the need to place eight million cubic yards of dredged material that is beach compatible. Because of cost, Perdido Key is the closest area to receive the material. Receiving areas include the Perdido Key Gulf beachfront (in lieu of the County implementing their project described above), PKSP, and GINS, Escambia County. The project could result in the placement of dredged material on 16 miles of beachfront including private, county, state, and Federal lands. The Navy has received their permits to complete the project. The Service completed an endangered species consultation for the project in 2007. The full project is on hold due to funding. However, the Federal navigation channel in the lower portion of the project area is expected to be maintenance dredged in 2009-2010.

Gulf County is currently completing a beach restoration project on St. Joseph peninsula and St. Joseph Peninsula State Park. The project will cover approximately 7.5 miles of Gulf of Mexico beachfront. The Service completed an endangered species consultation for the project. The project was completed in 2008.

CONCLUSION

Sea Turtles

After reviewing the current status of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of the proposed activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that work conducted under the Statewide Programmatic action, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

The conservation of the five loggerhead recovery units in the Northwest Atlantic is essential to the recovery of the loggerhead sea turtle. Each individual recovery unit is necessary to conserve genetic and demographic robustness, or other features necessary for long-term sustainability of the entire population. Thus, maintenance of viable nesting in each recovery unit contributes to the overall population. Three of the five loggerhead recovery units in the Northwest Atlantic occur within the action area, the PFRU, the DTRU, and the NGMRU. Sand placement is not expected to occur within the DTRU. The NGMRU averages about 1,000 nests per year. Northwest Florida accounts for 92 percent of this recovery unit in nest numbers (920 nests) and consists of approximately 234 miles of nesting shoreline. Of the available nesting habitat within the NGMRU, with most sand placement projects have a project life of five to seven years and channel maintenance activities occurring every two to three years, on average, sand placement impacts will occur on 8.8 miles of sea turtle nesting shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

The PFRU averages 64,513 nests per year. The entire recovery unit occurs within Florida and consists of approximately 595 miles of sandy shoreline (http://www.dep.state.fl.us/beaches/publications/pdf/fl_beach.pdf). Of the available nesting habitat within the PFRU, sand placement activities will occur on 18.9 miles of nesting shoreline per year during nonemergency years. This is based on the average linear feet of beach on which sand placement occurred during non-emergency years from 2001 to 2008.

Generally, green, leatherback, hawksbill, and Kemp's ridley nesting overlaps with or occurs within the beaches where loggerhead sea turtles nest on both the Atlantic and Gulf of Mexico beaches. Thus, for green, leatherback, hawksbill, and Kemp's ridley sea turtles, sand placement activities will affect an average of 27.7 miles of shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

For all species of sea turtles, post-hurricane sand placement activities occurred on approximately 205 miles of shoreline for the 2004-2005 period following the emergency events (declared disasters and Congressional Orders). These activities are within the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

Beach Mice

The PKBM, CBM, and SABM occur on both public and private lands throughout their historical ranges. Both the SEBM and the AIBM are located completely on county, state, or federally protected lands, except for a small area in St. Johns County in which the AIBM are found on private lands along the Florida coast.

After reviewing the current status of the species of the SEBM, AIBM, PKBM, CBM, and SABM, the environmental baseline for the action area, the effects of beach nourishment and dredged material placement and associated activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that the Statewide Programmatic action for these projects, as proposed, is not likely to jeopardize the continued existence of any of the above subspecies of beach mice and is not likely to destroy or adversely modify designated critical habitat for the PKBM, CBM, or SABM.

As discussed in the Effects of the Action section of this SPBO, we would not expect the carrying capacity of beach mouse habitat within the action area to be reduced. Beach mouse habitat will continue to provide for the biological needs of the subspecies as demonstrated below:

1. No permanent loss of beach mouse habitat will occur within the action area from the project construction or maintenance;

2. Temporary impacts to beach mouse habitat will be restored within the action area after project completion; and

3. A full complement of beach mouse habitat will remain within the action area after project completion.

Temporary impacts are expected to be limited to the construction/maintenance phase of the project and habitat restoration period following the project, which could be completed between one month and two years.

While a few beach mice may be lost, beach mice recover well from population size reductions (Wooten 1994) given sufficient habitat is available for population expansion after the bottleneck occurs. Therefore, we do not consider the potential loss of individuals to be significant.

Also, 50 feet of beach mouse critical habitat for each subspecies (PKBM, CBM, and SABM) could be temporarily affected each time a project is completed as a result of the sand placement activities. We would not anticipate that the loss of the critical habitat would alter or affect the remaining critical habitat in the action area for each subspecies (PKBM, CBM, and SABM) to the extent that it would appreciably diminish the habitat's capability to provide the intended conservation role for the subspecies in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and shall be implemented by the Corps so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps shall report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF ANTICIPATED TAKE

Sea Turtles

The Service anticipates that no more than 27.7 miles of highly eroded shoreline along the Florida coastline (no more than 8.8 miles within the NGMRU and no more than 18.9 miles within the PFRU) would receive sand placement per year during nonemergency calendar years with a maximum of 102 miles of shoreline (38 miles within the NGMRU and 64 miles of shoreline within the PFRU) receiving sand during or following an emergency event (declared disaster or Congressional Order) as a result of the Statewide Programmatic action. This represents two percent of the entire shoreline per year during a nonemergency year and seven percent of the entire shoreline during an emergency year. Over the last 10 years, one Congressional Order occurred due to emergency events in the 2004-2005 period. The increased sand placement on 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events. Incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because
    a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
    b. Human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;

2. The total number of hatchlings per undiscovered nest is unknown;

3. The reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown;

4. An unknown number of females may avoid the project beach and be forced to nest in a less than optimal area;

5. Lights may misdirect an unknown number of hatchlings and cause death; and

6. Escarpments may form and prevent an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species due to disturbance and sand placement on suitable turtle nesting beach habitat can be anticipated because (1) turtles will continue to nest within the project site during and following sand placement; (2) sand placement activities will likely occur during a portion of the nesting season; (3) sand placement activities will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter or misdirect nesting females and hatchlings during and following sand placement.

Take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

According to Schroeder (1994), there is an average survey error of seven percent; therefore, there is the possibility that some nests within the Action Area may be misidentified as false crawls and missed. However, due to implementation of the sea turtle protection measures, we anticipate that the take will not exceed seven percent of the nesting average in the action area. This number is not the level of take anticipated because the exact number cannot be predicted nor can the level of incidental take be monitored.

Beach Mouse

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated from the sand placement activities may occur any time of the year within a ten-year period. The Service anticipates incidental take of beach mice would be difficult to detect for the following reasons: (1) an unknown number of beach mice may be injured, crushed or buried during beach access construction work and remain entombed in the sand; (2) beach mice are nocturnal, are small, and finding a dead or injured body is unlikely because of predation, and (3) changes in beach mouse essential life behaviors may not be detectable in standardized monitoring surveys.

For projects that occur within beach mouse habitat it is anticipated that no more than 50 linear feet of beach mouse habitat could be affected per sand placement activity for beach access within a subspecies range statewide as a result of the sand placement activities.

The incidental take is expected to be in the form of: (1) harm or harassment to all beach mice occupying the created or expanded beach access points; (2) harassment of beach mice from disturbance of foraging opportunities within the access areas during the construction period; (3) harassment of beach mice from temporary loss of foraging and burrow habitat; and (4) harassment of beach mice from temporary restriction of movement across access areas.

EFFECT OF THE TAKE

Sea Turtles

In the SPBO, the Service determined that the level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Loggerhead critical habitat has been designated in the project area. Based on the Corps incorporation of the conservation measures into the project, the Service concurs that the project may affect but is not likely to adversely affect nor adversely modify NWAO loggerhead critical habitat in the terrestrial environment. The Corps will consult with the NMFS on any impacts to critical habitat in the marine environment.

Incidental take of loggerhead nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 18.9 miles of shoreline per year within the PFRU during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year. The increased sand placement of 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events.

Incidental take of green, leatherback, hawksbill and Kemp's ridley nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project or while placed sand remains on the beach. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 27.7 miles (8.8 miles within the northwest portion of Florida and 18.9 miles within the northeast, south and west portion of Florida) of shoreline per year during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of

Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year.

Beach Mouse

In the SPBO, the Service determined that this level of anticipated take is not likely to result in jeopardy to AIBM, SEBM, PKBM, CBM, and SABM or in adverse modification or destruction of designated critical habitat for the PKBM, CBM, or SABM. Critical habitat for the SEBM and AIBM has not been designated; therefore, the project will not result in destruction or adverse modification of critical habitat for these subspecies.

Incidental take of SEBM, AIBM, PKBM, CBM, and SABM is anticipated to occur at beach access locations for the sand placement activities. Take will occur during project construction where beach access points are expanded or created and where equipment is staged or stored within beach mouse habitat along approximately 50 feet of vegetated dunes for beach access.

REASONABLE AND PRUDENT MEASURES

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize take of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles; SEBM, AIBM, CBM, PKBM, and SABM in the action area for the following activities:

A. Sand placement from beach nourishment, sand bypass, and sand back pass activities;

B. Sand placement from navigation channel maintenance; and

C. Groin and jetty repair or replacement.

If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the term and condition is not reasonable and prudent for the specific project or activity and request exception under the SPBO or
2. Initiate consultation with the Service for the specific project or activity. The Service may respond by either of the following:
    a. Allowing an exception to the terms and conditions under the SPBO or
    b. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

Post construction requirements are listed in Reasonable and Prudent measures, A11, A12, A13, and A14. These post construction requirements may besubject to congressional authorization and the allocation of funds. Florida State statutes apply. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

REASONABLE AND PRUDENT MEASURES for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection (these projects are usually larger scaled) shall include the following measures:

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties, sand placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte counties, sand placement shall not occur from June 1 through September 30. This time frame does not include Venice Beach and which has low density nesting. In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties, Florida, sand placement may occur during the sea turtle nesting season.

A4. All derelict material or other debris shall be removed from the beach prior to any sand placement.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest.

A6. If a dune system is already part of the project design, the placement and design of the dune shall emulate the natural dune system to the maximum extent possible, including the dune configuration and shape.

A7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice.

A8. A meeting between representatives of the Applicant's or Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

A9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted by the FWC-authorized Marine Turtle Permit Holder. Surveys for early and late nesting sea turtles shall be conducted where appropriate.

A10. If nests are constructed in the area of proposed sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

A11. A post construction survey(s) of all artificial lighting visible from the project beach shall be completed by the Applicant or Corps.

A12. The Applicant or Corps shall ensure that daily nesting surveys are conducted by the FWC Marine Turtle Permit Holder for two nesting seasons following construction if the new sand still remains on the beach.

A13. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities.

A14. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles.

A15. Construction equipment and materials including pipes shall be stored off the beach in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

A16. Lighting associated with the project construction including on the dredge shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

A17. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC permit holder is present) between dusk and the time of completion the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

A18. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice.

A19. Beach mouse habitat shall be avoided to the maximum extent possible when selecting sites for access corridors, storage and staging of equipment.

A20. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

A21. Existing vegetated habitat at beach access points and travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access corridor.

A22. Expanded or newly created beach access points shall be restored following construction.

A23. A report describing the actions taken shall be submitted to the Service following completion of the proposed work.

A24. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

All conservation measures described in the Corps' Programmatic Biological Assessment are hereby incorporated by reference as Terms and Conditions within this document pursuant to 50 CFR §402.14(I) with the addition of the following Terms and Conditions. In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures, described above and outline reporting/monitoring requirements.

These Terms and Conditions are nondiscretionary.

Post construction requirements are listed in Terms and Conditions A11, A12, A13, and A14. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

TERMS AND CONDITIONS for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection shall include the following conditions:

All beaches

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach-compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). If a variance is requested from FDEP, the Service must be contacted to discuss whether the project falls outside of the SPBO. A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes may be placed and/or stored on the beach.

b. Sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in A3.c below).

c. For higher density nesting beaches in Gulf and Franklin counties sand placement shall not occur during the main part of the nesting season (June 1 through September 30). On Manasota Key located in Sarasota and Charlotte counties (excluding Venice Beach), sand placement shall not occur during the main part of the nesting season (May 1 through October 31). These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, and St. George Island in Franklin County.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) may proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require an individual emergency consultation.

Land managers on publicly owned conservation lands must be involved in the project coordination.

A4. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach to the maximum extent possible prior to any sand placement in accordance with the dates in A3. If debris removal activities take place during shorebird breeding or peak sea turtle nesting season (**Tables 17 and 18**), the work shall be conducted during daylight hours only and shall not commence until completion of daily seabird, shorebird or marine turtle surveys each day.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events. The meeting will be used to discuss modifications to the beach profile based on the post-construction monitoring data.

Beach profile may vary depending on location, shoreline dynamics, nature of the fill material, and other factors. If a native beach berm elevation is not possible, due to the beach width, impacts to nearshore hardbottom, or other considerations, as discussed during the meeting, the alternative template shall include features to minimize impacts to sea turtle nesting success and the potential for ponding and escarpment formation for that beach. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Dunes and other construction features must be within the scope of the Congressionally-authorized project, if it is a civil works project, and constructible without impacting other resources. If a recommended dune is not possible, the Corps will contact the Service to see if consultation needs to be reinitiated or discuss features incorporated with the profile that will enhance the existing dune. Dune features included in the profile design (or project) shall have a slope of 1.5:1 followed by a gradual slope of 4:1 for approximately 20 feet seaward on a high erosion beach (**Figure 13)** or a 4:1 slope (**Figure 14**) on a low erosion beach. The Corps must explore options to include a dune system in the project design for existing authorized projects and new non-Federal projects. If another slope is proposed for use, the Corps shall consult the Service. The seaward toe of the dune should be at least 20 feet from the waterline.

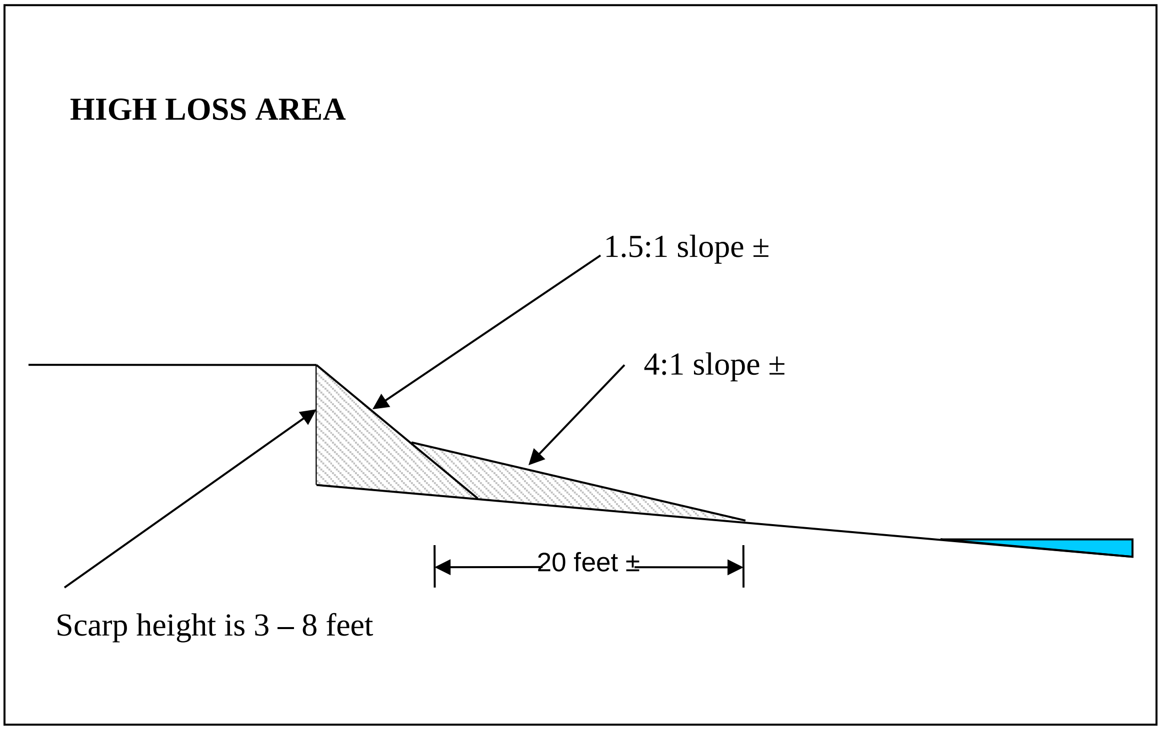

Figure 13. Recommended slope on a high erosion beach for sand placement projects that include the creation of a dune.

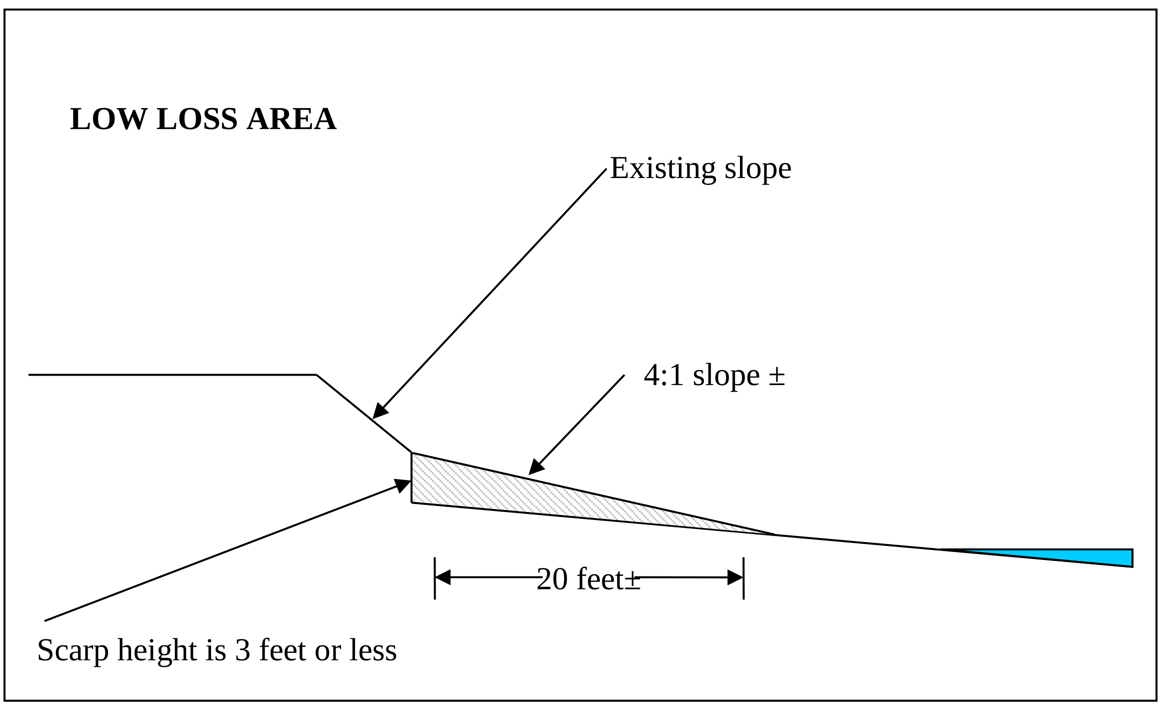

Figure 14. Recommended slope on a low erosion beach for sand placement projects that include the creation of a dune.

A6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. The Corps shall brief workers on the importance of not littering and keeping the project area trash and debris free.

A7. A meeting between representatives of the Corps (including the Corps project manager and/or the managing contractor), the Service, the FWC, the FWC Marine Turtle Permit Holder, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, and will include the following

a. Staging locations, storing equipment including fuel stations
b. Coordination with the Marine Turtle Permit Holder on nesting surveys and any nighttime work
c. Pipeline placement (between 5 to 10 feet from dune)
d. Minimizing driving
e. Egg relocation- permit holder and location (must be approved by FWC)
f. Free-roaming cat observation (for projects in or near beach mouse habitat)
g. Follow up lighting surveys - dates and inspector
h. Follow up coordination during construction and post construction
i. Coordination on construction lighting including dredge lighting and travel within and adjacent to the work area
j. Direction of the project including progression of sand placement along the beach
k. Late season nests present in project area (if any)
l. Plans for compaction monitoring or tilling
m. Plans for escarpment surveys

At the preconstruction meeting, the Corps shall also provide the Service with specific anticipated shoreline lengths and anticipated duration using the form on the following web link: http://www.fws.gov/northflorida/SeaTurtles/Docs/Corp%20of%20Engineers%20Sea%20Turtle%20Permit%20Information.pdf. Only the following information should be filled out: Corps Permit Number, FWS Log Number, Project Location, Construction Activity, Duration of Protect, and Actual Take (linear feet of beach). This form shall be emailed to the Service at seaturtle@fws.gov. This form is in addition to the annual report listed below.

Sea Turtle Protection

A8. Daily early morning surveys for sea turtle nests shall be required and continue throughout the season as outlined in **Tables 16 and 17 (Nesting Season Monitoring)** if construction occurs during the nesting and hatching season. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

Table 16. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/relocation)	Beach Placement Window	Early Season Relocation*	Late Season Relocation**	Nesting Season Monitoring (monitoring throughout season)
Brevard, Indian River, St. Lucie, and Broward Counties	25 Feb - 11 Nov	15 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Brevard, Indian River, St. Lucie, & Broward counties nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to Jan 15 (11 Nov) (or 65 days prior to start of construction **)	1 Mar - 11 Nov ***
Martin and Palm Beach Counties	12 Feb – 17 Nov	21 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Martin and Palm Beach Counties, nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to 21 Jan (17 Nov) (or 65 days prior to start of construction**)	1 Mar - 17 Nov***

** Relocation can only begin after FWC authorizes nest relocation in accordance with Florida Statute 379.2431 (1).
*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

Table 17. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Outside of Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/ relocation)	Beach Placement Window	Nesting Season Monitoring and Relocation (monitoring throughout season)
Nassau, Duval, Flagler, St. Johns, and Volusia Counties	2 Apr. – 24 Oct	28 Dec	All Year	15 Apr – 24 Oct ***
Miami-Dade County	11 Feb – 25 Sep	29 Nov	All Year	1 Mar – 25 Sep***
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) & Franklin County (St. George Isl)	1 May - 4 Sep	13 Nov	1 Oct - 31 May	1 May – 4 Sep***
All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	2 May – 16 Sep	24 Nov	All Year	1 May - 16 Sep***
Sarasota and Charlotte Counties (Manasota Key)	24 Apr – 7 Sep	11 Nov	1 Nov - 30 Apr (except Venice beach)	15 Apr – 7 Sep***
All other beaches in Sarasota and Charlotte Counties	24 Apr – 12 Sep	16 Nov	All Year	15 Apr – 12 Sep***
Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	20 Apr – 19 Sep	23 Nov	All Year	15 Apr – 19 Sep***

*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

A9. If nests are constructed in the area of anticipated sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation as outlined in a through f. If nests are laid on the dune outside of the immediate sand placement area, the Corps must contact the Service to discuss whether relocation or mark and avoidance is required. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during the earlier part of the nesting season (see Table 14) through April 30, daily early morning surveys shall begin March 1 and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements (i through iii below). For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through November 11, and eggs shall be relocated per the requirements listed in (a)i through (a)iii. The Corps must contact the Service if there are any nests still incubating after November 30.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Relocation cannot begin until the Corps has a copy of the FWC permit authorizing relocation for construction purposes at that particular sand placement project. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or be subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

Daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the period of sea turtle nest laying (**see Table 17**), daily early morning (before 9 a.m.) surveys and egg relocation shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in A10.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or by nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17) with relocation only through the end of fill placement. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in A10.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, sand placement activities shall occur only during the Beach Placement Window indicated in Table 17 (except on Venice Beach), outside the period of peak sea turtle egg laying and egg hatching for this area. If nests are laid in the early part of the nesting season monitoring during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17 whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17), with egg relocation continuing only through the end of fill placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in A10.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nesting season monitoring and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to sand placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of nesting season monitoring indicated in Table 17 and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

A10. Two surveys shall be conducted of all lighting visible from the beach placement area by the Applicant or Corps, using standard techniques for such a survey (**Appendix C**), in the year following construction. The first survey shall be conducted between May 1 and May 15 and a fill out FWS Sea Turtle Lighting Survey Form (**Appendix D**) and send electronically to seaturtle@fws.gov. The second survey shall be conducted between July 15 and August 1. A summary report of the surveys, including any actions taken, shall be submitted to the Service by December 31 of the year in which surveys are conducted. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area. If the project is completed during the nesting season and prior to May 1, the Corps may conduct the lighting surveys during the year of construction.

A11. Daily nesting surveys shall be conducted for two nesting seasons following construction in accordance with **Table 18** and reported in accordance with **Table 20** by the Corps or the Applicant if placed material still remains on the beach. Post construction year-one surveys shall record the number of nests, nesting success, reproductive success, disorientations, and lost nests due to erosion and/or inundation. Post construction year-two surveys shall only need to record nest numbers, nesting success, and disorientations (**Table 20**). This information will be used to periodically assess the cumulative effects of these projects on sea turtle nesting and hatchling production and monitor suitability of post construction beaches for nesting.

Table 18. Post-Construction Sea Turtle Monitoring.

Region	Nest Laying Season	Years 1 and 2 Post-Construction Monitoring
Brevard, Indian River, St. Lucie, and Broward Counties Martin and Palm Beach Counties	25 Feb – 11 Nov 12 Feb – 17 Nov	Daily surveys: 1 Mar - 31 Oct (for late season: 15 days without a nests, can stop monitoring-email FWS and FWC to stop
Nassau, Duval, and St. Johns, Counties	2 Apr. – 24 Oct.	Daily surveys: 1 May – 30 Sep
Flagler and Volusia Counties	2 Apr. – 24 Oct.	Daily surveys: 15 Apr- 15 Oct
Miami-Dade County	11 Feb – 25 Sep	Daily surveys: 1 Apr – 30 Sep
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) and Franklin County (St. George Island) All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	1 May – 4 Sep 2 May – 16 Sep	Daily surveys: 1 May – 31 Aug
Sarasota and Charlotte Counties (Manasota Key) All other beaches in Sarasota and Charlotte Counties Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	24 Apr – 7 Sep 24 Apr – 12 Sep 20 Apr – 19 Sep	Daily surveys: 15 Apr –15 Sep

A12. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years.

Table 19. Dates for Compaction Monitoring and Escarpment Surveys by County.

County where project occurs	**Date**
Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, and Monroe	Work must be completed by Mar 1
Miami-Dade, Monroe	Work must be completed by April 1
Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin, Volusia, Flagler, St. Johns, Duval, Nassau, Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier	Work must be completed by Apr 15

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted electronically to seaturtle@fws.gov prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.

(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act. See Appendix E for shorebird conditions recommended by FWC.

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

A13. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the sand placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed in **Table 19**. Any escarpment removal shall be reported by location in the annual report. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. If during weekly escarpment surveys, it is found that subsequent reformation of escarpments interferes with sea turtle nesting or that they exceed 18 inches in height for a distance of 100 feet during the nesting and hatching season, the Service shall be contacted immediately to determine the appropriate action to be taken. If it is determined by the Service or FWC that that escarpment leveling is required during the nesting or hatching season the Service, in coordination with the FWC, will provide a brief written authorization within 5 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be sent electronically to seaturtle@fws.gov. A summary is required even when no action has been taken (**Table 3**).

A14. Staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see table 14) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

A15. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. A light management plan for the dredge and the work site shall be submitted for approval by the Service and FWC prior to the pre-construction meeting. In accordance with this plan, lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water’s surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing on dredge and land-based lights and be large enough to block light from all lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

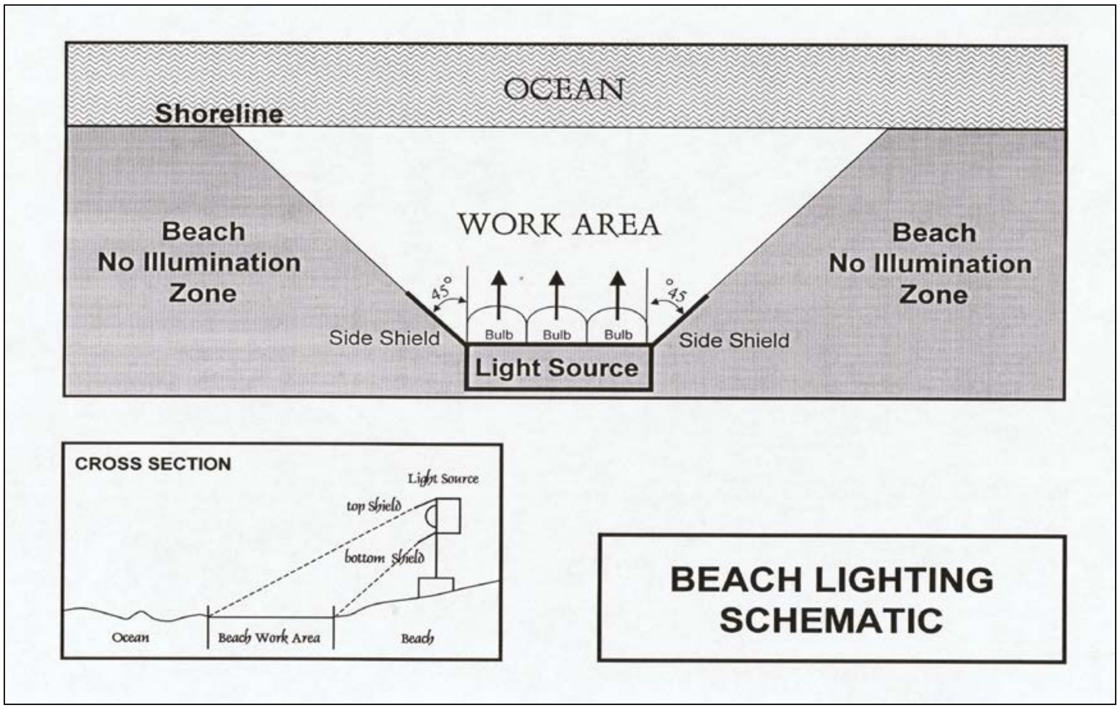

Figure 15. Beach lighting schematic.

A16. During the early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

Dune Planting

A17. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice. Dune vegetation planting may occur during the sea turtle nesting season under the following conditions.

a. Daily early morning sea turtle nesting surveys (before 9 a.m.) shall be conducted during the Nest Laying period for all counties in Florida where sea turtle nesting occurs (see Tables 16 and 17). Nesting surveys shall only be conducted by personnel with prior experience and training in nesting surveys. Surveyors shall have a valid FWC permit. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (all times). No dune planting activity shall occur until after the daily turtle survey and nest conservation and protection efforts have been completed. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys;

b. Any nests deposited in the dune planting area not requiring relocation for conservation purposes shall be left in place. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 3-foot radius around the nest. No planting or other activity shall occur within this area nor will any activities be allowed that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the planting activity;

c. If a nest is disturbed or uncovered during planting activity, the Corps, or the Applicant shall cease all work and immediately contact the project turtle permit holder. If a nest(s) cannot be safely avoided during planting, all activity within 10 feet of a nest shall be delayed until hatching and emerging success monitoring of the nest is completed;

d. All dune planting activities shall be conducted by hand and only during daylight hours;

e. All dune vegetation shall consist of coastal dune species native to the local area; (*i.e*., native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material for the plant size;

f. No use of heavy equipment shall occur on the dunes or seaward for planting purposes. A lightweight (all-terrain type) vehicle, with tire pressures of 10 psi or less may be used for this purpose; and

g. Irrigation equipment, if needed, shall be authorized under a FDEP permit.

<u>Beach Mouse Protection</u>

A18. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

A19. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune as required during sea turtle nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO.

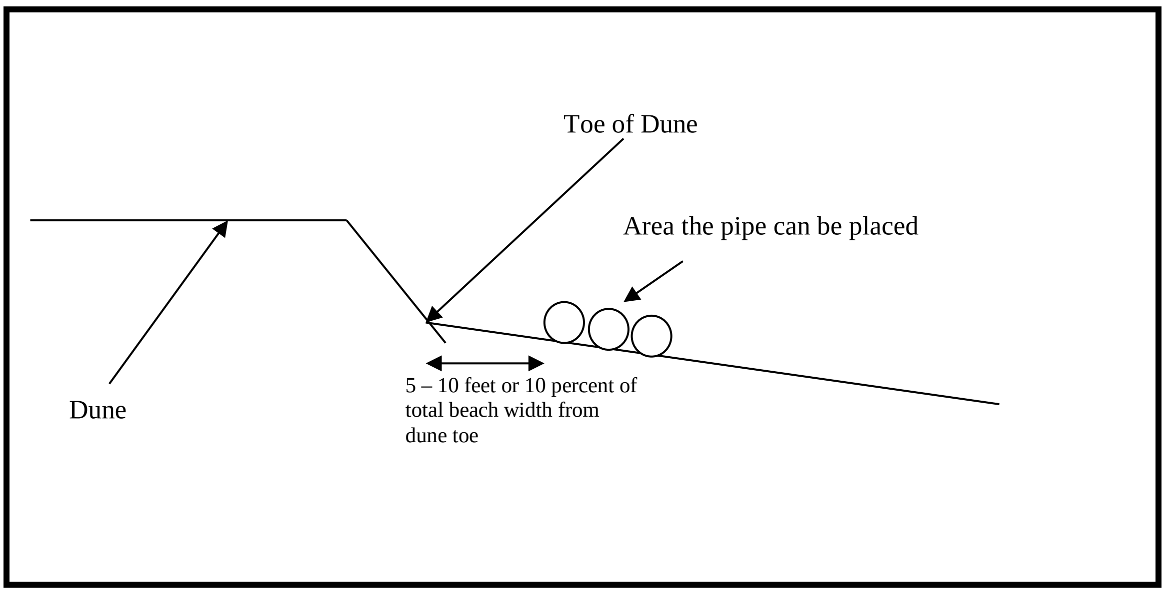

Figure 16. Equipment placement for projects occurring in beach mouse occupied habitat.

A20. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be fully restored to the preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

A21. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be spaced no closer than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least one inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

A22. A report with the following shall be submitted to the Service electronically (seaturtle@fws.gov) by December 31 after completion of construction.

i. **A summary of the information listed in Table 20 for construction**
ii. **A summary of the information listed in Table 21 for post-construction**

Table 20. Information to include in the report following the project completion.

All projects	**Project location (include Florida DEP R-monuments and latitude and longitude coordinates)**
	Project description (include linear feet of beach, actual fill template, access points, and borrow areas)
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nests surveys for nourished and non-nourished areas)
	Descriptions and locations of sites where nests were relocated
Beach mice	**Acreage of new or widened access areas affected in beach mouse habitat**
	Vegetation completed for new or widened access areas
	Success rate of vegetation of restoration

Table 21. Sea turtle monitoring following sand placement activity.

Date	Duration	Variable	Criterion
Nesting Success	Year of in season construction, two years post construction if placed sand remains on beach and variable does not meet criterion based on previous year	Number of nests and non-nesting events	40 percent or greater
Hatching success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to emerge from nest onto beach	80 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Disorientations	Year of in season construction and two years post construction if placed sand remains on the beach	Number of nests and individuals that misorient or disorient	http://myfwc.com/media/418153/Seaturtle_Guidelines_A_LDIR_Directions.pdf
Lighting Surveys	Two surveys the year following construction, one survey between May 1 and May 15 and second survey between July 15 and August 1	Number, location and photographs of lights visible from nourished berm, corrective actions and notifications made	Lighting survey and meeting resulting with plan for reduction in lights visible from nourished berm within one to two month period
Compaction	Three seasons following construction. Not required if the beach is tilled prior to nesting season each year placed sand remains on beach	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for three years each year placed sand remains on the beach	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

If nesting and reproductive (hatching and emergence) success is less than the criteria in the table above, the Corps and the Service must discuss during the annual meeting to review additional conditions prior to the next sand placement on this beach.

A23. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement (not including near shore placement for shore protection) shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Reasonable and Prudent Measures B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

B3. For dredged material placement on the beach, sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties, dredged material placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County dredged material placement shall not occur from June 1 through September 30. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur from May 1 through October 31 (except Venice Beach). In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape Sand Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, sand placement may occur during the sea turtle nesting season (**Table 16 and Table 17**).

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting season, sand placement will be conducted at or below MLLW line.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible.

B6. The Corps shall continue to work with FDEP, FWC, and the Service to create a sea turtle friendly beach profile for placement of material during construction.

B7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**).

B8. A meeting between representatives of the Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

B9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. Surveys for early and late nesting sea turtles shall be conducted where appropriate. If nests are constructed in the proposed area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

B10. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities. Not required for dredged material placement in the swash and littoral zone.

B11. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles. Not required for dredged material placement in the swash and littoral zone.

B12. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

B13. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

B14. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC sea turtle permit holder is present) between dusk and the time of completion of the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

B15. Beach mouse habitat shall be avoided when selecting sites for storage and staging of equipment to the maximum extent possible.

B16. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

B17. Existing vegetated habitat at beach access points and along shoreline travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access and travel corridors.

B18. Expanded or newly created beach access points shall be restored.

B19. A report describing the actions taken shall be submitted to the Service work for each year when the activity has occurred.

B20. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement of Corps civil works project shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Terms and Conditions B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

All beaches

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

B3. Dredged material placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Dredged material placement in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties shall occur only during the beach placement window indicated in Table 16. construction equipment or pipes may be placed and/or stored on the beach only during the beach placement window indicated in Table 16.

b. Dredged material placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in B3.c. below).

c. For higher density nesting beaches in Gulf and Franklin counties dredged material placement shall not occur during the main part of the nesting season June 1 through September 31. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur during the main part of the nesting season (May 1 through October 31). This timeframe does not include Venice Beach due to the low density nesting. These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties. See Table 17 for the Beach Placement Windows.

d. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone during the sea turtle nesting season (**Tables 16and 17**), the Corps shall contact the Service for coordination.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte Counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require that an individual emergency consultation be conducted.

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting and hatching season, sand placement will be conducted at or below the MLLW line. The swash zone is that region between the upper limit of wave run-up (approximately one-foot above MHW) and the lower limit of wave run-out (approximately one-foot below MLW). Material will not be placed so that it is exposed above the water during low tide during the nesting and hatching season. The Corps must consult with NMFS on impacts to hatchlings that emerge from those nests adjacent to the inwater construction area. The Service will discuss with the Corps and NMFS additional measures that could include caging nests close to the emergence date.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible. If debris removal activities take place during the peak sea turtle nesting season (**Tables 16 and 17**), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle nesting survey each day.

B6. The Corps shall continue to work with FDEP, FWC and the Service in conducting the second phase of testing on the sea turtle friendly profile during project construction. This includes exploring options to include a dune system in the project design for existing authorized projects and new non-federal projects and how the existing sand placement template may be modified.

B7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. All workers shall be briefed on the importance of not littering and keeping the project area trash and debris free.

B8. A meeting between representatives of the Corps, the Service, the FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, free-roaming cat observation, and reporting within the work area, as well as follow up meetings during construction (**Table 3**).

Sea Turtle Protection

B9. Daily early morning surveys for sea turtle nests shall be required as outlined in a through f. If nests are constructed in the area of sand proposed placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation (**Tables 614 and 17**).

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during earlier part of the nest laying season through April 30, daily early morning surveys shall be conducted for sea turtle nests shall begin with the start of the nesting season monitoring (see Table 16) and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through the end of the nest laying season indicated in Table 16, and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished area prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

During the period from March 1 through April 30, daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the nest laying period (**Table 17**), daily early morning (before 9 a.m.) surveys shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in B9.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or at the beginning of nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of the nest laying season (see Table 17). Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in B9.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County sand placement activities shall occur only during the Beach Placement Window indicated in Table 17. For Manasota Key in Sarasota and Charlotte Counties (except Venice Beach), sand placement activities shall during the Beach Placement Window indicted in Table 15, the period of peak sea turtle egg laying and egg hatching for this area. If nests laid in the early part of the nest laying season during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii below.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15, whichever is later. Nesting surveys shall continue through September 15. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in B9.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nest laying season or the end of sand placement whichever comes first. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of nest laying season (**Table 17**) whichever is later. Nesting surveys shall continue through the nesting season monitoring period (**Table 15).** If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

B10. Sand compaction shall be monitored in the area of dredged material placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years. Not required for dredged material placement in the swash and littoral zone.

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted seaturtle@fws.gov prior to any tilling actions being taken. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act (http://myfwc.com/docs/Conservation/FBCI_BNB_SeaTurtleMonitors.pdf)

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

B11. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the dredged material placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach. Not required for dredged material placement in the swash and littoral zone.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal shall be reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined by the Service, in coordination with the FWC, that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronic to seaturtle@fws.gov.

B12. If available, staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes that are placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents take that was not considered in the SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

B13. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. Lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

B14. During the period during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if FWC sea turtle permit holder is present) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

Beach Mouse Protection

B15. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging, and beach travel corridors to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

B16. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune.

B17. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The topography at the access points shall be fully restored to preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

B18. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be no closer than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least 1 inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

B19. An excel sheet with the information listed in **Table 20** shall be submitted to the Service electronically seaturtle@fws.gov by December 31 of the year following construction. A report with the information from Terms and Conditions B10 and B11 shall be submitted to the Service by December 31 of the year for 3 years following construction.

B20. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following measures:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall not occur during the period of peak sea turtle egg laying and egg hatching (May 1 through October 31), to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

C2. Maintenance of groin or jetty projects conducted during the early (February 1 through April 30) and late sea turtle nesting season (November 1 through November 30) shall adhere to the following conditions:

a. Install a barrier around the perimeter of the groin or jetty repair or replacement work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

b. For projects conducted during the early and late sea turtle nesting season, construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles to the maximum extent possible.

c. For projects conducted during the early and late sea turtle nesting season, no work may occur at night.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For maintenance of groin or jetty projects, conducted during the sea turtle nesting season.

a. Daily surveys shall be conducted by sea turtle permit holders. Nests laid adjacent to the work area shall be marked by flag and rope for avoidance.

b. A barrier shall be installed around the perimeter of the groin or jetty maintenance work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

c. Construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles and beach mice to the maximum extent possible.

d. No work shall occur at night.

In All Counties:

C4. If any safety lighting associated with the project is required, the Corps must coordinate with the Service. All safety lighting must be minimized to reduce the possibility of disrupting and disorienting nesting or hatchling sea turtles and nocturnal activities of beach mice. All lights shall be downward directed, full cut-off and fully shielded, and shall utilize long wavelength (greater than 590 nm) light sources.

C5. If entrapment of sea turtle hatchlings occurs in the groin or jetty system, the Corps shall meet with the Service to discuss a possible solution prior to the next nesting season.

C6. A report describing the projects conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service.

TERMS AND CONDITIONS for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following conditions:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall be started after October 31 and be completed before May 1.

C2. For groin or jetty repair or replacement projects conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16):

a. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at mean high water (MHW), as close to the groin or jetty as feasible, particularly during the period from sunset to sunrise. The Corps must contact the Service if there are any existing nests within the 100-foot buffer area.

b. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL shall be delineated. If the project is conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16), daily morning surveys shall be conducted within the travel corridor. If nests are laid within the travel corridor, the travel corridor must be re-routed to avoid the nest. If re-routing is not possible, these nests shall be relocated per the requirements listed in A9 (a)i through (a)iii.

c. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No construction shall be conducted at night.

e. Daily early morning surveys for sea turtle nests shall be required as outlined in e(i) and e (ii). All nests laid in the vicinity of the project area shall be marked for avoidance per the requirements specified below:

   i. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

   ii. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For groin or jetty repair or replacement projects conducted during the sea turtle nesting season (see Table 17):

a. Daily early morning surveys shall be conducted within the travel corridor.

b. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at MHW, as close to the groin or jetty as feasible during the period from sunset to sunrise.

c. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL will be delineated. Nests laid within the travel corridor that would impede traffic will be relocated per the requirements listed in A9(a)i through (a)iii.. Nests laid in adjacent areas will be marked and avoided per the requirements listed in C(2)(e) i through iii. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No nighttime construction may occur during the nesting season.

e. Material stockpiled on the beach shall only occur within the 200-foot barrier (100-foot area on either side). Construction activities shall not occur in any location prior to completion of the necessary sea turtle protection measures outlined below. If any nesting turtles are sighted on the beach, construction activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has marked the nest. All activities shall avoid the marked nest areas.

C4. All nests laid adjacent to the project area shall be marked for avoidance per the following requirements:

a. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

i. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In All Counties:

C5. To the maximum extent possible within the travel corridor, all ruts shall be filled or leveled to the natural beach profile prior to completion of daily construction.

C6. Exterior lighting shall not be permanently installed in association with the project. Temporary lighting of the construction area during the sea turtle nesting season shall be reduced to the minimum standard required by OSHA for general construction areas. Lighting on all equipment including offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for general construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

C7. If entrapment of sea turtle hatchlings occurs in the groin or jetty system during construction, the Corps shall contact the Service immediately.

C8. A report describing the work conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service electronically to seaturtle@fws.gov by December 31 of each year when the activity has occurred. This report will include the following information:

Table 22. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-monuments and latitude and longitude coordinates)
	Project description
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and mark and avoid activities
	Nesting survey, mark and avoid activities, and nest relocation results

The Service believes that incidental take will be limited to the 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of sand on the of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties, construction activities should be planned to take place outside the main part of the sea turtle nesting and hatching season (May 1 through October 31).
2. Work cooperatively with the Service, FWC, County or Municipality, to reduce sea turtle disorientations in the sand placement areas. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area.
3. Work cooperatively with the Service to mimic the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events.
4. If public driving is allowed on the project beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require the local sponsor or Applicant to have authorization from the Service for incidental take of sea turtles, their nests, and hatchlings and beach mice, as appropriate, due to such driving or provide written documentation from the Service that no incidental take authorization is required. If required, the incidental take authorization for driving on the beach should be obtained prior to any subsequent sand placement events.
5. Beach nourishment should not occur on publicly owned conservation lands during the sea turtle nesting season.
6. All created dunes should be planted with at least three species of appropriate native salt-resistant dune vegetation. Examples along the Atlantic coast include: bitter panicgrass, sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Northwest Florida coast includes: bitter panicgrass, little bluestem (Schizachyrium scoparium), sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Southwest Florida coast include: sea oats (grown from local genetic stock), bitter panicgrass, beach morning-glory, and railroad vine.
7. If the project area is within a local municipality that has not adopted a lighting ordinance, and lighting is shown to be an issue on a nourished beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require an ordinance be adopted prior to any subsequent sand placement event.

8. To increase public awareness about sea turtles and beach mice, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and beach mice.
9. If the Corps has the authority, we recommend it exercise its discretionary authority to require predator control programs (including education of pet owners and cat colony supporters) should be implemented that target free-roaming cats.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. Reinitiation of formal consultation is also required ten years after the issuance of this SPBO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

The above findings and recommendations constitute the report of the Service. If you have any questions about this SPBO, please contact Ann Marie Lauritsen of this office at (904) 525-0661, Richard Zane of the Panama City Field Office at (850) 769-0552, or Jeffrey Howe of the South Florida Field Office at (772) 562-3909.

Sincerely,

Donald R. Imgrund

for Larry Williams
State Supervisor

cc:
FWC, Lake City, Florida (Melissa Tucker)
FWC, Lake City, Florida (Nancy Douglass)
FWC, Lake City, Florida (Terry Doonan)
FWC, Panama City, Florida (John Himes)
FWC, Tallahassee, Florida, (Robbin Trindell)
NMFS, Protected Species Division, St. Petersburg (Eric Hawk)
Service, Atlanta RO digital version in Word
Service, Panama City, Florida, (Patricia Kelly, Lisa Lehnhoff)
Service, St. Peteresburg, Florida (Ann Marie Lauritsen)
Service, Vero Beach, Florida (Jeffrey Howe)

LITERATURE CITED

Ackerman, R.A. 1980. Physiological and ecological aspects of gas exchange by sea turtle eggs. American Zoologist 20:575-583.

Ackerman, R. A., T. Rimkus, and R. Horton. 1991. The hydric structure and climate of natural and renourished sea turtle nesting beaches along the Atlantic coast of Florida. Research report to Florida Department of Natural Resources, Tallahassee, Florida (Contract #6407); 1991, 59 pp.

Amorocho, D. 2003. Monitoring nesting loggerhead turtles (*Caretta caretta*) in the central Caribbean coast of Colombia. Marine Turtle Newsletter 101:8-13.

Baldwin, R., G.R. Hughes, and R.I.T. Prince. 2003. Loggerhead turtles in the Indian Ocean. Pages 218-232 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Bangs, O. 1898. The land mammals of peninsular Florida and the coastal region of Georgia. Proceedings of the Boston Society of Natural History 28:157-235.

Bard, A. 2004. Personal communication. Summary of trapping history at Sebastian Inlet State Park. Florida Department of Environmental Protection, Division of Recreation and Parks, Apopka, Florida, to Billy Brooks, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Bernardo, J. and P.T. Plotkin. 2007. An evolutionary perspective on the arribada phenomenon and reproductive behavior polymorphism of olive ridley sea turtles (*Lepidochelys olivacea*). Pages 59-87 *in* Plotkin, P.T. (editor). Biology and Conservation of Ridley Sea Turtles. John Hopkins University Press, Baltimore, Maryland.

Bigler, W.J. and J.H. Jenkins. 1975. Population characteristics of *Peromyscus gossypinus* and *Sigmodon hispidus* in tropical hammocks of South Florida. Journal of Mammalogy 56:633-644.

Billes, A., J.-B. Moundemba, and S. Gontier. 2000. Campagne Nyamu 1999-2000. Rapport de fin de saison. PROTOMAC-ECOFAC. 111 pages.

Bird, B.L. 2002. Effects of predatory risk, vegetation structure, and artificial lighting on the foraging behavior of beach mice. M.S. thesis. University of Florida, Gainesville, Florida.

Bird, B.L., L.C. Branch, and D.L. Miller. 2004. Effects of coastal lighting on foraging behavior of beach mice. Conservation Biology 18: 1435-1439.

Bjorndal, K.A., A.B. Meylan, and B.J. Turner. 1983. Sea turtles nesting at Melbourne Beach, Florida, I. Size, growth and reproductive biology. Biological Conservation 26:65-77.

Blair, W.F. 1951. Population structure, social behavior and environmental relations in a natural population of the beach mouse (*Peromyscus polionotus leucocephalus*). Contributions Laboratory Vertebrate Zoology, University of Michigan 48:1-47.

Blair, K. 2005. Determination of sex ratios and their relationship to nest temperature of loggerhead sea turtle (*Caretta caretta*, L.) hatchlings produced along the southeastern Atlantic coast of the United States. M.S. thesis. Florida Atlantic University, Boca Raton, Florida.

Bolten, A.B. 2003. Active swimmers - passive drifters: the oceanic juvenile stage of loggerheads in the Atlantic system. Pages 63-78 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Bouchard, S. S. and K.A. Bjorndal. 2000. Sea turtles as biological transporters of nutrients and energy from marine to terrestrial ecosystems. Ecology 81(8):2305-2312.

Bowen, B. W., A.L. Bass, L. Soares, and R.J. Toonen. 2005. Conservation implications of complex population structure: lessons from the loggerhead turtle (*Caretta caretta*). Molecular Ecology 14:2389-2402.

Bowen, W.W. 1968. Variation and evolution of Gulf coast populations of beach mice (*Peromyscus polionotus*). Bulletin Florida State Museum of Biological Science 12:1-91.

Caldwell, D.K. 1962. Comments on the nesting behavior of Atlantic loggerhead sea turtles, based primarily on tagging returns. Quarterly Journal of the Florida Academy of Sciences 25(4):287-302.

Carr, A. and L. Ogren. 1960. The ecology and migrations of sea turtles, 4. The green turtle in the Caribbean Sea. Bulletin of the American Museum of Natural History 121(1):1-48.

Caughley, G. and A. Gunn. 1996. Conservation biology in theory and practice. Blackwell Science, Oxford.

Chaloupka, M. 2001. Historical trends, seasonality and spatial synchrony in green sea turtle egg production. Biological Conservation 101:263-279.

Christens, E. 1990. Nest emergence lag in loggerhead sea turtles. Journal of Herpetology 24(4):400-402.

Coastal Engineering Research Center. 1984. Shore protection manual, volumes I and II. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Coastal Tech. 1999. St. Andrews Bay entrance. Inlet management - feasibility and design investigation. Preliminary draft 9/23/99 to FDEP, Bureau of Beaches and Coastal Systems.

Congdon, J.D., A.E. Dunham, and R.C. van Loben Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): implications for conservation and management of long-lived organisms. Conservation Biology 7(4):826-833.

Conroy, M.J. and J.P. Runge. 2006. Interim report: review of trapping protocols, demographic estimation, and viability analysis for the Alabama beach mice (*Peromyscus polionotus ammobates*) II. Critique of population viability analyses for Alabama beach mouse. Georgia Cooperative Fish and Wildlife Research Unit, University of Georgia, Athens, Georgia. Report to U.S. Fish and Wildlife Service, Daphne, Alabama.

Corliss, L.A., J.I. Richardson, C. Ryder, and R. Bell. 1989. The hawksbills of Jumby Bay, Antigua, West Indies. Pages 33-35 *in* Eckert, S.A., K.L. Eckert, and T.H. Richardson (compilers). Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFC-232.

Crouse, D. 1999. Population modeling and implications for Caribbean hawksbill sea turtle management. Chelonian Conservation and Biology 3(2):185-188.

Dahlen, M.K., R. Bell, J.I. Richardson, and T.H. Richardson. 2000. Beyond D-0004: Thirty-four years of loggerhead (*Caretta caretta*) research on Little Cumberland Island, Georgia, 1964-1997. Pages 60-62 i*n* Abreu-Grobois, F.A., R. Briseno-Duenas, R. Marquez, and L. Sarti (compilers). Proceedings of the Eighteenth International Sea Turtle Symposium. NOAA Technical Memorandum NMFS-SEFSC-436.

Daniel, R.S. and K.U. Smith. 1947. The sea-approach behavior of the neonate loggerhead turtle (*Caretta caretta*). Journal of Comparative and Physiological Psychology 40(6):413-420.

Danielson, B.J. 2005. Importance of multiple independent populations of Alabama beach mice. Issue paper and presentation to Alabama beach mouse recovery team. May 16, 2005. U.S. Fish and Wildlife Service.

Davis, G.E. and M.C. Whiting. 1977. Loggerhead sea turtle nesting in Everglades National Park, Florida, U.S.A. Herpetologica 33:18-28.

Dean, C. 1999. Against the tide: the battle for America’s beaches. Columbia University Press; New York, New York.

Dickerson, D.D. and D.A. Nelson. 1989. Recent results on hatchling orientation responses to light wavelengths and intensities. Pages 41-43 *in* Eckert, S.A., K.L. Eckert, and T.H. Richardson (compilers). Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFC-232.

Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish and Wildlife Service, Biological Report 88(14).

Dodd, M.G. and A.H. Mackinnon. 1999. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 1999: implications for management. Georgia Department of Natural Resources report

Dodd, M.G. and A.H. Mackinnon. 2000. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2000: implications for management. Georgia Department of Natural Resources unpublished report.

Dodd, M.G. and A.H. Mackinnon. 2001. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2001. Georgia Department of Natural Resources. Report to the U.S. Fish and Wildlife Service, Jacksonville, Florida..

Dodd, M.G. and A.H. Mackinnon. 2002. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2002. Georgia Department of Natural Resources. Report submitted to the U.S. Fish and Wildlife Service, Jacksonville, Florida.

Dodd, M.G. and A.H. Mackinnon. 2003. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2003. Georgia Department of Natural Resources. Report submitted to the U.S. Fish and Wildlife Service, Jacksonville, Florida.

Dodd, M.G. and A.H. Mackinnon. 2004. Loggerhead turtle (*Caretta caretta*) nesting in Georgia, 2004. Georgia Department of Natural Resources. Report submitted to the U.S. Fish and Wildlife Service, Jacksonville, Florida.

Douglas, B. 1997. Global Sea Rise: A Redetermination. Surveys in Geophysics 18(2, 3):279-292.

Ehrhart, L.M. 1978. Choctawhatchee beach mouse. Pages 18-19 *in* Layne, J.N. (editor), Rare and endangered biota of Florida, Volume I, Mammals. University Presses of Florida, Gainsville, Florida.

Ehrhart, L.M. 1989. Status report of the loggerhead turtle. Pages 122-139 *in* Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (editors). Proceedings of the Second Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226.

Ehrhart, L.M., D.A. Bagley, and W.E. Redfoot. 2003. Loggerhead turtles in the Atlantic Ocean: geographic distribution, abundance, and population status. Pages 157-174 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Ehrlich, P.R. 1988. The loss of diversity: causes and consequences. Pages 21-27 *in* Wilson, E.O. (editor). Biodiversity. National Academy Press, Washington, D.C.

Emanuel, K. 2005. Increasing destructiveness of tropical cyclones over the past 30 years. Nature 436(4): 686-688.

Encalada, S.E., J.C. Zurita, and B.W. Bowen. 1999. Genetic consequences of coastal development: the sea turtle rookeries at X'cacel, Mexico. Marine Turtle Newsletter 83:8-10.

Ernest, R.G. and R.E. Martin. 1993. Sea turtle protection program performed in support of velocity cap repairs, Florida Power & Light Company St. Lucie Plant. Applied Biology, Inc., Jensen Beach, Florida.

Ernest, R.G. and R.E. Martin. 1999. Martin County beach nourishment project: sea turtle monitoring and studies. 1997 annual report and final assessment. Report to Florida Department of Environmental Protection. Applied Biology, Inc., Jensen Beach, Florida

Extine, D.D. 1980. Population ecology of the beach mouse, *Peromyscus polionotus niveiventris*. M.S. thesis. Department of Natural Sciences, University of Central Florida, Orlando, Florida.

Extine, D.D. and I.J. Stout. 1987. Dispersion and habitat occupancy of the beach mouse *Peromyscus polionotus niveiventris*. Journal of Mammalogy 68:297-304.

Fleming, K.L. and N.R. Holler. 1990. Reproduction in captive Santa Rosa beach mice (*Peromyscus polionotus leucocephalus*) and Choctawhatchee beach mice (*Peromyscus polionotus allophrys*). Journal of the Alabama Academy of Science 61:143

Fletemeyer, J. 1980. Sea turtle monitoring project. Report to the Broward County Environmental Quality Control Board, Florida.

Florida Department of Environmental Protection (FDEP). 2007. Topsail Hill State Preserve unit management plan. Division of Recreation and Parks. Tallahassee, Florida. http://www.dep.state.fl.us/Parks/planning/parkplans/TopsailHillPreserveStatePark.pdf

Florida Department of Environmental Protection (FDEP). 2009. Critically eroded beaches in Florida. Bureau of Beaches and Coastal Systems. Tallahassee, Florida http://www.dep.state.fl.us/BEACHES/publications/pdf/CritEroRpt09.pdf

Florida Fish and Wildlife Conservation Commission (FWC). 2007a. Light sources contributing to reported disorientation events in Florida, 2007. http://www.myfwc.com/docs/WildlifeHabitats/Seaturtle_DisorientationEvents2007.pdf

Florida Fish and Wildlife Conservation Commission (FWC). 2007b. Sea turtle protection ordinance adopted by counties and municipalities (as of 01/02/2008). http://www.myfwc.com/WILDLIFEHABITATS/Seaturtle_LightingOrdinances.htm

Florida Fish and Wildlife Conservation Commission (FWC). 2008a. 2008 Nest survey results do not change turtle nesting trends. http://research.myfwc.com/features/view_article.asp?id=27537

Florida Fish and Wildlife Conservation Commission (FWC). 2008b. Long-term monitoring of beach mouse populations in Florida. Final report to U.S. Fish and Wildlife Service. Florida Fish and Wildlife Conservation Commission, Panama City, FL. FWC/FWRI file code: F2176-04-080F. March. 68 pp.

Florida Fish and Wildlife Conservation Commission (FWC). 2008c. Reported nesting activity of the Kemps Ridley (*Lepidochelys kempii*), in Florida, 1979-2007. Fish and Wildlife Research Institute. http://research.myfwc.com/images/articles/2377/sea_turtle_nesting_on_florida_bchs_93-07.pdf

Florida Fish and Wildlife Conservation Commission (FWC). 2008d. Personal communication to the Loggerhead Recovery Team. Florida Fish and Wildlife Research Institute.

Florida Fish and Wildlife Conservation Commission (FWC). 2008e. Personal communication. Summary disorientation data on Florida beaches during 2008. Florida Fish and Wildlife Conservation Commission, Imperiled Species Management Section, Tequesta, Florida to Ann Marie Lauritsen, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Florida Fish and Wildlife Conservation Commission (FWC). 2009a. Statewide Nesting Beach Survey database http://research.myfwc.com/features/view_article.asp?id=10690

Florida Fish and Wildlife Conservation Commission (FWC). 2009b. Index Nesting Beach Survey Totals. http://research.myfwc.com/features/view_article.asp?id=10690

Florida Fish and Wildlife Conservation Commission (FWC). 2009c. Florida's endangered species, threatened species, and species of special concern. http://research.myfwc.com/features/view_article.asp?id=5182

Florida Fish and Wildlife Conservation Commission (FWC). 2010. Florida's endangered species, threatened species, and species of special concern. http://myfwc.com/wildlifehabitats/imperiled/

Florida Fish and Wildlife Conservation Commission/Florida Fish and Wildlife Research Institute (FWC/FWRI). 2010a. A good nesting season for loggerheads in 2010 does not reverse a recent declining trend. http://research.myfwc.com/features/view_article.asp?id=27537

Florida Fish and Wildlife Conservation Commission/Florida Fish and Wildlife Research Institute (FWC/FWRI). 2010b. Index nesting beach survey totals (1989 - 2010). http://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals-1989-2010/

Florida Fish and Wildlife Conservation Commission. Index nesting beach survey totals (1989 - 2013). . 2010c. Perdido Key State Park Beach Mouse Track Tube Results May 2005 to August 2010. Panama City, Florida.

Florida Fish and Wildlife Conservation Commission. 2012a. Beach Mouse Track Tube Monitoring in Northern Florida. 2011-2012. Panama City, Florida.

Florida Fish and Wildlife Conservation Commission. 2012b. Beach Mouse Track Tube Monitoring in Northwest Florida April-July 2012. Panama City, Florida.

Florida Fish and Wildlife Conservation Commission. 2012c. Beach Mouse Track Tube Monitoring in Northwest Florida August-October 2012. Panama City, Florida.

Florida Fish and Wildlife Conservation Commission. 2013a. Beach Mouse Track Tube Monitoring in Northwest Florida January-June 2013. Panama City, Florida.

Florida Fish and Wildlife Conservation Commission. 2013b. Beach Mouse Track Tube Monitoring in Northwest Florida July-December 2013. Panama City, Florida.

Florida Fish and Wildlife Conservation Commission/Florida Fish and Wildlife Research Institute (FWC/FWRI). 2014a.

Florida Fish and Wildlife Conservation Commission. 2014b. Unpublished Beach mouse Track Tube Monitoring Data for Northwest Florida. 2009-2011. Panama City, Florida.

Foley, A. 2005. Personal communication to Loggerhead Recovery Team. Florida Fish and Wildlife Research Institute.

Foley, A., B. Schroeder, and S. MacPherson. 2008. Post-nesting migrations and resident areas of Florida loggerheads. Pages 75-76 *in* Kalb, H., A. Rohde, K. Gayheart, and K. Shanker (compilers). Proceedings of the Twenty-fifth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-582.

Foltz, D.W. 1981. Genetic evidence for the long-term monogamy in a small rodent, *Peromyscus polionotus*. American Naturalist 117:665-675.

Foote, J., J. Sprinkel, T. Mueller, and J. McCarthy. 2000. An overview of twelve years of tagging data from *Caretta caretta* and *Chelonia mydas* nesting habitat along the central

Gulf coast of Florida, USA. Pages 280-283 *in* Kalb, H.J. and T. Wibbels (compilers). Proceedings of the Nineteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-443.

Frair, W., R.G. Ackerman, and N. Mrosovsky. 1972. Body temperature of *Dermochelys coriacea:* warm water turtle from cold water. Science 177:791-793.

Francisco-Pearce, A.M. 2001. Contrasting population structure of *Caretta caretta* using mitochondrial and nuclear DNA primers. Masters thesis. University of Florida, Gainesville, Florida.

Frank, P.A. and S.R. Humphrey. 1996. Populations, habitat requirements, and management of the endemic Anastasia island beach mouse (*Peromyscus polionotus phasma*), emphasizing the potential threat of exotic house mice (*Mus musculus*). Final Rep. No. NG88-006 to Florida Game and Fresh Water Fish Commission. Tallahassee, Florida.

Frazer, N.B. and J.I. Richardson. 1985. Annual variation in clutch size and frequency for loggerhead turtles, *Caretta-caretta*, nesting at Little Cumberland Island, Georgia, USA. Herpetologica 41(3):246-251.

Fretey, J., A. Billes, and M. Tiwari. 2007. Leatherback *Dermochelys coriacea*, nesting along the Atlantic coast of Africa. Chelonian Conservation and Biology 6(1): 126-129.

Galindo-Leal, C. and C.J. Krebs. 1998. Effects of food abundance on individuals and populations of the rock mouse (*Peromyscus difficilis*). Journal of Mammology 79(4):1131-1142.

Garner, J. A., S.A. Garner, and W. Coles. 2005. Tagging and nesting research on leatherback sea turtles (*Dermochelys coriacea*) on Sandy Point, St. Croix, U.S. Virgin Island, 2005. Annual report to Fish and Wildlife Service. 54 pages.

Garten, C.T., Jr. 1976. Relationships between aggressive behavior and genetic heterozygosity in the oldfield mouse, *Peromyscus polionotus*. Evolution 30:59-72.

Gerrodette, T. and J. Brandon. 2000. Designing a monitoring program to detect trends. Pages 36-39 *in* Bjorndal, K.A. and A.B. Bolten (editors). Proceedings of a Workshop on Assessing Abundance and Trends for In-water Sea Turtle Populations. NOAA Technical Memorandum NMFS-SEFSC-445.

Glen, F. and N. Mrosovsky. 2004. Antigua revisited: the impact of climate change on sand and nest temperatures at a hawksbill turtle (*Eretmochelys imbricata*) nesting beach. Global Change Biology 10:2036-2045.

Glenn, L. 1998. The consequences of human manipulation of the coastal environment on hatchling loggerhead sea turtles (*Caretta caretta*, L.). Pages 58-59 *in* Byles, R. and Y.

Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Godfrey, P.J., S.P. Leatherman, and P.A. Buckley. 1978. Impact of off-road vehicles on coastal ecosystems. Pages 581-599 *in* Coastal Zone '78 Symposium on Technical, Environmental Socioeconomic and Regulatory Aspects of Coastal Zone Management. Vol. II, San Francisco, California.

Godfrey, M.H. and N. Mrosovsky. 1997. Estimating the time between hatching of sea turtles and their emergence from the nest. Chelonian Conservation and Biology 2(4):581-585.

Gore, J. 1987. Florida Game and Fresh Water Fish Commission. Memorandum on St. Andrew beach mouse status.

Gore, J. 1990. Personal communication via a letter to Michael M. Bentzien, U.S. Fish and Wildlife Service, Jacksonville, Florida, on the status of the St. Andrew beach mouse. Florida Game and Fresh Water Fish Commission.

Gore, J. 1994. Personal communication to John Milio, U.S. Fish and Wildlife Service, Jacksonville, Florida. Florida Game and Fresh Water Fish Commission.

Gore, J. 1995. Florida Game and Fresh Water Fish Commission. Memorandum on Beach mice status and recovery planning.

Gore, J.A. 1999. Personal communication about the Choctawhatchee beach population to the U.S. Fish and Wildlife Service, Panama City, Florida Field Office. Mammal Research Coordinator. Florida Fish and Wildlife Conservation Commission. Panama City, Florida.

Gore, J. 2008. Personal communication to Lorna Patrick, U.S. Fish and Wildlife Service on status of Perdido Key beach mice at Gulf Islands National Seashore. Florida Game and Fresh Water Fish Commission.

Gore, J.A. and T. Schaefer. 1993. Santa Rosa beach mouse survey. Nongame Wildlife Program Final Performance Report. Florida Fish and Wildlife Fish Commission. Panama City, Florida. http://research.myfwc.com/engine/download_redirection_process.asp?file=93gore%5F4747%2Epdf&objid=53462&dltype=publication

Greer, A.E., J.D. Lazell, Jr., and R.M. Wright. 1973. Anatomical evidence for counter-current heat exchanger in the leatherback turtle (*Dermochelys coriacea*). Nature 244:181.

Groom, M.J. and M. A. Pascual. 1997. The analysis of population persistence: an outlook on the practice of viability analysis. Pages 1-27 *in* Fiedler, P.L. and P.M. Karieva (editors). Conservation Biology for the Coming Decade. Chapman and Hall, New York.

Hailman, J.P. and A.M. Elowson. 1992. Ethogram of the nesting female loggerhead (*Caretta caretta*). Herpetologica 48:1-30.

Hall, E.R. 1981. The mammals of North America, second edition. John Wiley and Sons, New York, New York.

Hanson, J., T. Wibbels, and R.E. Martin. 1998. Predicted female bias in sex ratios of hatchling loggerhead sea turtles from a Florida nesting beach. Canadian Journal of Zoology 76(10):1850-1861.

Hawkes, L.A., A.C. Broderick, M.H. Godfrey, and B.J. Godley. 2005. Status of nesting loggerhead turtles *Caretta caretta* at Bald Head Island (North Carolina, USA) after 24 years of intensive monitoring and conservation. Oryx 39(1):65-72.

Hawkes, L.A., A.C. Broderick, M.H. Godfrey, and B.J. Godley. 2008. Climate change and marine turtles. Endangered Species Research 7:137-154.

Hays, G.C. 2000. The implications of variable remigration intervals for the assessment of population size in marine turtles. Journal of Theoretical Biology 206:221-227.

Hendrickson, J.R. 1958. The green sea turtle *Chelonia mydas* (Linn.) in Malaya and Sarawak. Proceedings of the Zoological Society of London 130:455-535.

Hendrickson, J.R. 1980. The ecological strategies of sea turtles. American Zoologist 20:597-608.

Henwood, T.A. and L.H. Ogren. 1987. Distribution and migration of immature Kemp's ridley turtles (*Lepidochelys kempi*) and green turtles (*Chelonia mydas*) off Florida, Georgia, and South Carolina. Northeast Gulf Science 9(2):153-159.

Heppell, S.S. 1998. Application of life-history theory and population model analysis to turtle conservation. Copeia 1998(2):367-375.

Heppell, S.S., L.B. Crowder, and T.R. Menzel. 1999. Life table analysis of long-lived marine species with implications for conservation and management. Pages 137-148 *in* Musick, J.A. (editor). Life in the Slow Lane: Ecology and Conservation of Long-lived Marine Animals. American Fisheries Society Symposium 23, Bethesda, Maryland.

Heppell, S.S., M.L. Snover, and L.B. Crowder. 2003. Sea turtle population ecology. Pages 275-306 *in* Lutz, P.L., J.A. Musick, and J. Wyneken (editors). The Biology of Sea Turtles, Volume II. CRC Press, Boca Raton, Florida.

Herren, R. M. The effect of beach nourishment on loggerhead (Caretta caretta) nesting and reproductive success at Sebastian Inlet, Florida. M.S. Thesis, University of Central Florida, Orlando; 1999, 138 pp.

Hildebrand, H.H. 1963. Hallazgo del área de anidación de la tortuga marina "lora" *Lepidochelys kempi* (Garman), en la coasta occidental del Golfo de México. Sobretiro de Ciencia, México 22:105-112.

Hill, E.A. 1989. Population dynamics, habitat, and distribution of the Alabama beach mouse. M.S. thesis. Auburn University, Auburn, Alabama.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). U.S. Fish and Wildlife Service, Biological Report 97(1).

Holler, N.R. 1992a. Choctawhatchee beach mouse. Pages 76-86 *in* Humphrey, S.R. (editor). Rare and Endangered Biota of Florida, Volume 1. Mammals. University Presses Florida, Tallahassee, Florida.

Holler, N.R. 1992b. Perdido Key beach mouse. Pages 102-109 *in* Humphrey, S.R. (editor). Rare and Endangered Biota of Florida, Volume 1. Mammals. University Presses of Florida, Tallahassee, Florida.

Holler, N.R. 1995. Personal communication about beach mouse captive breeding program from Unit Leader, Alabama Fish and Wildlife Cooperative Research Unit, Auburn University, to Lorna Patrick, U.S. Fish and Wildlife Service, Panama City, Florida.

Holler, N.R., D.W. Mason, R.M. Dawson, T. Simons, and M.C. Wooten. 1989. Reestablishment of the Perdido Key beach mouse (*Peromyscus polionotus trissyllepsis*) on Gulf Islands National Seashore. Conservation Biology 3: 397-403.

Holler, N.R., M.C. Wooten, and C.L. Hawcroft. 1997. Population biology of endangered Gulf coast beach mice (*Peromyscus polionotus*): conservation implication. Technical Report. Alabama Cooperative Fish and Wildlife Research Unit.

Holler, N.R., M.C. Wooten, and M. Oli. 1999. Viability analysis of endangered Gulf coast beach mice (*Peromyscus polionotus*) populations. Report for agreement 1448-0004-94-9174, mod. 2, Obj. 2 to U.S. Fish and Wildlife Service, Panama City, Florida.

Holliman, D.C. 1983. Status and habitat of Alabama gulf coast beach mice *Peromyscus polionotus ammobates* and *P. p. trissyllepsis*. Northeast Gulf Science 6:121-129.

Hopkins, S.R. and T.M. Murphy. 1980. Reproductive ecology of *Caretta caretta* in South Carolina. South Carolina Wildlife Marine Resources Department Completion Report.

Hosier, P.E., M. Kochhar, and V. Thayer. 1981. Off-road vehicle and pedestrian track effects on the sea –approach of hatchling loggerhead turtles. Environmental Conservation 8:158-161.

Houghton, J.D.R. and G.C. Hays. 2001. Asynchronous emergence by loggerhead turtle (*Caretta caretta*) hatchlings. Naturwissenschaften 88:133-136.

Howard, B. and P. Davis. 1999. Sea turtle nesting activity at Ocean Ridge in Palm Beach County, Florida 1999. Palm Beach County Department of Environmental Resources Management, West Palm Beach, Florida.

Howell, A.H. 1909. Notes on the distribution of certain mammals in the southeastern United States. Proceedings of the Biological Society of Washington 22:55-68.

Howell, A.H. 1921. A biological survey of Alabama. North American Fauna 49:1-88.

Howell, A.H. 1939. Description of five new mammals from Florida. Journal of Mammalogy 20:363-365.

Hughes, A.L. and E.A. Caine. 1994. The effects of beach features on hatchling loggerhead sea turtles. Pages 237 *in* Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar (compilers). Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Humphrey, S.R. and D.B. Barbour. 1981. Status and habitat of three subspecies of *Peromyscus polionotus* in Florida. Journal of Mammalogy 62:840-844.

Humphrey, S.R. and P.A. Frank. 1992a. Anastasia Island Beach Mouse. Pages 94-101 *in* Humphrey, S.R. (editor). Rare and endangered biota of Florida Volume 1 Mammals.

Humphrey, S.R. and P.A. Frank. 1992b. Survey for the southeastern beach mouse at Treasure Shores Park. Final report to Indian River County Board of Commissioners. Vero Beach, Florida.

Humphrey, S.R., W.H. Kern, Jr., and M.S. Ludlow. 1987. Status survey of seven Florida mammals. Florida Cooperative Fish and Wildlife Research Unit. Technical Report no. 25. Gainesville, Florida.

Intergovernmental Panel on Climate Change. 2007a. Climate Change 2007: The Physical Science Basis - Summary for Policymakers. Contribution of Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Intergovernmental Panel on Climate Change. 2007b. Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability. Working Group II Contribution to the Intergovernmental Panel on Climate Change. Fourth Assessment Report.

Ivey, R.D. 1949. Life history notes on three mice from the Florida east coast. Journal of Mammalogy 30:157-162.

James, F.C. 1987. Endemism in a beach population of the oldfield mouse *Peromyscus polionotus peninsularis*. Final project report to Florida Game and Fresh Water Fish Commission, Tallahassee, FL. Project Number GFC-86-047. November 1987. 23 pp.

James, F.C. 1992. St. Andrews beach mouse. Pages 87-93 *in* Humphrey, S.R. (editor). Rare and Endangered Biota of Florida, Volume 1. Mammals. University Presses of Florida, Tallahassee.

James, F.C. 1995. Endemism in a Beach Population of the oldfield mouse *Peromyscus polionotus peninsularis*, Florida Game and Freshwater Fish Commission: Nongame Wildlife Program.

Jennings, D. 2004. Personal communication. Summary of the status of the Southeastern beach mouse in Indian River County. U.S. Fish and Wildlife Service, Vero Beach, Florida to Billy Brooks, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Kamezaki, N., Y. Matsuzawa, O. Abe, H. Asakawa, T. Fujii, K. Goto, S. Hagino, M. Hayami, M. Ishii, T. Iwamoto, T. Kamata, H. Kato, J. Kodama, Y. Kondo, I. Miyawaki, K. Mizobuchi, Y. Nakamura, Y. Nakashima, H. Naruse, K. Omuta, M. Samejima, H. Suganuma, H. Takeshita, T. Tanaka, T. Toji, M. Uematsu, A. Yamamoto, T. Yamato, and I. Wakabayashi. 2003. Loggerhead turtles nesting in Japan. Pages 210-217 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Kaufman, W. and O. Pilkey. 1979. The Beaches are Moving: The Drowning of America's Shoreline. Anchor Press/Doubleday, Garden City, New York.

Kautz, R.S. and J.A. Cox. 2001. Strategic habitats for biodiversity conservation in Florida. Conservation Biology 15:55-77.

Komar, P.D. 1983. Coastal erosion in response to the construction of jetties and breakwaters. Pages 191-204 *in* Komar, P.D. (editor). CRC Handbook of Coastal Processes and Erosion. CRC Press. Boca Raton, Florida.

Kovatch, L. 2003. Beach mouse tracking surveys at Grayton Beach State Park, Florida. August 26, 2003. Report to U.S. Fish and Wildlife Service, Panama City, Florida.

Labisky, R.F., M.A. Mercadante, and W.L. Finger. 1986. Factors affecting reproductive success of sea turtles on Cape Canaveral Air Force Station, Florida, 1985. Final report to the United

States Air Force. United States Fish and Wildlife Service Cooperative Fish and Wildlife Research Unit, Agreement Number 14-16-0009-1544, Research Work Order Number 25.

Lacy, R.C. 1993. Impact of Inbreeding in Natural and Captive Populations of Vertebrates: Implications for Conservation. The University of Chicago.

Lacy, R.C., G. Alaks, and A. Walsh. 1995. Hierarchical analysis of inbreeding depression in *Peromyscus polionotus*. Evolution 50:2187-2200.

Land Planning Group, Inc. 1991. Southeastern beach mouse survey of Seaview Subdivision, Indian River County, Florida. Final Report to Financial Services Group, Inc., Stuart, Florida.

LeBuff, C.R., Jr. 1990. The loggerhead turtle in the eastern Gulf of Mexico. Caretta Research, Inc.; Sanibel Island, Florida.

Limpus, C.J. 1971. Sea turtle ocean finding behaviour. Search 2(10):385-387.

Limpus, C.J. and D.J. Limpus. 2003. Loggerhead turtles in the equatorial and southern Pacific Ocean: a species in decline. Pages 199-209 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Limpus, C.J., V. Baker, and J.D. Miller. 1979. Movement induced mortality of loggerhead eggs. Herpetologica 35(4):335-338.

Limpus, C., J.D. Miller, and C.J. Parmenter. 1993. The northern Great Barrier Reef green turtle *Chelonia mydas* breeding population. Pages 47-50 *in* Smith, A.K. (compiler), K.H. Zevering and C.E. Zevering (editors). Raine Island and Environs Great Barrier Reef: Quest to Preserve a Fragile Outpost of Nature. Raine Island Corporation and Great Barrier Reef Marine Park Authority, Townsville, Queensland, Australia.

Linzey, D.W. 1978. Perdido Bay beach mouse. Pages 19-20 *in* Layne, J.N. (editor). Rare and Endangered Biota of Florida, Volume 1. Mammals. University Presses of Florida, Gainesville, Florida.

Loggins, R. 2007. Personal communication about the status of Perdido Key beach mice to Sandra Sneckenberger, Service Panama City, Florida. Florida Fish and Wildlife Conservation Commission.

Lohmann, K.J. and C.M.F. Lohmann. 2003. Orientation mechanisms of hatchling loggerheads. Pages 44-62 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Lomascolo, T. and T.M. Aide. 2001. Seed and seedling bank dynamics in secondary forests following hurricane Georges in Puerto Rico. Caribbean Journal of Science 37:259-270.

Lutcavage, M. E., P.Plotkin, and B.E. Witherington. 1997. Human impacts on sea turtle survival. Lutz, P. L. ,Musick, J. A. eds., The Biology of Sea Turtles. CRC Marine Science Series, CRC Press, Inc., Boca Raton, Florida. 432 pp.; 1997, p. 387-409.
Lynn, W.J. 2000a. Social organization and burrow-site selection of the Alabama Beach Mouse *Peromyscus polionotus ammobates*). M.S. thesis. Auburn University. Auburn, Alabama.

Lynn, W.J. 2000b. East Pass trapping. Alabama Cooperative Fish and Wildlife Research Unit. U.S. Fish and Wildlife Service. Panama City, Florida. Memo dated September 18, 2000.

Lynn, W.J. 2002a. St. Andrew beach mouse survey to Jack Mobley, Tyndall Air Force base. U.S. Fish and Wildlife Service. Panama City, FL. Memo dated May 29, 2002.

Lynn, W.J. 2002b. Grayton Beach State Park trapping survey. U.S. Fish and Wildlife Service, Panama City, Florida.

Lynn, W.J. 2002c. East Crooked Island, Tyndall Air Force Base trapping summary report. U.S. Fish and Wildlife Service. Panama City, Florida.

Lynn, W.J. 2002d. East Pass - West Crooked Island side CBM status survey. First quarter trapping results. Janaury 15-20, 2002. U.S. Fish and Wildlife Service. Panama City Field Office, Florida. 4 pp. Memo dated January 31, 2002.

Lynn, W.J. 2002e. East Pass - West Crooked Island side CBM status survey. Second quarter trapping results. April 15-20, 2002. U.S. Fish and Wildlife Service. Panama City Field Office, Florida. 4 pp. Memo dated May 3, 2002.

Lynn, W.J. 2002f. East Pass - West Crooked Island side CBM status survey. Third quarter trapping results. August 6-10, 2002. U.S. Fish and Wildlife Service. Panama City Field Office, Florida. 4 pp. Memo dated August 29, 2002.

Lynn, W.J. 2002g. East Pass - West Crooked Island side CBM status survey. Fifth quarter trapping results. October 7-12, 2002. U.S. Fish and Wildlife Service. Panama City Field Office, Florida. 4 pp. Memo dated October 18, 2002.

Lynn, W.J. 2003a. Topsail Hill Preserve State Park Status Survey and translocation report. U.S. Fish and Wildlife Service. Panama City, Field Office, Florida.

Lynn, W.J. 2003b. East Pass - West Crooked Island side CBM status survey. Fifth quarter trapping results. February 1-2, 2003. U.S. Fish and Wildlife Service. Panama City Field Office, Florida. 4 pp. Memo dated February 19, 2003.

Lynn, W.J. 2004a. Seigler property trapping report. Escambia County, Perdido Key, Florida. U.S. Fish and Wildlife Service. Panama City Field Office, Florida.

Lynn, W.J. 2004b. Monitoring and effects upon the Choctawhatchee beach mouse from the reopening of East Pass in Bay County, Florida. Report to U.S. Fish and Wildlife Service, Panama City, Florida.

Lynn, W.J. and L. Kovatch. 2004. Perdido Key beach mouse final translocation report. U.S. Fish and Wildlife Service. Panama City Field Office, Florida.

Mann, T.M. 1977. Impact of developed coastline on nesting and hatchling sea turtles in southeastern Florida. M.S. thesis. Florida Atlantic University, Boca Raton, Florida.

Margaritoulis, D., R. Argano, I. Baran, F. Bentivegna, M.N. Bradai, J.A. Camiñas, P. Casale, G. De Metrio, A. Demetropoulos, G. Gerosa, B.J. Godley, D.A. Haddoud, J. Houghton, L. Laurent, and B. Lazar. 2003. Loggerhead turtles in the Mediterranean Sea: present knowledge and conservation perspectives. Pages 175-198 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Marquez-Millan, R. 1994. Synopsis of biological data on the Kemp's ridley sea turtle, *Lepidochelys kempi* (Garman, 1880). NOAA Technical Memorandum NMFS-SEFC-343.

Marquez-Millan, R., A. Villanueva O., and P.M. Burchfield. 1989. Nesting population and production of hatchlings of Kemp's ridley sea turtle at Rancho Nuevo, Tamaulipas, Mexico. Pages 16-19 *in* Caillouet, Jr., C.W. and A.M. Landry, Jr. (editors). Proceedings of the First international Symposium on Kemp's Ridley Sea Turtle Biology, Conservation, and Management. Texas A&M University, Sea Grant Program. TAMU-SG-89-105. College Station, Texas.

Martin, R.E. 1992. Turtle nest relocation on Jupiter Island, Florida: an evaluation. Presentation to the Fifth Annual National Conference on Beach Preservation Technology, February 12-14, 1992, St. Petersburg, Florida.

McDonald, D.L. and P.H. Dutton. 1996. Use of PIT tags and photoidentification to revise remigration estimates of leatherback turtles (*Dermochelys coriacea*) nesting in St. Croix, U.S. Virgin Islands, 1979-1995. Chelonian Conservation and Biology 2(2):148-152.

McGehee, M.A. 1990. Effects of moisture on eggs and hatchlings of loggerhead sea turtles (*Caretta caretta*). Herpetologica 46(3):251-258.

Meyers, J.M. 1983. Status, microhabitat, and management recommendations for *Peromyscus polionotus* on Gulf Coast beaches. Report to U.S. Fish and Wildlife Service, Atlanta, Georgia.

Meylan, A. 1982. Estimation of population size in sea turtles. Pages 135-138 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Meylan, A. 1992. Hawksbill turtle *Eretmochelys imbricata*. Pages 95-99 *in* Moler, P.E. (editor). Rare and Endangered Biota of Florida, Volume III. University Press of Florida, Gainesville, Florida.

Meylan, A.B. 1999. Status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean region. Chelonian Conservation and Biology 3(2):177-184.

Meylan, A.B. and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN *Red List of Threatened Animals*. Chelonian Conservation and Biology 3(2):200-224.

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the State of Florida 1979-1992. Florida Marine Research Publications Number 52, St. Petersburg, Florida.

Middlemas, K. 1999. Flow going. Article on the closure of East Pass. News Herald. Waterfront Section. Page 1. October 31, 1999.

Miller, K., G.C. Packard, and M.J. Packard. 1987. Hydric conditions during incubation influence locomotor performance of hatchling snapping turtles. Journal of Experimental Biology 127:401-412.

Mitchell, H.G., J.E. Moyers, and N.R. Holler. 1997. Current status and distribution of several Gulf coast subspecies of beach mice (*Peromyscus polionotus* spp.). Poster paper presented at the 77th annual Meeting of the American Society of mammalogists, Stillwater, OK. Alabama Cooperative Wildlife Research Unit, Auburn University, Auburn, Alabama.

Moody, K. 1998. The effects of nest relocation on hatching success and emergence success of the loggerhead turtle (*Caretta caretta*) in Florida. Pages 107-108 *in* Byles, R. and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Moore, L. 2007. Experts say U.S. Barrier Islands Could Disappear. Reuters AlertNet (Accessed January 26, 2007). http://www.alertnet.org/thenews/newsdesk/N12369516.htm.

Moran, K.L., K.A. Bjorndal, and A.B. Bolten. 1999. Effects of the thermal environment on the temporal pattern of emergence of hatchling loggerhead turtles *Caretta caretta*. Marine Ecology Progress Series 189:251-261.

Moyers, J.E. 1996. Food habits of Gulf coast subspecies of beach mice *Peromyscus polionotus* spp.). M.S. thesis. Auburn University, Auburn, Alabama.

Moyers, J.E. 2007. 2005 Annual Trapping Report. Report to U.S. Fish and Wildlife Service, Panama City, Florida

Moyers, J.E and S. Shea. 2002. Annual trapping report. Choctawhatchee and St. Andrew beach mice at St. Joe development sites, Walton, Bay, and Gulf Counties, Florida. St. Joe Timberland Co. U.S. Fish and Wildlife Service, Panama City, Florida.

Moyers, J.E., N.R. Holler, and M.C. Wooten. 1999. Species status report, current distribution and status of the Perdido Key, Choctawhatchee and St. Andrew Beach Mouse. Report to U.S. Fish and Wildlife Service. Grant Agreement no. 1448-0004-94-9174.

Mrosovsky, N. 1968. Nocturnal emergence of hatchling sea turtles: control by thermal inhibition of activity. Nature 220(5174):1338-1339.

Mrosovsky, N. 1988. Pivotal temperatures for loggerhead turtles from northern and southern nesting beaches. Canadian Journal of Zoology 66:661-669.

Mrosovsky, N. and A. Carr. 1967. Preference for light of short wavelengths in hatchling green sea turtles (*Chelonia mydas*), tested on their natural nesting beaches. Behavior 28:217-231.

Mrosovsky, N. and J. Provancha. 1989. Sex ratio of hatchling loggerhead sea turtles: data and estimates from a five year study. Canadian Journal of Zoology 70:530-538.

Mrosovsky, N. and S.J. Shettleworth. 1968. Wavelength preferences and brightness cues in water finding behavior of sea turtles. Behavior 32:211-257.

Mrosovsky, N. and C.L. Yntema. 1980. Temperature dependence of sexual differentiation in sea turtles: implications for conservation practices. Biological Conservation 18:271-280.

Murphy, T.M. and S.R. Hopkins. 1984. Aerial and ground surveys of marine turtle nesting beaches in the southeast region. Report to National Marine Fisheries Service.

Musick, J.A. 1999. Ecology and conservation of long-lived marine mammals. Pages 1-10 *in* Musick, J.A. (editor). Life in the Slow Lane: Ecology and Conservation of Long-lived Marine Animals. American Fisheries Society Symposium 23, Bethesda, Maryland.

National Marine Fisheries Service (NMFS). 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SEFSC-455.

National Marine Fisheries Service (NMFS). 2009a. Loggerhead Sea Turtles (*Caretta caretta*). National Marine Fisheries Service, Office of Protected Resources. Silver Springs, Maryland. http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm

National Marine Fisheries Service (NMFS). 2009b. Green Sea Turtles (*Chelonia mydas*). National Marine Fisheries Service, Office of Protected Resources. Silver Springs, Maryland. http://www.nmfs.noaa.gov/pr/species/turtles/green.htm

National Marine Fisheries Service (NMFS). 2009c. Leatherback Sea Turtles (*Dermochelys coriacea*). National Marine Fisheries Service, Office of Protected Resources. Silver Springs, Maryland. http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm

National Marine Fisheries Service (NMFS). 2009d. Hawksbill Turtles (*Eretmochelys imbricata*). National Marine Fisheries Service, Office of Protected Resources. Silver Springs, Maryland. http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1991. Recovery plan for U.S. population of Atlantic green turtle (*Chelonia mydas*). National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1992. Recovery plan for leatherback turtles (*Dermochelys coriacea*) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1993. Recovery plan for hawksbill turtle (*Eretmochelys imbricata*) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1998a. Recovery plan for U.S. Pacific populations of the East Pacific green turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1998b. Recovery plan for U.S. Pacific populations of the green turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1998c. Recovery plan for U.S. Pacific populations of the hawksbill turtle (*Eretmochelys imbricata*). National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1998d. Recovery plan for U.S. Pacific populations of the leatherback turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 1998e. Recovery plan for U.S. Pacific populations of the loggerhead turtle (*Caretta caretta*). National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service and the U. S. Fish and Wildlife Service (NMFS and Service). 2008. Recovery plan for the Northwest Atlantic population of the loggerhead sea turtle (*Caretta caretta*), second revision. National Marine Fisheries Service, Silver Spring, Maryland.

National Marine Fisheries Service, U.S. Fish and Wildlife Service, and SEMARNAT. 2011. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. National Marine Fisheries Service. Silver Spring, Maryland 156 pp. + appendices.

National Research Council. 1987. Responding to changes in sea level: Engineering Implications. National Academy Press, Washington, D.C.

National Research Council. 1990a. Decline of the sea turtles: causes and prevention. National Academy Press; Washington, D.C.

National Research Council. 1990b. Managing coastal erosion. National Academy Press; Washington, D.C.

National Research Council. 1995. Beach nourishment and protection. National Academy Press; Washington, D.C.

Nelson, D.A. 1987. The use of tilling to soften nourished beach sand consistency for nesting sea turtles. Report of the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nelson, D.A. 1988. Life history and environmental requirements of loggerhead turtles. U.S. Fish and Wildlife Service Biological Report 88(23). U.S. Army Corps of Engineers TR EL-86-2 (Rev.).

Nelson, D.A. and B. Blihovde. 1998. Nesting sea turtle response to beach scarps. Page 113 *in* Byles, R., and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Nelson, D.A. and D.D. Dickerson. 1987. Correlation of loggerhead turtle nest digging times with beach sand consistency. Abstract of the 7th Annual Workshop on Sea Turtle Conservation and Biology.

Nelson, D.A. and D.D. Dickerson. 1988a. Effects of beach nourishment on sea turtles. *In* Tait, L.S. (editor). Proceedings of the Beach Preservation Technology Conference '88. Florida Shore & Beach Preservation Association, Inc., Tallahassee, Florida.

Nelson, D.A. and D.D. Dickerson. 1988b. Hardness of nourished and natural sea turtle nesting beaches on the east coast of Florida. Report of the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nelson, D.A. and D.D. Dickerson. 1988c. Response of nesting sea turtles to tilling of compacted beaches, Jupiter Island, Florida. Report of the U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nelson, D.A., K. Mauck, and J. Fletemeyer. 1987. Physical effects of beach nourishment on sea turtle nesting, Delray Beach, Florida. Technical Report EL-87-15. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Nielsen, J.T., F.A. Abreu-Grobois, A. Arenas, and M.S. Gaines. 2012. Increased genetic variation uncovered in loggerhead turtles from Quintana Roo, Mexico and St. George Island, Florida. *In* Proceedings of the Twenty-ninth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum.

Noss, R.F. and B. Csuti. 1997. Habitat fragmentation. Pages 269–304 *in* Meffe, G.K. and R.C. Carroll (editors). Principles of Conservation Biology, Second Edition, Sinauer Associates, Sunderland, Massachusetts.

Novak, J.A. 1997. Home range and habitat use of Choctawhatchee beach mice. M.S. thesis. Auburn University, Auburn, Alabama.

Ogren, L.H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: preliminary results from the 1984-1987 surveys. Pages 116-123 *in* Caillouet, C.W., Jr., and A.M. Landry, Jr. (eds.). Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management. Texas A&M University Sea Grant College Program TAMU-SG-89-105.

Oli, M., Holler, N.R, and M.C. Wooten. 2001. Viability analysis of endangered Gulf Coast beach mice (*Peromyscus polionotus*) populations. Alabama Cooperative Fish and Wildlife Research Unit and Department of Zoology and Wildlife Science.

Osgood, W.H. 1909. Revision of the American genus *Peromyscus*. North American Fauna 28. Government Printing Office; Washington, D.C.

Otis, D.L., K.P. Burnham, G.C. White, and D.R. Anderson. 1978. Statistical inference from capture data on closed animal populations. Wildlife Monographs 62:1-135.

Packard, M.J. and G.C. Packard. 1986. Effect of water balance on growth and calcium mobilization of embryonic painted turtles (*Chrysemys picta*). Physiological Zoology 59(4):398-405.

Packard,G.C., M.J. Packard, T.J. Boardman, and M.D. Ashen. 1981. Possible adaptive value of water exchange in flexible-shelled eggs of turtles. Science 213:471-473.

Packard, G.C., M.J. Packard, and T.J. Boardman. 1984. Influence of hydration of the environment on the pattern of nitrogen excretion by embryonic snapping turtles (*Chelydra serpentina*). Journal of Experimental Biology 108:195-204.

Packard, G.C., M.J. Packard, and W.H.N. Gutzke. 1985. Influence of hydration of the environment on eggs and embryos of the terrestrial turtle *Terrapene ornata*. Physiological Zoology 58(5):564-575.

Packard G.C., M.J. Packard, K. Miller, and T.J. Boardman. 1988. Effects of temperature and moisture during incubation on carcass composition of hatchling snapping turtles (*Chelydra serpentina*). Journal of Comparative Physiology B 158:117-125.

Parmenter, C.J. 1980. Incubation of the eggs of the green sea turtle, *Chelonia mydas*, in Torres Strait, Australia: the effect of movement on hatchability. Australian Wildlife Research 7:487-491.

Pendleton, E., Hammer-Klose, E. Thieler, and S. Williams. 2004. Coastal Vulnerability Assessment of Gulf Islands National Seashore (GUIS) to Sea Level Rise, U.S. Geological Survey Open-File Report 03-108. http://pubs.usgs.gov/of/2003/of03-108/.

Philibosian, R. 1976. Disorientation of hawksbill turtle hatchlings (*Eretmochelys imbricata*) by stadium lights. Copeia 1976:824.

Pilkey, Jr., O.H., D.C. Sharma, H.R. Wanless, L.J. Doyle, O.H. Pilkey, Sr., W. J. Neal, and B.L. Gruver. 1984. Living with the East Florida Shore. Duke University Press, Durham, North Carolina.

Pilkey, O.H. and K.L. Dixon. 1996. The Corps and the shore. Island Press; Washington, D.C.

Pollock, K.H., J.D. Nichols, C. Brownie, and J.E. Hines. 1990. Statistical inference for capture-recapture experiments. Wildlife Monographs 107:1-97.

Possardt, E. 2005. Personal communication to Sandy MacPherson, U.S. Fish and Wildlife Service, Jacksonville, Florida. U.S. Fish and Wildlife Service, Atlanta, GA.

Pournelle, G.H. and B.A. Barrington. 1953. Notes on the mammals of Anastasia Island, St. Johns County, Florida. Journal of Mammalogy 34:133-135

Pritchard, P.C.H. 1982. Nesting of the leatherback turtle, *Dermochelys coriacea* in Pacific Mexico, with a new estimate of the world population status. Copeia 1982(4):741-747.

Pritchard, P.C.H. 1992. Leatherback turtle *Dermochelys coriacea*. Pages 214-218 *in* Moler, P.E. (editor). Rare and Endangered Biota of Florida, Volume III. University Press of Florida; Gainesville, Florida.

Provancha, J.A. and L.M. Ehrhart. 1987. Sea turtle nesting trends at Kennedy Space Center and Cape Canaveral Air Force Station, Florida, and relationships with factors influencing nest site selection. Pages 33-44 *in* Witzell, W.N. (editor). Ecology of East Florida Sea Turtles: Proceedings of the Cape Canaveral, Florida Sea Turtle Workshop. NOAA Technical Report NMFS-53.

Rabon, D.R., Jr., S.A. Johnson, R. Boettcher, M. Dodd, M. Lyons, S. Murphy, S. Ramsey, S. Roff, and K. Stewart. 2003. Confirmed leatherback turtle (*Dermochelys coriacea*) nests from North Carolina, with a summary of leatherback nesting activities north of Florida. Marine Turtle Newslettter 101:4-8.

Rave, E.H. and N.R. Holler. 1992. Population dynamics of Alabama beach mice (*Peromyscus polionotus ammobates*) in south Alabama. Journal of Mammalogy 73(2):347-355.

Raymond, P.W. 1984. The effects of beach restoration on marine turtles nesting in south Brevard County, Florida. M.S. thesis. University of Central Florida, Orlando, Florida.

Reina, R.D., P.A. Mayor, J.R. Spotila, R. Piedra, and F.V. Paladino. 2002. Nesting ecology of the leatherback turtle, *Dermochelys coriacea*, at Parque Nacional Marino Las Baulas, Costa Rica: 1988-1989 to 1999-2000. Copeia 2002(3):653-664.

Richardson, T.H., J.I. Richardson, C. Ruckdeschel, and M.W. Dix. 1978. Remigration patterns of loggerhead sea turtles (*Caretta caretta*) nesting on Little Cumberland Island and Cumberland Island, Georgia. Pages 39-44 *in* Henderson, G.E. (editor). Proceedings of the Florida and Interregional Conference on Sea Turtles. Florida Marine Research Publications Number 33.

Robson, M.S. 1989. Southeastern beach mouse survey. Nongame Wildlife Section Report, Florida Game and Fresh Water Fish Commission, Tallahassee, Florida.

Ross, J.P. 1979. Sea turtles in the Sultanate of Oman. World Wildlife Fund Project 1320 Report.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. Pages 189-195 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles. Smithsonian Institution Press; Washington, D.C.

Ross, J.P. and M.A. Barwani. 1995. Review of sea turtles in the Arabian area. Pages 373-383 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles, Revised Edition. Smithsonian Institution Press, Washington, D.C.

Rostal, D.C. 2007. Reproductive physiology of the ridley sea turtle. Pages 151-165 *in* Plotkin P.T. (editor). Biology and Conservation of Ridley Sea Turtles. Johns Hopkins University Press, Baltimore, Maryland.

Rostal, D.C., J.S. Grumbles, R.A. Byles, R. Marquez-M., and D.W. Owens. 1997. Nesting physiology of Kemp's ridley sea turtles, *Lepidochelys kempi*, at Rancho Nuevo, Tamaulipas, Mexico, with observations on population estimates. Chelonian Conservation and Biology 2(4):538-547.

Routa, R.A. 1968. Sea turtle nest survey of Hutchinson Island, Florida. Quarterly Journal of the Florida Academy of Sciences 30(4):287-294.

Rumbold, D. G., Davis, P. W., and C. Perretta. Estimating the effect of beach nourishment on Caretta caretta (loggerhead sea turtle) nesting. Restoration Ecology; 2001, v. 9, no. 3, p. 304-310.

St. Joe/Arvida. 2003. ITP annual report reporting year 2002. Watercolor and Watersound. TE020830-1. Jacksonville, Florida.

St. Joe Company. 1999. ITP annual report reporting year 1998. Watercolor The Villages at Seagrove and Camp Creek d/b/a Watersound. TE020830-1. Seagrove Beach, Florida.

Sauzo, A. 2004. Personal communication. Summary of trapping events at Smyrna Dunes Park. University of Florida, Orlando, Florida to Billy Brooks, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Salmon, M., J. Wyneken, E. Fritz, and M. Lucas. 1992. Seafinding by hatchling sea turtles: role of brightness, silhouette and beach slope as orientation cues. Behaviour 122 (1-2):56-77.

Schroeder, B.A. 1981. Predation and nest success in two species of marine turtles (*Caretta caretta* and *Chelonia mydas*) at Merritt Island, Florida. Florida Scientist 44(1):35.

Schroeder, B.A. 1994. Florida index nesting beach surveys: are we on the right track? Pages 132-133 *in* Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar (compilers). Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Schroeder, B.A., A.M. Foley, and D.A. Bagley. 2003. Nesting patterns, reproductive migrations, and adult foraging areas of loggerhead turtles. Pages 114-124 *in* Bolten, A.B. and B.E. Witherington (editors). Loggerhead Sea Turtles. Smithsonian Books, Washington D.C.

Schmid, J.R. 1998. Marine turtle populations on the west central coast of Florida: results of tagging studies at the Cedar Keys, Florida, 1986-1995. Fishery Bulletin 96:589-602.

Schmid, J.R. and W.N. Witzell. 1997. Age and growth of wild Kemp's ridley turtles (*Lepidochelys kempi*): cumulative results of tagging studies in Florida. Chelonian Conservation and Biology 2(4):532-537.

Scott, J. A. 2006. Use of satellite telemetry to determine ecology and management of loggerhead turtle (*Caretta caretta*) during the nesting season in Georgia. Unpublished Master of Science thesis. University of Georgia, Athens, Georgia.

Selander, R.K., M.H. Smith, S.Y. Yang, W.E. Johnson, and J.B. Gentry. 1971. Biochemical polymorphism and systematics in the genus *Peromyscus*. I. Variation in the old-field mouse (*Peromyscus polionotus*). University of Texas Studies in Genetics 6:49-90.

Shaffer, M. and B.A. Stein. 2000. Safeguarding our Precious Heritage. Chapter 11 in Stein, B.A., L.S. Kutner, J.S. Adams (eds). Precious Heritage: The Status of Biodiversity in the United States. Oxford University Press. New York.

Shaver, D. 2008. Personal communication via e-mail to Sandy MacPherson, U.S. Fish and Wildlife Service, Jacksonville, Florida, on Kemp's ridley sea turtle nesting in Texas in 2008. National Park Service.

Slaby, L. 2005. Letter to P.A. Lang, U.S. Fish and Wildlife Service, Panama City, Florida. Florida Game and Fresh Water Fish Commission.

Smith, K.E.L. 2003. Movements and habitat use of the Santa Rosa beach mouse (*Peromyscus polionotus leucocephalus*) in a successional dune mosaic. M.S. thesis. University of Florida, Gainesville, Florida.

Smith, M.H. 1966. The evolutionary significance of certain behavioral, physiological, and morphological adaptations of the old-field mouse, *Peromyscus polionotus*. Ph.D. dissertation. University of Florida, Gainesville, Florida.

Smith, M.H. 1971. Food as a limiting factor in the population ecology of *Peromyscus polionotus* group from Florida and Alabama. Journal of Mammalogy 7:149-184.

Smith, M.H., C.T. Garten, Jr., and P.R. Ramsey. 1975. Genic heterozygosity and population dynamics in small mammals. Pages 85-102 *in* Markert, C.L. (editor). Isozymes IV. Genetics and Evolution. Academic Press, New York.

Sneckenberger, S.I. 2001. Factors influencing habitat use by the Alabama beach mouse (*Peromyscus polionotus ammobates*). M.S. thesis. Auburn University, Auburn, Alabama.

Sneckenberger, S.I. 2005. Personal communication about observing beach mouse burrows on private lands on Perdido Key to Lorna Patrick, U.S. Fish and Wildlife Service, Panama City, Florida.

Snover, M. 2005. Personal communication to the Loggerhead Sea Turtle Recovery Team. National Marine Fisheries Service.

Snover, M.L., A.A. Hohn, L.B. Crowder, and S.S. Heppell. 2007. Age and growth in Kemp's ridley sea turtles: evidence from mark-recapture and skeletochronology. Pages 89-106 *in* Plotkin P.T. (editor). Biology and Conservation of Ridley Sea Turtles. John Hopkins University Press, Baltimore, Maryland.

Solow, A.R., K.A. Bjorndal, and A.B. Bolten. 2002. Annual variation in nesting numbers of marine turtles: the effect of sea surface temperature on re-migration intervals. Ecology Letters 5:742-746.

Soulé, M.E. and D. Simberloff. 1986. What do genetics and ecology tell us about the design of nature reserves? Biological Conservation 35:19-40.

Soulé, M.E. and B.A. Wilcox. 1980. Conservation biology: an evolutionary-ecological perspective. Sinauer Associates, Inc., Sunderland, Massachusetts.

Spotila, J.R., E.A. Standora, S.J. Morreale, G.J. Ruiz, and C. Puccia. 1983. Methodology for the study of temperature related phenomena affecting sea turtle eggs. Service Endangered Species Report 11.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: are leatherback turtles going extinct? Chelonian Conservation and Biology 2(2):290-222.

Spotila, J.R. R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405:529-530.

Stancyk, S.E. 1995. Non-human predators of sea turtles and their control. Pages 139-152 *in* Bjorndal, K.A. (editor). Biology and Conservation of Sea Turtles, Revised Edition. Smithsonian Institution Press, Washington, D.C.

Stancyk, S.E., O.R. Talbert, and J.M. Dean. 1980. Nesting activity of the loggerhead turtle *Caretta caretta* in South Carolina, II: protection of nests from raccoon predation by transplantation. Biological Conservation 18:289-298.

Steinitz, M. J., S. Kemp, D. Russell, M. Salmon, and J. Wyneken. Beach renourishment and loggerhead turtle reproduction: a seven year study at Jupiter Island, Florida. Epperly, S. P.

,Braun, J. Compilers, Proceedings of the Seventeenth Annual Sea Turtle Symposium. U.S. Dep. Commer. NOAA Tech Memo. NMFS-SEFSC-415. 294 pp.; 1998, p. 270-271.

Sternberg, J. 1981. The worldwide distribution of sea turtle nesting beaches. Center for Environmental Education, Washington, D.C.

Stewart, K. and C. Johnson. 2006. *Dermochelys coriacea*-Leatherback sea turtle. In Meylan, P.A. (editor). Biology and Conservation of Florida Turtles. Chelonian Research Monographs 3:144-157.

Stewart, K.R. and J. Wyneken. 2004. Predation risk to loggerhead hatchlings at a high-density nesting beach in Southeast Florida. Bulletin of Marine Science 74(2):325-335.

Stout, I.J. 1992. Southeastern beach mouse. Pages 242-249 *in* Humphrey, S.R. (editor). Rare and Endangered Biota of Florida, Volume 1. Mammals. University Press of Florida, Tallahassee, Florida.

Stout, I.J., J.D. Roth, C.L. Parkinson. 2006. The distribution and abundance of southeastern beach mice (*Peromyscus polionotus niveiventris*) on the Cape Canaveral Air Force Station. Draft Annual Report to Cape Canaveral Air Force Station. Grant No.: 11-20-6012. 51 pages.

Sumner, F.B. 1926. An Analysis of geographic variation in mice of the *Peromyscus polinoyus* group from Florida and Alabama. Journal of Mammalogy 7:149-184.

Swilling, W.R. 2000. Ecological dynamics of the endangered Alabama beach mouse (*Peromyscus polionotus ammobates*). M.S. thesis. Auburn University, Auburn, Alabama.

Swilling, W.R., M.C. Wooten, N.R. Holler, and W.J. Lynn. 1998. Population dynamics of Alabama beach mice (*Peromyscus polionotus ammobates*) following Hurricane Opal. American Midland Naturalist 140:287-298.

Talbert, O.R., Jr., S.E. Stancyk, J.M. Dean, and J.M. Will. 1980. Nesting activity of the loggerhead turtle (*Caretta caretta*) in South Carolina I: a rookery in transition. Copeia 1980(4):709-718.

Teska, W.R., M.H. Smith, and J.M. Novak. 1990. Food quality, heterozygosity, and fitness correlated in *Peromyscus polionotus*. Evolution 44:1318-1325.

Toothacker, L. 2004. Beach mouse tracking surveys at Grayton Beach State Park. Florida Park Service, Grayton Beach State Park, Florida.

Traylor-Holzer, K. 2004. Draft Population Viability Analysis for the Alabama Beach Mouse: Report to the U.S. Fish and Wildlife Service, IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, NM.

Traylor-Holzer, K. 2005. Revised Population Viability Analysis for the Alabama Beach Mouse: Report to the U.S. Fish and Wildlife Service, IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, NM.

Traylor-Holzer, K. 2006. Final Population Viability Analysis for the Alabama Beach Mouse: Report to the U.S. Fish and Wildlife Service, IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, New Mexico.

Trindell, R. 2005. Sea turtles and beach nourishment. Florida Fish and Wildlife Conservation Commission, Imperiled Species Management Section. Invited Instructor, CLE Conference.

Trindell, R. 2007. Personal communication. Summary of lighting impacts on Brevard County beaches after beach nourishment. Florida Fish and Wildlife Conservation Commission, Imperiled Species Management Section, Tallahassee, Florida to Lorna Patrick, U. S. Fish and Wildlife Service, Panama City, Florida.

Trindell, R., M. Conti, D. Gallagher, and B. Witherington. 2008. Sea turtles and lights on Florida's nesting beaches. Pages 152-153 *in* Kalb, H., A. Rohde, K. Gayheart, and K. Shanker (compilers). Proceedings of the Twenty-fifth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-582.

Turtle Expert Working Group (TEWG). 1998. An assessment of the Kemp's ridley (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409.

Turtle Expert Working Group. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-444. 115 pages.

Turtle Expert Working Group (TEWG). 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555.

U.S. Fish and Wildlife Service (Service). 1987. Recovery plan for the Alabama beach mouse (*Peromyscus polionotus ammobates*), Perdido Key beach mouse (*P. p. trisyllepsis*), and Choctawhatchee beach mouse (*P. p. allophrys*). U.S. Fish and Wildlife Service, Atlanta, Georgia.

U.S. Fish and Wildlife Service (Service). 1993. Recovery plan for the Anastasia Island and southeastern beach mouse. Atlanta, Georgia.

U.S. Fish and Wildlife Service (Service). 1999. Multi-species recovery plan for South Florida. Atlanta, Georgia.

U.S. Fish and Wildlife Service (Service). 2003a. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. May 2003. U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2003b. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. October 2003. U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2004. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. May 2004. U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2005a. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. March. U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2005b. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. April. U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2005c. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. June. U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2005d. Choctawhatchee beach mouse trapping survey and translocation report: Topsail Hill Preserve State Park. October, U.S. Fish and Wildlife Service, Panama City Field Office, Florida.

U.S. Fish and Wildlife Service (Service). 2006. Strategic Habitat Conservation. Final Report of the National Ecological Assessment Team to the U.S. Fish and Wildlife Service and U.S. Geologic Survey.

U.S. Fish and Wildlife Service (Service). 2007a. Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*) 5-year review: summary and evaluation. U.S. Fish and Wildlife Service, Panama City, Florida.

U.S. Fish and Wildlife Service (Service). 2007b. Perdido Key beach mouse (*Peromyscus polionotus allophrys*) 5-year review: summary and evaluation. U.S. Fish and Wildlife Service, Panama City, Florida.

U.S. Fish and Wildlife Service (Service). 2007c. Draft communications plan on the U.S. Fish and Wildlife Service's Role in Climate Change.

U.S. Fish and Wildlife Service (Service). 2009. Final report on the Mexico/United States of America population restoration project for the Kemp's ridley sea turtle, *Lepidochelys kempii*, on the coasts of Tamaulipas and Veracruz, Mexico.

U.S. Fish and Wildlife Service (Service). 2010. Final report on the Mexico/United States of America population restoration project for the Kemp's ridley sea turtle, *Lepidochelys kempii*, on the coasts of Tamaulipas and Veracruz, Mexico.

U.S. Fish and Wildlife Service and National Marine Fisheries Service (Service and NMFS). 1992. Recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Van Zant, J.L. 2000. Trapping data sheet GBSRA, cabins. September 27, 2000. Auburn University, Auburn, Alabama.

Van Zant, J.L. 2003. Personal communication about beach mouse genetic research ongoing at Auburn University to Sandra Sneckenberger, U.S. Fish and Wildlife Service, Panama City, Florida.

Van Zant, J.L. 2006. Personal communication. Summary of trapping events at Pelican Island National Wildlife Refuge. University of Central Florida, Orlando, Florida to Annie Dziergowski, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Van Zant, J.L. and M.C. Wooten. 2003. Translocation of Choctawhatchee beach mice (*Peromyscus polionotus allophrys*): hard lessons learned. Biological Conservation 112(3):405-413.

Van Zant, J.L. and M.C. Wooten. 2006. Personal communication about beach mouse genetic research ongoing at Auburn University to Sandra Sneckenberger, U.S. Fish and Wildlife Service, Panama City, Florida.

Wanless, H.R. and K.L Maier. 2007. An evaluation of beach renourishment sands adjacent to reefal settings, southeast Florida. Southeastern Geology 45(1):25-42.

Webster, P., G. Holland, J. Curry, and H. Chang. 2005. Changes in tropical cyclone number, duration, and intensity in a warming environment. Science 309(5742):1844-1846.

Weishampel, J.F., D.A. Bagley, and L.M. Ehrhart. 2006. Intra-annual loggerhead and green turtle spatial nesting patterns. Southeastern Naturalist 5(3):453-462.

Weston, J. 2007. Captive breeding of beach mice. Peromyscus Genetic Stock Center, University of South Carolina, Columbia, South Carolina.

Wiens, J.A. 1996. Wildlife in patchy environments: metapopulations, mosaics, and management. Pages 53-84 *in* McCullough, D.R. (editor). Metapopulations and Wildlife Conservation. Island Press, Washington D.C.

Williams-Walls, N., J. O'Hara, R.M. Gallagher, D.F. Worth, B.D. Peery, and J.R. Wilcox. 1983. Spatial and temporal trends of sea turtle nesting on Hutchinson Island, Florida, 1971-1979. Bulletin of Marine Science 33(1):55-66.

With, K.A., and T.O. Crist. 1995. Critical thresholds in species responses to landscape structure. Ecology 76:2446-2459.

Witherington, B.E. 1986. Human and natural causes of marine turtle clutch and hatchling mortality and their relationship to hatching production on an important Florida nesting beach. M.S. thesis. University of Central Florida, Orlando, Florida.

Witherington, B.E. 1992. Behavioral responses of nesting sea turtles to artificial lighting. Herpetologica 48:31-39.

Witherington, B.E. 1997. The problem of photopollution for sea turtles and other nocturnal animals. Pages 303-328 *in* Clemmons, J.R. and R. Buchholz (editors). Behavioral approaches to conservation in the wild. Cambridge University Press, Cambridge, United Kingdom.

Witherington, B.E. 2006. Personal communication to Loggerhead Recovery Team on nest monitoring in Florida during 2005. Florida Fish and Wildlife Research Institute.

Witherington, B.E. and L.M. Ehrhart. 1989. Status and reproductive characteristics of green turtles (*Chelonia mydas*) nesting in Florida. Pages 351-352 *in* Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (editors). Proceedings of the Second Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226.

Witherington, B.E. and K.A. Bjorndal. 1991. Influences of artificial lighting on the seaward orientation of hatchling loggerhead turtles (*Caretta caretta*). Biological Conservation 55:139-149.

Witherington, B.E. and R.E. Martin. 1996. Understanding, assessing, and resolving light pollution problems on sea turtle nesting beaches. Florida Marine Research Institute Technical Report TR-2.

Witherington, B.E., K.A. Bjorndal, and C.M. McCabe. 1990. Temporal pattern of nocturnal emergence of loggerhead turtle hatchlings from natural nests. Copeia 1990(4):1165-1168.

Witherington, B., L. Lucas, and C. Koeppel. 2005. Nesting sea turtles respond to the effects of ocean inlets. Pages 355-356 *in* Coyne, M.S. and R.D. Clark (compilers). Proceedings of the Twenty-first Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-528.

Witzell, W.N. 1998. Long-term tag returns from juvenile Kemp's ridley turtles. Marine Turtle Newsletter 79:20.

Wood, D.W. and K.A. Bjorndal. 2000. Relation of temperature, moisture, salinity, and slope to nest site selection in loggerhead sea turtles. Copeia 2000(1):119-128.

Wooten, M.C. 1994. Estimation of genetic variation and systematic status of populations of the beach mouse, *Peromyscus polionotus*. Final Report, Florida Game and Freshwater Fish Commission. Tallahassee, Florida.

Wooten, M.C. and N.R. Holler. 1999. Genetic analyses within and among natural populations of beach mice. Final report to the U.S. Fish and Wildlife Service, Atlanta, Georgia.

Wyneken, J., L. DeCarlo, L. Glenn, M. Salmon, D. Davidson, S. Weege., and L. Fisher. 1998. On the consequences of timing, location and fish for hatchlings leaving open beach hatcheries. Pages 155-156 *in* Byles, R. and Y. Fernandez (compilers). Proceedings of the Sixteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412.

Wyneken, J., L.B. Crowder, and S. Epperly. 2005. Final report: evaluating multiple stressors in loggerhead sea turtles: developing a two-sex spatially explicit model. Final Report to the U.S. Environmental Protection Agency National Center for Environmental Research, Washington, DC. EPA Grant Number: R829094.

Young, R.S. 2007. Personal communication with Mary Mittiga and Patty Kelly. January 22, 2007. Western Carolina University, Cullowhee, North Carolina,.

Zug, G.R. and J.F. Parham. 1996. Age and growth in leatherback turtles, *Dermochelys coriacea* (Testidines: Dermochelyidae): a skeletochronological analysis. Chelonian Conservation and Biology 2(2):244-249.

Zurita, J.C., R. Herrera, A. Arenas, M.E. Torres, C. Calderón, L. Gómez, J.C. Alvarado, and R. Villavicencio. 2003. Nesting loggerhead and green sea turtles in Quintana Roo, Mexico. Pages 125-127 *in* Seminoff, J.A. (compiler). Proceedings of the Twenty-second Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-503.

Appendix A

PREVIOUS FORMAL CONSULTATIONS/BIOLOGICAL OPINIONS WITHIN FLORIDA THAT HAVE BEEN ISSUED FOR ALL PROJECTS THAT HAD ADVERSE IMPACTS TO THE SEA TURTLES ON THE NESTING BEACH

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
STATEWIDE	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Monroe, Miami-Dade, Collier, Lee, Charlotte, Sarasota, Manatee, Pinellas, Pasco, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia	FEMA Emergency Beach Berm Repair	2007-F-0430		Repair of 5-year beach berms post-disaster	75 miles
JAX FIELD OFFICE						
1991	Brevard	Lighting at Cape Canaveral Air Force and Patrick Air Force Station	4-1-91-028	Lighting at both installations	Sea turtle lighting	75 disoriented loggerhead nests; 2 green turtles nests at CCAFS and 2 loggerhead nests at PAFB
1993	Brevard	Beach nourishment on Cape Canaveral	4-1-93-073C		Beach nourishment	2 miles
1995	Brevard	Inlet Bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14	Inlet bypass	
1996	Brevard	Canaveral Port Authority Dredge and Beach Disposal		R-34 to R-38	Dredge and beach restoration	
1998	Brevard	Inlet bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14		
2000	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	00-0545	Lighting at both installations	Sea turtle lighting	2 percent hatchling and nesting female disorientations at each installation.
2001	Brevard	Brevard County Shore Protection Project (North Reach)		R-5 to R-12 and R-13 to R-54.5	Beach nourishment	9.4 miles
2001	Brevard	Patrick Air Force Base Beach Restoration		R-53 to R-70	Beach nourishment	

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2002	Brevard	Brevard County Shore Protection Project (South Reach)		R-123.5 to R-139	Beach nourishment	3.02 miles
2002	Brevard	Brevard County Shore Protection Project (North Reach)		R-4 to R-20	Beach nourishment	
2002	Brevard	Permanent Sand Tightening of North Jetty at Canaveral Harbor	02-1090	North jetty at Canaveral Inlet	Sand tightening and extension of existing jetty	500 feet
2003	Brevard	Brevard County Shore Protection Project (South Reach)		R-118.3 to R-123.5		0.94 mile
2004	Brevard	Canaveral Harbor Federal Sand Bypass and Beach Placement	04-0077	R-14 to R-20	Inlet bypass and beach nourishment	18,600 linear feet
2005	Brevard	Brevard County Shore Protection Project (North and South Reach)	05-0443	R-5 to R-20 and R-21 to R-54.5 and R-118 to R-139	Beach nourishment	13.2 miles
2005	Brevard	Brevard County FEMA Berm and Dune Restoration	05-1054	R-75 to R-118	Dune repair	12 miles
2005	Brevard	Patrick Air Force Base Beach Restoration	05-0258	R-54.5 to R-75.3	Beach nourishment	
2005	Brevard	Sloped Geotexile Revetment Armoring Structures	05-0454	5 tubes along north and south Melbourne beach	Protec tube installation	4,600 linear feet
2006	Brevard	Brevard County FEMA Berm and Dune Restoration	41910-2006-F-0189	R-75 to R-118	Dune repair	12 miles
2006	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	41910-2006-F-0841		Sea turtle lighting	3 percent hatchling and nesting female disorientations at each installation
15 Feb 2008	Brevard	Patrick Air Force Base Dune Restoration	41910-2008-F-0150	R-65 to R-70	Dune restoration	6,000 linear feet
25 Jan 2008	Brevard	Brevard County's Dune Restoration	41910-2008-F-0189	R-75 to R-118 and R-138 to R-202	Dune restoration	140,000 cy along 3,000 linear feet
2009	Brevard	Brevard County's Dune Restoration	41910-2009-F-0125	R 75.4 to R 118.3 and R-139 to R-213	Dune restoration	22 miles
2009	Brevard	Mid Reach		R-75 to R119	Beach berm repair (permanent)	40,748 linear feet
2009	Brevard	South Beach		R-139 to R-215	Beach berm repair (permanent)	70,385 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2009	Brevard	Patrick Air Force Base Dune Restoration and Beach Nourishment	41910-2009-F-0336	R-36 to R-75, R-53 to R-65	Sand placement	8,500 linear feet for dune restoration and 11,235 linear feet for beach nourishment.
2009	Brevard	Brevard Dune Restoration	41910-2009-F-0125	R-75.4 to R-118.3, R-139 to R-213	Dune restoration	Periodically on no more than 22 miles.
2009	Brevard	Mid Reach Shore Protection	41910-2008-F-0547	R-119 to R-75.4	Sand placement	7.7 linear miles
2009	Brevard	Canaveral Harbor Sand Bypass	41910-2008-F-0547	Canaveral Harbor	Sand bypass	18,600 linear no more than every 2 years
2009	Brevard	Kennedy Space Center Lighting	41910-2009-F-0306			3% of all hatchling disorientation events
2009	Brevard	South Beach Renourishment	41910-2009-F-0327			7.8 miles
1991	Duval	Duval County Beach Erosion Control		R-44 to R-52.5	Beach nourishment	9,000 linear feet
1996	Duval	Duval County Beach Erosion Control		R-47 to R-80	Beach nourishment	5 miles
2003	Duval	Duval County Beach Erosion Control		R-72 to R-80	Beach nourishment	
2005	Duval	Duval County Beach Erosion Control	05-1544	R-43 to R-53 and R-57 to R-80	Beach nourishment	5.7 miles
2010	Duval	Duval County Hurricane and Storm Damage Reduction	2010-CPA-0045	V-501 to R-80	Beach nourishment	52,800 linear feet
2005	Flagler	Road Stabilization from SR A1A	41910-2006-IE-0173		Seawall	140 linear feet
2009	Flager	State Road (SR) A1A Shoreline Stabilization	41910-2007-F-0495	200 feet south of South 28th Street to 980 feet south of Osprey Point Drive	Sand placement, revetments, and seawalls	5.2 miles = length of take; 3,000 linear feet of anticipated incidental take
2005	Hillsborough	Egmont Key Nourishment	05-1845	R-2 to R-10	Beach nourishment	8,000 linear feet
1993	Manatee	Anna Maria Island Beach Restoration		R-2 to R-36	Beach nourishment	4.7 miles
1997	Manatee	Dredge Material Disposal and Longboat Key Beach Restoration		R-48 to R-51	Dredge and beach nourishment	
2002	Manatee	Anna Maria Island Beach Restoration		R-7 to R-10 and R-12 to R-36	Beach nourishment	5.2 miles
2005	Manatee	Anna Maria Island Shore Protection Project	41910-2006-F-0079	R-7 to R-10	Beach nourishment	3,000 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2005	Manatee	Anna Maria Island Emergency Beach Restoration	05-1227	R-2 to R-41	Beach nourishment	4.2 miles
2005	Manatee	Town of Longboat Key Beach Renourishment	4-1-04-TR-4529	R-44.5 to R-46	Beach nourishment	0.34 mile
2007	Manatee	Longboat Key Groin Installation	41910-2007-F-0521		Groin installation	2,210 linear feet
2009	Manatee	Anna Maria Island Beach Nourishment	41910-2008-F-456	R-7 to R-10, R-35 +790 feet and R-41 +365 feet	Sand placement	8,000 linear feet
2010	Manatee	Longboat Key North End Nourishment	41910-2010-F-0301			4,015 linear feet of beach
1994	Nassau	South Amelia Island Beach Restoration		R-60 to R-78	Beach nourishment	
1997	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal		R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
2002	Nassau	South Amelia Island Beach Restoration		R-50 to R-80	Beach nourishment	3.4 miles
2002	Nassau	Fernandina Harbor Dredge and Beach Disposal		R-1 to R-9	Dredge and beach nourishment	8,000 linear feet
2004	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-9 to R-33	Beach nourishment	3.6 miles
2005	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-11 to R-34	Beach nourishment	4.3 miles
2005	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal	41910-2006-F-0254	R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
1988	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1990	Pinellas	Sand Key/Indian Rocks Beach Restoration		R-72 to R-85	Beach nourishment	
1991	Pinellas	Long Key Beach Restoration		R-144 to R-147	Beach nourishment	0.45 mile
1991	Pinellas	Johns Pass Dredge Material Disposal		R-127 to R-130	Dredge disposal and sand placement	
1992	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1992	Pinellas	Sand Key/Indian Shore Beach Restoration		R-85 to R-99	Beach nourishment	
1996	Pinellas	Treasure Island Beach Restoration		R-138 to R-142	Beach nourishment	2,500 linear feet
1996	Pinellas	Long Key Beach Restoration		R-144 to R-146	Beach nourishment	0.45 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
1998	Pinellas	Sand Key/Belleair Beach Restoration		R-56 to R-66	Beach nourishment	
1999	Pinellas	Sand Key Beach Restoration		R-71 to R-107	Beach nourishment	
2000	Pinellas	Treasure Island Beach Restoration		R-136 to R-141	Beach nourishment	2.0 miles
2000	Pinellas	Terminal Groin at North End of Treasure Island			Groin construction	
2000	Pinellas	Long Key Beach Restoration		R-144 to R-145.6	Beach nourishment	2,800 linear feet
2000	Pinellas	Dredge Material Disposal and Honeymoon Island Beach Restoration		R-10 to R-12	Dredge disposal and sand placement	
2004	Pinellas	Treasure Island Beach Restoration	04-1247	R-136 to R-141	Beach nourishment	5,000 feet
2004	Pinellas	Long Key Beach Restoration	04-1247	R-144 to R-148	Beach nourishment	4,000 linear feet
2005	Pinellas	Sand Key Emergency Renourishment	05-0627	R-56 to R-66 and R-72 to R-106	Beach nourishment	8.6 miles
2006	Pinellas	Treasure Island, Sunset, Long Key, Pass a Grill Emergency Renourishment	41910-2006-F-0480	R-126 to R-146	Beach nourishment	9.5 miles
2006	Pinellas	Dredge Material Disposal and Mullet Key and Fort DeSoto Beach Restoration	41910-2006-F-0692	R-177 to R-179.5 and R-181 to R-183	Dredge disposal and sand placement	4,500 linear feet
2009	Pinellas	Treasure Island Beach Nourishment	41910-2009-F-0250	R-136 to R-141, R-144 to R-148	Sand placement	11,375 linear feet
1997	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209		
2001	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D			
2002	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-137 to R-152	Beach nourishment	2.5 miles
2003	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-132 to R-152	Beach nourishment	3.8 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2003	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209	Beach nourishment	
2005	St. Johns	St. Johns County Shore Protection Project at St. Augustine	05-0446	R-137 to R-150	Beach nourishment	2.5 miles
2006	St. Johns		TE091980-0		Beach driving	41.1 linear miles
2007	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	41910-2007-F-0305	R-200 to R-208	Beach nourishment	4,000 linear feet
2009	St. Johns	Beach berm repair		R-201 to R-203, R-207 to R-208	Beach berm repair	7,000 linear feet
2009	St. Johns	Matanzas Inlet Maintenance Dredge and Summer Haven Sand Placement	41910-2009-F-0462	R-200 to R-208	Sand placement	8,000 linear feet
2009	St. Johns	St. Augustine Shore Protection Project	41910-2009-F-0444	600 feet north of R-137 and 600 feet south of R-151	Sand placement	15,280 linear feet
2010	St. Johns	St. Augustine Inlet Dredge and Sand Placement	41910-2010-F-0105			20,000 linear feet
2004	Volusia	Volusia County FEMA Berm	05-1074	R-40 to R-145 and R-161 to R-208	Beach nourishment	
2005	Volusia	Ponce de Leon Dredge and Beach Placement	05-0884	R-143 to R-145	Dredge and sand placement	3,000 linear feet
2005	Volusia		TE811813-11		Beach driving	50 miles
2006	Volusia	New Smyrna/Silver Sands Dune Restoration	05-1007	R-161 to R-175	Beach restoration	5.4 miles
2006	Volusia	Volusia County FEMA Berm	41910-2006-F-0831		Repair of right of way and beach placement	230 linear feet
2007	Volusia	Ponce de Leon Dredge and Beach Placement	41910-2007-F-0109	R-158 to R-175	Dredge and sand placement	3.2 miles
2009	Volusia	Ponce de Leon Inlet Maintenance Dredging and Sand Placement	41910-2009-F-0362	R-143 to R-145	Sand placement	8,000 linear feet
PANAMA CITY FIELD OFFICE						
8 April 1998	Bay	Panama City Beach Beach Nourishment	4-P-97-108	R-4.4 and R-93.2	Beach nourishment new project	16 miles
24 June 1998	Bay	Tyndall AFB Driving on the Beach	4-P-98-020	V-9 (virtual) to R-122	Driving on the beach for military missions	18 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 July 1998	Bay	Lake Powell Emergency Opening	4-P-97-089	R- 0.5	Emergency outlet opening	1,500 feet
16 April 1999	Bay	Panama City Beach Beach Nourishment Amendment 1	4-P-97-108	R-0.5 to R-9	Beach nourishment completion	16 miles (no additional take provided from original)
9 March 2000	Bay	Panama City Beach Beach Nourishment Amendment 2	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
10 April 2000	Bay	Panama City Beach Beach Nourishment Amendment 3	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
18 December 2000	Bay	Panama City Beach Beach Nourishment Amendment 4	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement and compaction testing sample numbers beach nourishment	16 miles (no additional take provided from original)
4 January 2001	Bay	East Pass Re-Opening	4-P-00-211	No R-monuments	Dredging of a closed inlet and dredged material placement on beach	2 miles
29 March 2001	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement beach nourishment	16 miles (no additional take provided from original)
7 Sept 2001	Bay	City of Mexico Beach Sand Bypass System	4-P-01-178	Mexico Beach canal	Dredging and spoil disposal	3,700 feet 2.0 acres
14 January 2005	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-4.4 and R-93.2	Post hurricane restoration	16 miles (no additional take provided from original)
2006	Bay	Tyndall Air Force Base INRMP	4-P-05-240	V-9 (virtual) to R-122	Integrated Natural Resources Management Plan	18 miles
26 March 2006	Bay	Mexico Beach Canal Sand By Pass Amendment 1	4-P-05-281 2007-F-0205	R-127 to R-129	By pass system improvements	5,000 feet
24 May 2007	Bay	Panama City Beach Beach Nourishment Amendment 6	4-P-97-108 2007-TA-0127	R-4.5 to R-30 and R-76 to R-88	New work and post hurricane restoration	31,500 feet of 16 miles total no additional take provided
25 October 2007	Bay	Panama City Beach Nourishment Amendment 8	2008-F-0004	2008 project: R-74 to R-91; Entire project: R-0.5 to R-91	Beach nourishment	17.9 miles
29 Feb 2008	Bay	Panama City Harbor (revised BO)	2008-F-0168	R-97	Navigation channel maintenance dredging and beach placement of dredged material.	500 ft of beachfront at St. Andrew State Park

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
8 June 2009	Bay	Panama City Harbor Navigation Channel Amendment 1	2009-F-0175	R-92 to R-97	Maintenance navigation channel dredging and dredged material placement	0.85 mile
2009	Bay	City of Mexico Beach		R-128.5 to R-138.2	Beach berm repair (emergency)	9,393 linear feet
06 Jan 2010	Bay	Lake Powell Outlet Emergency Opening	2009-F-0226	R-0-A and R-1	Emergency opening of the outlet to the Gulf of Mexico	2,400 feet
7 August 2000	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin	Destin Dome OCS Offshore Oil and Gas Drilling	4-P-00-003	Gulf of Mexico federal waters	Oil and gas offshore exploration	Formal consultation with no take
3 June 2002	Escambia	Pensacola Beach Beach Nourishment	4-P-02-056	R-108 to R-143	Beach nourishment	8.3 miles Loggerhead 14 nests Green 1 nest Leatherback < 1 nest Kemp's ridley <1 nest
9 June 2009	Escambia	Perdido Key Beach Nourishment	2008-F-0059	R-1 to R-34	New beach nourishment	6.5 miles
9 Sept 2010	Escambia	Pensacola Navigation Channel	2009-F-0205; using statewide programmatic 41910-2010-F-0547	R-32 to R-64	Navigation channel maintenance and dredge material disposal	6.3 miles
11 Jan 2010	Escambia	FEMA Perdido Key Upland Berm	Using statewide programmatic 41910-2010-F-0547	R-21.5 to R-31.5	Post Tropical Storm Gustav berm	2.0 miles
8 April 2005	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf	FEMA Beach Berms Post Hurricane Ivan Emergency Coordination (consultation incomplete)		UK	Emergency beach berms	Walton 20 miles Okaloosa 4.2 miles Mexico Bch 1 mile Panama City Bch UK St Joseph peninsula UK Perdido Key UK Navarre UK
10 May 2004	Franklin	Alligator Point Beach Nourishment	4-P-02-163	R-207 to R-210	Beach nourishment	2,500 feet Loggerhead,: 2 nests, green 1 nest; leatherback 1 nest
17 May 2007	Gulf	St. Joseph Peninsula Beach Nourishment	4-P-07-056 2007-F-0220	R-67 to R-105.5	Beach nourishment	7.5 miles
31 Jan 2008	Gulf	St. Joseph Peninsula Beach Nourishment; Amendment 2	2008-F-0161	R-67 to R-105.5	Beach nourishment – change from work in 2 to 1 season.	7.5 miles; no increase in IT.
2009	Gulf	St. Joseph Peninsula Beach		R-95.3 to R-105.5	Beach berm repair (emergency)	10,300 linear feet

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25 April 2001	Okaloosa	Eglin AFB Porous Groin within Season	4-P-00-207	Eglin AFB Test Sites 1 and 3	Experimental porous groin system	
18 June 2002	Okaloosa	Eglin 737 Sensor Test Site 13-A SRI	4-P-02-088	V-507	Military testing	0.01 acre 0.12 mile
2009	Okaloosa	City of Destin		R-17.37 to R-19	Beach berm repair (emergency)	1,260 linear feet
23 Dec 2009	Okaloosa	East Pass at Destin Navigation Channel	2009-F-0096	R-17 to R-25.5	Navigational channel maintenance	1.7 miles
21 March 2003	Okaloosa Santa Rosa	Eglin Marine Expeditionary Unit Training	4-P-03-052	V-621 to V-501	Military marine training	
9 October 2003	Okaloosa Santa Rosa	Eglin AFB U.S. Army Ranger Los Banos	4-P-03-289	V-502 to V-533	Military army training	7 miles
25 February 2004	Okaloosa, Santa Rosa	Eglin AFB Advance Skills Training	4-P-03-264	R-502 to R-534	Military training	7 miles 70 acres
4 June 2004	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	4-P-04-225	V-501 to V-514	Military naval testing	0.5 mile 15.2 acres
1 December 2005	Okaloosa Santa Rosa	Eglin Air Force Base Military Mission & Training Santa Rosa Island Programmatic	4-P-05-242	V-621 to V-501	Military missions	17 miles
6 December 2007	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	2008-F-0056	V-501 to V-514 Test Site A-15	Military naval testing	0.7 acre
3 June 2008	Okaloosa Santa Rosa	Eglin AFB Beach and Dune Restoration	2008-F-0139	V-551 to V-609 excluding non-AF lands and V-512 to V-518	Beach nourishment including dune restoration (new)	5.0 miles
28 August 2008	Okaloosa, Santa Rosa	Eglin Air Force Base Armoring Santa Rosa Island Test Sites A-3, A-6, A-13B	2008-F-061	Test Sites A-3, A-6, A-13B	Storm protection at air force facilities, Santa Rosa island	0.57 miles
21 April 2009	Okaloosa, Santa Rosa	East Pass Destin Navigation Channel	2009-F-0295	V-619.5 to V-621 and R-17	Maintenance navigation channel dredging and dredged material placement	1.6 miles
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base protection of Test Sites A-3, A-13, and A-13b	2008-F-061 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base	2008-F-039 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet
26 March 2002	Santa Rosa, Okaloosa, Gulf	Eglin AFB INRMP		V-621 to V-501	Integrated natural resources management program	17 miles
19 July 2005	Santa Rosa	Navarre Beach Nourishment Emergency Coordination (consultation incomplete)	4-P-04-244	R-192.5 to R-213.5	Emergency beach nourishment	4.1 miles
24 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
30 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
29 Nov 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
28 August 2008	Santa Rosa	Eglin AFB SRI Armoring at Test Sites	2008-F-0061	V-608, V-551, and V-512	Bulkheads around test sites A-3, A-6, and A-13B	0.57 mile
7 Dec 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
9 October 2009	Santa Rosa	Navarre Beach Restoration Amendment 7	2010-F-0036	R-192 to R-194	Emergency beach restoration	1,800 feet
30 April 2004	Walton, Okaloosa	Walton County-Destin Beach Nourishment	4-P-01-149	R-39 (Okaloosa Co.) to R-21.93 (Walton Co.)	New beach nourishment	6.7 miles Loggerhead: 11 nests; green 1 nests; leatherback & Kemp's ridley: < 1 nests
8 May 2006	Walton	Western Lake Emergency Opening	4-P-01-105	R-72 to R-73	Emergency outlet opening	0.5 miles 3.0 acres
26 October 2007	Walton	Eastern Lake Emergency Opening	2007-F-0627	R-94 to R-95	Emergency opening of coastal dune lake to GOM	0.5 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
9 November 2007	Walton	Alligator Lake Emergency Opening	2007-F-0031	R-68 to R-70	Emergency opening of coastal dune lake to GOM	0.5 mile
2 October 2008	Walton	Walton County Beach Nourishment Phase 2	2008-F-060	R-41 to R-67, R-78 to R-98, R-105.5 to R-127	Beach nourishment (new)	13.5 miles
SOUTH FLORIDA FIELD OFFICE						3,390 feet
11 March 2003	Broward	Broward County Shore Protection Project	4-1-99-F-506		Port Everglades dredging and beach nourishment	
4 Dec 2003	Broward	Diplomat Beach Nourishment	4-1-00-F-743		Nourishment and 200 feet of riprap	
25 Aug 2004	Broward	Fishermen's Pier	4-1-04-F-8366		Pier repair	14,910 square feet
18 June 2007	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	315 feet of the Inlet and 500 feet of shoreline at R-25.	Inlet dredging and sand nourishment	500 feet
10 Dec 2007	Broward	Town of Hillsboro Beach Pressure Equalizing Modules (PEMs) Pilot Project	41420-2007-F-0859	300 feet north of R-7 to 100 feet south of R-12 1 mile of shoreline	Pilot project to investigate the effectiveness of the PEMs	1 mile
7 Mar 2008	Broward	Broward County Glass Cullet Pilot Project	41420-2007-FA-0599	Centered at R-103	Pilot project to examine the effectiveness of glass cullet as potential beach fill supplement material for shoreline stabilization.	333 feet
28 April 2008	Broward	Town of Hillsboro Truck Haul Beach Nourishment Project	41420-2008-FA-0187	330 feet north and 100 feet south of R-7	Temporary beach nourishment	0.08 mile (430 feet)
3 Sept 2008	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	500 feet south of R-25	Inlet dredging and sand placement. This is an amended BO in regard to the original BO completed on 18 June 2007.	500 feet
28 May 2010	Broward	Port Everglades Jetty Repair	41420-2010-CPA-0144	South Jetty	Repair of the south jetty.	0.15 mile

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18 June 2010	Broward	Hillsboro Beach Sand Placement	41420-2008-FA-0187	R-5 +300 to R-12 +450 feet	Beach nourishment	1.35 miles
23 March 2005	Charlotte	Manasota Key Groin Construction	4-1-04-F-8338	R-19 to R-20	Stump Pass dredging (material placed on beach); and groin construction	1,000 feet
29 March 2006	Charlotte	Stump Pass Dredging and Beach Nourishment	4-1-04-F-8338	R-16.5 to R-18	Stump Pass dredging and beach nourishment	1,500 feet
26 April 2010	Charlotte	Stump Pass Dredging and Sand Placement	41420-2008-FA-0425	R-14.4 to R-20 R-22 to R-23 R-29 to R-39	Stump Pass dredging and sand placement	3.5 miles
3 April 2003	Collier	Keewaydin Island Limited Partnership T-Groin Project	4-02-F-1099	R-90 to R-91	Gordon Pass – maintenance dredge; nourish the section of beach where groins are to be constructed; construct three t-groins	1,000 feet
14 March 2005	Collier	Hideaway Beach	4-1-04-F-6342	H-1 to H-5 and H-9 to H-12	Beach nourishment and t-groin construction	1.4 miles
20 Sept 2005	Collier	Collier County Beach Re-Nourishment Project	4-1-04-TR-8709	Segments within R-22 and R-79	Beach nourishment	13.4 miles
14 Nov 2005	Collier	South Marco Island Beach Re-Nourishment	4-1-04-TR-11752	R-144 to G-2	Beach nourishment	0.83 mile
28 August 2008	Collier	Doctor's Pass North Jetty Repair	41420-2008-FA-0432	R-57 plus 500 feet south	Removing the existing 240 feet of existing jetty and constructing a new jetty within generally the same footprint.	0.25 mile
27 October 2009	Collier	Hideaway Beach Erosion Control	41420-2008-FA-0935	H-4 to H-9	Sand placement and construction of six T-head groins.	0.47 mile
18 August 2010	Collier	Gordon Pass Erosion Control Project – Phase 2 (T-head groins)	41420-2008-FA-0765	R-91 to R-92	Construction of two T-head groins.	0.19 mile
28 Oct 2010	Collier	Collier County Truck Haul Sand Placement (Park Shore & Naples Beach)	41420-2010-F-0225	R-45 +600 feet to R-46 +400 feet; R-58A -500 feet to R-58	A truck haul sand placement project	0.37 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
12 Oct 2004	Indian River	Issuance of Permits to Homeowners for Emergency Coastal Armoring	10(a)(1)(B) permit			3,196 feet
28 Feb 2005	Indian River	Indian River County Beach Nourishment - Sectors 3 and 5	4-1-05-F-10922	Gaps between R-21 and R-107	Dune restoration and beach nourishment	5.90 miles dunes 0.8 mile beach
22 Nov 2005	Indian River	Indian River County Beach Nourishment – Sector 7	4-1-05-TR-9179	R-97 to R-108	Beach nourishment	2.2 miles
31 Oct 2006	Indian River	Indian River County Beach Nourishment – Sectors 1 and 2	41420-2006-FA-1491	R-3.5 to R-12	Dune enhancement and beach nourishment	1.62 miles
10 Sept 2007	Indian River	Sebastian Inlet Channel and Sand Trap Dredging, Sectors 1 and 2 Beach Nourishment	41420-2007-F-0864	R-3 to R-12	Sand trap dredging and beach nourishment	1.61 miles
10 October 2008	Indian River	Baytree and Marbrisa Condominium Dune Restoration	41420-2008-FA-0007	200 feet south of R-46 to 200 feet south of R-48	Dune restoration/enhancement	0.38 mile
16 October 2009	Indian River	City of Vero Beach, Outfall Pipe Installation	41420-2009-FA-0255	220 feet north and 930 feet south of R-83	Outfall pipe installation	0.22 mile
2 December 2009	Indian River	Indian River County Beach Nourishment Sector 3	41420-2007-F-0839	Phase 1 = R-32 to R-55 Phase 2 = R-20 to R-32	Beach and dune nourishment	Phase 1 = ~4.4 miles Phase 2 = ~2.3 miles
24 July 2002	Lee	Gasparilla Island Beach Nourishment	4-01-F-765	R-10 to R-26.5 R-25, R-25.5, R-26	Beach nourishment; breakwater construction; and two t-head groins	3.2 miles
19 June 2003	Lee	Bonita Beach Re-nourishment	4-1-02-F-1736		Beach nourishment	3,922 feet
4 March 2005	Lee	Sanibel and Captiva Island Beach Nourishment	4-1-04-F-9180	R-83 to R-109 and R-110 to R-118	Beach nourishment	6.0 miles
14 March 2007	Lee	Gasparilla Island Beach Nourishment (BO amendment)	41420-2007-FA-0509	South of R-26A	Beach nourishment	
27 August 2007	Lee	North Captiva Island Beach Nourishment	41420-2007-FA-1023	R-81 and 208 feet south of R-81A	Beach nourishment	0.23 mile
5 August 2009	Lee	Matanzas Pass Reopening	41420-2009-FA-0132	North end of Estero Island	Channel dredging	0.14 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
21 March 2008	Lee	Blind Pass Reopening	41420-2006-FA-1549	R-109 to R-114	Reopening Blind Pass and then nourishing the shoreline between R-112 and R-114.	0.95 mile
7 Dec 2009	Lee	Sanibel Island Sand Placement	41420-2009-FA-0066	R-174A to Bay 1A	Beach nourishment	0.25 mile
15 Sept 2010	Lee	Big Hickory Island Sand Placement and Groin Construction	41420-2010-CPA-0100	R-222.3 to R-223.8	Beach nourishment and groin construction	0.47 mile
31 Jan 2002	Martin	Jupiter Island	4-1-05-TR-13281	R-75 to R-117	Beach nourishment	6.5 miles
5 Jan 2005	Martin	Martin County Shore Protection Project	4-1-05-F-10476	R-1 to R-25.6	Beach nourishment	4.1 miles
2 Dec 2005	Martin	Jupiter Island Modification	4-1-05-TR-13281	R-76 to R-84 and R-87 to R-11	Beach nourishment	5 miles
2 Feb 2007	Martin	Sailfish Point Marina Channel Dredging and Beach Nourishment	41420-2007-FA-0196	R-36 to R-39	Channel dredging and beach nourishment	0.66 mile
6 October 2009	Martin	Bathtub Beach Park Sand Placement	41420-2009-FA-0110	R-34.5 to R-36	Beach nourishment	0.24 mile
8 June 2010	Martin	Martin County Beach Erosion Control Project	41420-2009-FA-0190	R-1 to R-25	Beach nourishment	~ 4 miles
23 Sept 2005	Miami-Dade	Bal-Harbour T-Groin Reconstruction	4-1-05-12842	R-27 to R-31.5	Groin removal and reconstruction	0.85 mile
11 Oct 2005	Miami-Dade	Bakers Haulover AIW Maintenance Dredging	4-1-04-TR-8700	R-28 to R-32	Dredging and beach nourishment	0.85 mile
7 June 2006	Miami-Dade	Miami-Dade Beach Nourishment	41420-2006-FA-0028	3 segments within R-48.7 and R-61	Beach nourishment	3,716 feet
25 July 2007	Miami-Dade	Miami Beach Nourishment	41420-2006-F-0028	R-67 to R-70	BO modification to June 7, 2006 BO	3,000 feet
5 Nov 2008	Miami-Dade	Baker's Haulover Dredging and Sand Placement	41420-2008-FA-0729	R-28 to R-32	BO modification to the October 11, 2005 BO. Dredging and sand placement events will be biannual.	4,000 feet
12 Nov 2008	Miami-Dade	DERM Truck Haul Sand Placement	41420-2008-FA-0776	R-27 to R-29 R-7 to R-12 R-43 to R-44+500 feet	Beach nourishment	1.78 miles
25 Nov 2009	Miami-Dade	DERM 27th Street Sand Placement	41420-2009-FA-0045	R-60 to R-61	Beach nourishment	0.19 mile
17 Dec 2009	Miami-Dade	32nd and 63rd Streets Sand Placement	41420-2009-FA-0415	R-37.75 to R-46.25 R-53.7 to R-55.5 R-60 to R-61	Sand placement	2.14 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 March 2010	Miami-Dade	55th Street Sand Placement	41420-2009-FA-0046	R-48.7 to R-50.7	Sand placement	0.38 mile
30 April 2010	Miami-Dade	44th Street Sand Placement	41420-2009-FA-0047	R-53.7 to R-55.5	Sand placement	0.34 mile
25 June 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0593	R-29 to R-32	Sand Placement – truck haul	0.60 mile
28 June 2010	Miami-Dade	Sunny Isles BeachSand Placement	41420-2009-FA-0594	R-12 to R-15)	Sand Placement – truck haul	0.58 mile
30 July 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0595	R-45 to R-48 +700 feet	Sand Placement – truck haul	0.78 mile
13 Sept 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0527	R-43 to R-44 + 500 feet	Sand Placement – truck haul	0.26 mile
8 October 2010	Miami-Dade	Sunny Isles Beach Sand Placement	41420-2009-FA-0526	R-7 to R-12	Sand Placement – truck haul	0.95 mile
8 October 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0525	R-27 to R-29	Sand Placement – truck haul	0.38 mile
2009	Monroe	Reclaimed sand placement and sand cleaning (seaweed removal)	41420-2010-F-0006	No R-monuments	Sand placement and cleaning	1,462 linear feet
2009	Monroe	City of Key West (South Beach)	41420-2010-F-0013	No R-monuments	Beach repair (emergency)	235 linear feet
2009	Monroe	City of Key West (Rest Beach)	41420-2010-F-0014	No R-monuments	Beach repair (emergency)	640 linear feet
2009	Monroe	City of Marathon, Sombrero Beach	41420-2010-F-0001	No R-monuments	Beach repair (emergency)	1,380 linear feet
5 March 2010	Monroe	City of Key West – Simonton Beach	41420-2010-FC-0412	Approximately 350 feet ENE of V-416 (latitude 24.562, longitude -81.8054	Emergency beach repair	95 linear feet
5 March 2010	Monroe	City of Key West – Dog Beach	41420-2010-FC-0413	Between V-414 and V-413 (latitude 24.5473, longitude -81.7929	Emergency beach repair	35 linear feet
13 May 2010	Monroe	City of Key West, Smathers Beach	41420-2008-FA-0185	No R-monuments	Sand placement	0.57 mile
27 March 2003	Palm Beach	Palm Beach Harbor M & O	4-1-03-F-139	200 feet south of the south jetty	Jetty sand tightening	200 feet
16 March 2004	Palm Beach	Boca Raton Inlet Sand Bypassing	4-1-04-F-4688	200 feet south of R-223	Inlet sand bypassing and beach nourishment	500 feet
11 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Delray Segment	4-1-05-F-10767	R-175 to R-188	Beach restoration	2.7 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
24 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Ocean Ridge Section	4-1-05-F-10787	R-153 to R-159	Beach nourishment	1.12 miles
11 April 2005	Palm Beach	South Lake Worth Inlet Sand Transfer Plant Reconstruction and Bypassing	4-1-04-F-8640	135 feet south of R-151, to 275 feet south of R-152	STP reconstruction and bypassing	900 feet
5 Dec 2005	Palm Beach	Mid-Town Beach Nourishment Project (Reach 3 & 4)	4-1-00-F-742	R-90.4 to R-101.4	Beach nourishment	2.4 miles
23 Dec 2005	Palm Beach	Palm Beach Harbor M & O	4-1-05-TR-13258	R-76 to R-79	Dredging and beach nourishment	3,450 feet
23 Feb 2006	Palm Beach	Boca Raton Central Beach Nourishment Project	4-1-01-F-1795	R-216 to R-222	Dredge shoal fronting Boca Raton Inlet and beach nourishment	1.3 miles
23 Feb 2006	Palm Beach	Boca Raton South Beach Nourishment Project	41420-2008-FA-0777 Old database number 41-01-F-652	R-223.3 to R-227.9	Dredge shoal fronting Boca Raton Inlet and beach nourishment	Approx. 1 mile
28 April 2006	Palm Beach	Palm Beach Nourishment Project – Reach 8	41420-2006-F-0018	R-125 to R-134	Beach nourishment	2.17 miles
31 July 2006	Palm Beach	Sea Dunes Condominium Seawall	41420-2006-FA-1108		Seawall construction	0.03 acre
15 Dec 2006	Palm Beach	North Ocean Boulevard Rock Revetment	41420-2006-FA-1490	290 feet north of R-84; 1,150 feet south of R-85	Rock revetment construction	0.34 mile
5 Feb 2007	Palm Beach	Palm Beach Sand Transfer Plant Reconstruction	41420-2006-FA-1447	R-76 to R-79	Sand transfer plant reconstruction and discharge pipe extension	0.57 mile
28 March 2007	Palm Beach	Lake Worth Inlet Jetty Repair	41420-2007-FA-0221	200 feet north of R-75 and 200 feet south of R-76	Jetty repair	400 feet
25 May 2007	Palm Beach	Singer Island and South Palm Beach Emergency Dune Restoration	41420-2007-FA-1001	385’ south of R-137 to 500’ north of R-136; 500’south of R-60 to 850’ south of R-65	Dune Restoration	6,135 feet
25 May 2007	Palm Beach	Jupiter Island ICWW Maintenance Dredging and Beach Nourishment	41420-2006-FA-1582	16,000 feet (130,000 cy) of the ICWW dredged; material placed between R-13 and R-19.	Channel dredging and beach nourishment	1.04 miles
20 July 2007	Palm Beach	North Boca Raton Beach Nourishment	41420-2007-FA-0477	T-205 to 181 feet south of R-212	Beach nourishment	1.45 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
9 Nov 2007	Palm Beach	Jupiter Inlet and channel dredging	41420-2006-FA-1582	R-13 to R-17	Dune restoration	~ 4,000 linear feet
14 Nov 2007	Palm Beach	Jupiter Inlet Sand Trap Dredging and Sand Placement	41420-2007-FA-0600	Maintenance dredging of the inlet; beach compatible placed R-13 to R-19	Inlet dredging and beach nourishment	1.02 miles
28 Nov 2007	Palm Beach	Modification to a Sheet Pile and Rubble-Mound T-Head Groin System	41420-2007-FA-0574	500 feet north of R-94 south to R-95	T-groin repair, extension, construction	0.4 mile
5 Feb 2008	Palm Beach	Reach 8 Dune Restoration	41420-2006-F-0018	R-125 to 350 feet south of R-134	Dune restoration	2.17 miles
9 Sept 2008	Palm Beach	Juno Beach Sand Placement	41420-2008-FA-0081	R-26 to R-38	Sand placement	2.45 miles
4 Nov 2008	Palm Beach	Palm Beach Harbor M&O and Sand Placement	41420-2008-FA-0524	R-76 to R-79	Biannual Inlet dredging and sand placement events.	3,450 feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0008	R-60 to R-68	Beach berm repair (permanent work)	6,880 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0009	R-135 to R-138	Beach berm repair (permanent work)	3,590 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F0010	R-137 to R-138	Beach berm repair (emergency)	125 linear feet
21 June 2010	Palm Beach	Mid-Town Reaches 3 & 4 Sand Placement	41420-2006-F-0011-R001	R-95 to R-100	Beach nourishment	0.95 mile
2 July 2010	Palm Beach	Phipps Ocean Park Reaches 7&8	41420-2010-CPA-0110	R-116 to R-125	Sand Placement	3.4 miles
3 Sept 2010	Palm Beach	Singer Island Breakwater	41420-2008-FA-0019	R-60.5 to R-66	Segmented, submerged breakwater	1.1 miles
19 June 2003	St. Lucie	Fort Pierce Shoreline Protection	4-1-03-F-1867 41420-2006-FA-1575	R-33.8 to R-41	Beach nourishment; berm expansion; and six t-head groins	1.3 miles
9 March 2006	St. Lucie	Blind Creek Restoration and South St. Lucie Emergency Berm Remediation Project	41420-2006-FA-0075	R-98 to R-115 R-88 to R-90	Wetland restoration and beach nourishment	3.6 miles
27 June 2008	St. Lucie	Fort Pierce Shoreline Protection Project	41420-2006-FA-1575	R-34 to R-41	Beach nourishment, berm expansion, and six t-head groins	1.3 miles
25 Aug 2004	Sarasota and Manatee	Longboat Key Beach Nourishment	4-1-04-F-4529	R-46A to R-29.5	Beach nourishment	9.45 miles
4 Oct 2005	Sarasota and Manatee	Longboat Key Beach Nourishment Project – BO Amendment	4-1-04-TR-4529	R-44 to R-44.5 and R-46A to R-44.5	Beach nourishment	0.47 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
20 Oct 2005	Sarasota	South Siesta Key	4-1-05-TR-12691	R-67 to R-77 plus 200 feet	Beach nourishment	2.1 miles
7 Dec 2007 (original BO) 28 July 08 (BO mod)	Sarasota	Lido Key Beach Fill Placement Project	41420-2007-F-0841	R-35.5 to R-44.2 2.27 miles	Beach nourishment with 425,000 cy of fill material.	2.27 miles
13 August 2008	Sarasota	Longboat Key Permeable Adjustable Groins	41420-2007-FA-0205	R-13 to R-13.5	Construction of two permeable adjustable groins.	0.09 mile project area 0.43 mile action area
2009	Sarasota		41420-2010-F-0003	R-77 to midpoint between R-77 and R-76	Beach restoration	700 linear feet
2009	Sarasota	Longboat Key Beach	41420-2010-F-0007	R-13 to R-14 Sarasota County; R-44 to R-5, and R-48.5 to R-49.5 Manatee County	Beach berm repair	951, 1,197, and 1,142 linear feet, respectively

Appendix B

NMFS Consultations

CONSULTATION ACTIVITY	TYPE OF ACTION	DATE SIGNED	ACTION AREA	INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE)									
				Loggerhead (NWAO & NP DPS)		Green Turtle		Leatherback		Hawksbill		Kemp's Ridley Olive Ridley	
				Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Non-Fishery Consultations													
North Carolina DENR Inshore Gillnet- Incidental Take Permit	Section 10(a)(1)(B)	9/6/13	North Carolina Inshore Waters	1-yr Estimate									
						330	165					98	49
				1-yr Observed									
				24		18		8		8		12	
Removal of Offshore Structures in the Gulf of Mexico Outer Continental Shelf	Oil & Gas	8/28/2006	Gulf of Mexico	6-yr Estimate									
				15*	0	3*	0	3*	0	3*	0	3*	0
Sinking Exercises (SINKEX) in the Western North Atlantic Ocean	Military	9/22/2006	Western North Atlantic Ocean	1-yr Estimate									
				ITS - We do not have information to determine an amount of take. Survey data for the SINKEX location is extremely limited and the densities or abundance of sea turtles within the area is not known. Therefore, we anticipate the extent of take would be within the water column that would be affected by the shock and pressure waves above levels of 12 psi and 182 dB re 1 µ Pa2-sec in the greatest 1/3 octave band. For the largest underwater detonations, the extent includes the volume within 2 nmi of the detonation. Thus, the extent of take includes the "exclusion zone" of the SINKEX.									
Issuance of multiple permits to conduct scientific research on Atlantic sturgeon pursuant to section 10 (a)(1) of the Endangered Species Act of 1973	Section 10(a)(1)(A) for Sturgeon Research	4/2/2012	U.S. Atlantic Coast (from ME to FL)	Anticipated take for the entire research permit (5 years)									
				4*	0	4*	0	4*	0	4*	0	4*	0
National Science Foundation - Marine Seismic Survey in the Central Pacific Ocean	Seismic	11/23/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				ITS - We do not have information to determine an amount of take. Harassment of these sea turtles is expected to occur at received levels of seismic sounds above 166 dB re 1 µPa. Because density estimates of sea turtles in the survey area are unknown, we estimate take as the number of turtles exposed to seismic operations above 166 dB re 1 µPa during the proposed activities. These turtles could be of all ages and life stages in the survey area.									
Navy - Conduct of training in the Virginia Capes, Cherry Point and Jacksonville Range Complexes June 2011 to June 2012	Navy Activities	6/1/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				485	9	311*	3*	20	1	311*	3*	557	5

Appendix C

Assessments: Discerning Problems Caused by Artificial Lighting

Lighting Inspections

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This “urban skyglow” is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach. Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are partially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION

Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS

An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections. Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaries need what remedy.

NIGHTTIME INSPECTIONS

A nighttime survey shall be conducted of all lighting visible from the beach placement area by the FWC permit holder, using standard techniques for such a survey. During the nighttime lighting surveys, the surveyor shall walk the length of the beach placement area looking for light from artificial sources. During the nighttime lighting surveys, a complete census shall be made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. Because problem lighting will be most visible on the darkest nights, lighting inspections are to be conducted when there is no moon visible. Descriptions of light sources identified during the survey should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east, etc.). A summary report of the survey shall be submitted to the Corps, FWC, and the Service.

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. **Direct lighting**. A luminaire is considered to be direct lighting if some glowing element of the luminaire (e.g., the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; style

of fixture), mounting (pole, porch, *etc.*), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to 14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represent a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be give the information they need to make proper alterations to light sources. This information should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

Appendix D
Sea Turtle Lighting Survey Form

Lighting Survey Form

The lighting survey must be conducted to include a landward view from the seaward most extent of the beach profile. The survey must occur after 9 p.m. The survey must follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation.

Date: ____

Contact information of person conducting the lighting survey: _________________________

____

Location (name of beach): _______________________________

Lighting ordinance (applicable County or Municipality): ______________________________

Compliance Officer name and contact information: __________________________________

Survey start time: _______

Survey end time: _______

Survey start location (include address or GPS location):_____________________

____

____

Survey end location (include address or GPS location): _____________________

____

Date summarizing report sent to the following: marineturtle@myfwc.com, JCPCompliance@dep.state.fl.us, and seaturtle@fws.gov:________________________________

County or Municipality contact information for follow up meeting with the FWS and FWC:

____

For each light visible from the nesting beach provide the following information:

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommendations sent? (YES/NO)

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommendations sent? (YES/NO)

Appendix E

Nesting Seabird and Shorebird Protection Conditions

a. Selection of Bird Monitors. The Permittee or designated representative ("Permittee") shall hire one or more Bird Monitors, depending on the size of the area to be affected, who shall monitor shorebird and seabird (shorebird) activity before, during, and after construction. Bird Monitors shall have proven seabird and shorebird identification skills and avian survey experience. Before hiring any Bird Monitors, the Representative shall provide a list of candidate Bird Monitors with (1) their contact information and (2) a summary of their qualifications, including bird identification skills and avian survey experience, to the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) and copied to JCPCompliance@dep.state.fl.us for FWC approval before the Permittee hires the Bird Monitor(s).

b. The Bird Monitor(s) shall review and become familiar with the general information on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org). They shall use the data-collection protocol and implement data-entry procedures as outlined in that website. An outline of data to be collected, including downloadable field data sheets, is available on the website.

c. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this project: February 15 – September 1.

   Surveys during the breeding season shall begin on the first day of the breeding season or 10 days before any site work begins, whichever is later. Surveys shall be conducted through August 31 or until all breeding activity has concluded, whichever is later.

d. During the breeding season, the Bird Monitor(s) shall survey all potential beach-nesting bird habitats that may be affected by construction or pre-construction activities. The Bird Monitor(s) shall establish one or more shorebird survey routes in the FSD website to cover these areas.

e. During the pre-construction and construction phases of the project, the Bird Monitor(s) shall complete surveys on a daily basis to detect breeding activity and the presence of flightless chicks before (1) equipment is moved to the area, (2) vehicles are operated in the area, or (3) any other activities occur that have the potential to disrupt breeding behavior or cause harm to the birds or their eggs or young. Once construction is completed and all personnel and equipment have been removed from the beach, surveys may be conducted at weekly intervals.

f. The Bird Monitor(s) shall survey the project area by walking and looking for evidence of (1) shorebirds exhibiting breeding behavior, (2) shorebird chicks, or (3) shorebird juveniles, as outlined in the FSD's Breeding Bird Protocol for Shorebirds and Seabirds. The Bird Monitor(s) shall use binoculars for these surveys.

g. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed under 6 mph and only on beaches at or below the high-tide line. The Bird Monitor(s) shall stop at no greater than 200-meter intervals to look for breeding activity.

h. Once the Bird Monitor(s) confirms that birds are breeding, as evidenced by the presence of a scrape, eggs, or young, the Bird Monitor(s) shall notify the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) within 24 hours. The Bird Monitor(s) shall report all breeding activity to the FSD website within one week of data collection.

Seabird and Shorebird Buffer Zones and Travel Corridors

The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where shorebirds have been engaged in breeding behavior, including territory defense. The FWC considers a 300-foot-wide buffer to be adequate based on published studies; however, a smaller, site-specific buffer may be established if approved by the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit). All sources of human disturbance (including pedestrians, pets, and vehicles) shall be prohibited in the buffer zone.

a. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall widen of the buffer zone immediately to a sufficient size to protect breeding birds.

b. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

c. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked with posts, twine, and signs stating "Do Not Enter, Important Nesting Area" or similar language. The signs shall include the name and a phone number of the entity responsible for posting. Posts shall not be higher than 3 feet once installed. "Symbolic fencing" (i.e., twine, string, or rope) shall be placed between all posts and be clearly visible to pedestrians. In areas where marine turtles nest, the ropes shall be at least 2.5 feet above the ground. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these shall be clearly marked. The Bird Monitor(s) shall ensure that the posting is maintained in good repair until breeding is completed or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

d. The Bird Monitor(s) shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

e. The Bird Monitor(s) shall designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may go past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

f. When flightless chicks are present on the beach, the Bird Monitor(s) shall accompany any moving vehicles or equipment to ensure that no chicks are in the path of the moving vehicle and no tracks are left that could trap flightless chicks.

g. The FWC recommends that the Bird Monitor(s) ensure that some activity in the travel corridor is maintained on a daily basis in order to discourage birds from nesting within the travel corridor. These activities shall not be allowed to disturb shorebirds nesting on site or interfere with marine turtle nesting, especially if the corridors are established before construction has started.

h. *Notification.* If the Bird Monitor(s) find that shorebirds are breeding within the project area, he or she shall ensure that an informational bulletin board is placed and maintained in the construction staging area. This bulletin board shall display the location map of the construction site, depict the location(s) of the bird breeding areas, and include a clearly visible warning stating: "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE AND FEDERAL MIGRATORY BIRD ACTS".

Post-construction Conditions, Monitoring and Reporting

i. Shorebird: If beach cleaning will occur on the nourished beach, a minimum of 30 percent of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

Appendix F

EXAMPLES OF PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle must be secured or heavy enough so it is not easily turned over.

APPENDIX A - PERMITS

USACE PERMIT - BIOLOGICAL OPINION:
USFWS PIPING PLOVER PROGRAMMATIC BIOLOGICAL OPINION (P^{3}BO) (22 MAY 2013)

64 PAGES

SAJ-2014-00606 (SP-MEP)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960
May 22, 2013

Eric P. Summa
Chief, Environmental Branch (PD-E)
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Summa:

This document transmits the U.S. Fish and Wildlife Service's (Service) Programmatic Piping Plover Biological Opinion (P^3BO) for the effects of U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities on the non-breeding piping plover (*Charadrius melodus*) and its designated Critical Habitat in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). The current status of the federally listed piping plover is threatened, and the Service designated Critical Habitat for wintering piping plovers on July 10, 2001. This P^3BO is for the North Florida Ecological Services Office (NFESO) and the South Florida Ecological Services Office (SFESO) areas of responsibility (AORs). You requested formal consultation by letter of May 7, 2013.

This P^3BO is based on the information provided in the Corps May 7, 2013, letter, the Statewide Programmatic Biological Assessment of February 17, 2011, subsequent meetings between Corps and Service personnel, and other sources of information. We have assigned Consultation Code 04EF1000-2013-F-0124 to this consultation. A complete administrative record of this consultation is on file at the NFESO. Each project proposing to utilize this P^3BO will undergo an evaluation process by the Corps to determine if it properly fits within this programmatic approach. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the P^3BO are applicable to the project, the Service will concur within 30 days and it will be covered by this programmatic consultation. The Corps will consult separately on individual projects that do not fit within this programmatic approach unless the Service grants an exception in accordance with the Incidental Take Statement in the P^3BO.

This consultation includes the following proposed activities conducted in the AORs of the NFESO and the SFESO:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management (BOEM);
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

For Civil Works activities, the Corps specified during the consultation process that "fish and wildlife enhancement" activities beyond mitigation of project impacts must be authorized as a project purpose, be authorized as a project feature, or be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 June 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority [ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)], the Corps does not expect to receive authorization and funding for it. However, the Corps proposes to implement the following Conservation Measures to reduce impacts on piping plovers for all projects (those in both non-optimal and optimal piping plover habitat) included in this consultation with the potential to affect piping plovers or their critical habitat:

1. Adhere to appropriate seasonal windows to the maximum extent practicable;

2. Implement survey guidelines for non-breeding shorebirds when appropriate. For Corps Civil Works projects, the "surveys" must be limited to the term of the construction unless they are otherwise authorized and funded by Congress;

   [Note: The term of the construction is considered to be the time in which the construction contractor is working on the beach. This usually starts soon after the "notice to proceed" and ends when the contractor finishes placing sand or finishes conducting other shore protection activities on/near the beach.]

3. Pipeline alignment and associated construction activities may be modified to reduce impacts to foraging, sheltering, and roosting;

4. Avoid impacts to the primary constituent elements (PCEs) of piping plover Critical Habitat to the maximum extent practicable;

5. The Corps or Applicant will evaluate the project area prior to consultation for the presence of piping plover PCEs as a basis for making their initial determination of effect;

6. The Corps will work with the Service to develop shore protection design guidelines and/or mitigation measures that can be utilized during future project planning to protect and/or enhance high value piping plover habitat locations (*i.e.*, washover fans). For Corps Civil Works projects, "enhancement" must be limited to the extent authorized and funded as a project feature or project purpose;

7. The Corps will attempt to time the construction of Civil Works sand placement and dredging projects to prevent two adjacent beaches or inlets from being constructed in the same year;

8. The Corps Civil Works program will work with the Florida Department of Environmental Protection (FDEP) to consider the value and context of inlet habitat features (*i.e.*, emergent spits, sand bars, etc.) within each inlet's management plan and adjust future dredging frequencies, to the maximum extent practicable and consistent with applicable law, so that adjacent habitats are made available and total habitat loss would not occur at one time within a given inlet complex; and

9. The Corps Civil Works program will consider placing dredged materials in the nearshore region as an alternative to beach placement to minimize effects to piping plovers and their habitat.

With the implementation of these Conservation Measures, the Corps has determined the proposed activities may affect, but are not likely to adversely affect the piping plover in areas not identified as Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and they include coastal habitat features that function mostly unimpeded. Optimal Piping Plover Areas include:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or
    f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely state-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

    a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
    b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
    c. Palmer Point Park, Sarasota County (R-77 to R-83);

d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
e. Crandon Park, Miami-Dade County (R-89 to R-101); and
f. Sanibel Island, Lee County (R-109 to R-174).

The Service concurs with this determination as it applies to projects in non-optimal habitat, and the Corps will reinitiate consultation if they are unable to implement the Conservation Measures as described above. No additional consultation is required for projects located in habitat determined to be non-optimal for piping plovers. The attached P^3BO addresses projects located in optimal piping plover habitat, as defined above.

As with the Service's Statewide Programmatic Biological Opinion (SPBO), the Corps and the Service will meet annually during the fourth week of August to review the proposed activities, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this P^3BO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions. This programmatic consultation will be reviewed every 5 years. If new information concerning the projects or the piping plover arises, this consultation will be reviewed sooner than 5 years. Reinitiation of formal consultation is required 10 years after the issuance of this P^3BO.

We are available to meet with agency representatives to discuss this consultation. If you have any questions, please contact Dawn Jennings at the NFESO (904-731-3103) or Craig Aubrey in the SFESO (772-469-4309).

Sincerely yours,

Larry Williams

Larry Williams
State Supervisor

SHORE PROTECTION ACTIVITIES IN THE GEOGRAPHICAL REGION OF THE NORTH AND SOUTH FLORIDA ECOLOGICAL SERVICES FIELD OFFICES

Programmatic Piping Plover Biological Opinion

May 22, 2013

Prepared by:

U.S. Fish and Wildlife Service

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ACRONYMS AND ABBREVIATIONS

Act	Endangered Species Act
AOR	Area of Responsibility
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FR	Federal Register
MBTA	Migratory Bird Treaty Act
NFESO	U.S. Fish and Wildlife Service’s North Florida Ecological Services Office
P^3BO	Programmatic Piping Plover Biological Opinion
PCE	Primary Constituent Elements
Service	U.S. Fish and Wildlife Service
SFESO	U.S. Fish and Wildlife Service’s South Florida Ecological Services Office
SPBO	Statewide Programmatic Biological Opinion
USGS	U.S. Geological Survey

CONSULTATION HISTORY

1980s and 1990s	Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s.
April 19, 2011	The Service issued the original SPBO concerning planning and regulatory sand placement projects in Florida and their effects on nesting sea turtles.
August 22, 2011	The Service issued their revised SPBO. The SPBO did not include take for the non-breeding piping plover or its designated Critical Habitat. Consultation for plovers was conducted on a case-by-case basis.
October 30, 2012	The Service and the Corps held the first annual meeting on the progress of the SPBO. The agencies discussed outstanding piping plover issues, including the proposed terms and conditions. The agencies agreed to conduct a separate re-initiation of consultation for piping plovers limited to peninsular Florida to programmatically address take of piping plovers.
May 7, 2013	The Corps sent a letter to the Service formally requesting a Programmatic Piping Plover Biological Opinion.
Other Collaboration	Numerous telephone conversations and e-mails were conducted between the Corps and the Service concerning the content of the P^3BO and initiation of consultation.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes activities associated with the placement of compatible sediment on beaches or in the nearshore region of Optimal Piping Plover Areas. Optimal Piping Plover Areas are defined as having documented use by piping plovers, and include coastal habitat features that function mostly unimpeded. Below is a list of currently known Optimal Piping Plover Areas:

1. Designated piping plover Critical Habitat Units (see Appendix A);

2. All Federal, State, and County publicly owned land where coastal processes are allowed to function, mostly unimpeded, that have any of the following features in the Action Area:

    a. Located within 1 mile of an inlet;
    b. Emergent nearshore sand bars;
    c. Washover fans;
    d. Emergent bayside and Ocean/Gulf-side shoals and sand bars;
    e. Bayside mudflats, sand flats, and algal flats; or

f. Bayside shorelines of bays and lagoons.

[Publicly owned land where coastal processes are allowed to function, mostly unimpeded, generally does not include public lands that are solely State-owned water bottoms, street ends, parking lots, piers, beach accesses, or shoreline developed for commercial or residential purposes. It generally does include public lands consisting of parks, preserves, and natural undeveloped shoreline and dunes.]; and

3. The following additional areas are also considered optimal piping plover habitat (FDEP Range Monuments provided in parentheses):

   a. Charley Pass, south of Critical Habitat Unit FL-23 on North Captiva Island, Lee County (R-75.5 and R-83);
   b. Stump Pass and the beaches adjacent to it, Charlotte County (R-15.5 to R-33);
   c. Palmer Point Park, Sarasota County (R-77 to R-83);
   d. St. Lucie Inlet and associated shoals, Martin County (R-42 to R-78);
   e. Crandon Park, Miami-Dade County (R-89 to R-101); and
   f. Sanibel Island, Lee County (R-109 to R-174).

ACTION AREA

The Action Area includes sandy beaches; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; bayside shorelines of bays and lagoons; and emergent nearshore sand bars of the Atlantic Coast (Nassau County to Miami-Dade County) and the Gulf Coast (Monroe County to Taylor County) of Florida (Figures 1 and 2). The proposed action includes the replacement and rehabilitation of groins utilized as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This P^3BO includes both Corps Regulatory and Civil Works activities. Both Corps Regulatory and Civil Works activities may include the involvement of other Federal agencies, such as the Department of Defense, BOEM, and the Federal Emergency Management Agency. The activities covered in the P^3BO encompass the following:

1. Operations and maintenance dredging activities of navigational channels and sand placement on the sandy beach and dune (including up to or over hardened structures), the swash zone, and the nearshore regions associated with both shore protection projects and maintenance dredging;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the BOEM;
3. Sand by-passing/back-passing; and
4. Groins and jetty repair, or replacement.

The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future sand placement actions addressed in this P^3BO may include maintenance of these existing projects or beaches that have not experienced a history of sand placement activities. Maintenance dredging activities include dredging of both deep draft harbors and shallow draft inlets when these activities affect optimal piping plover habitat.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat description

The piping plover is a small, pale sand-colored shorebird, about 7 inches long with a wingspan of about 15 inches (Palmer 1967). Cryptic coloration is a primary defense mechanism for piping plovers where nests, adults, and chicks all blend in with their typical beach surroundings. Piping plovers on wintering and migration grounds respond to intruders (*e.g.*, pedestrian, avian and mammalian) usually by squatting, running, and flushing (flying).

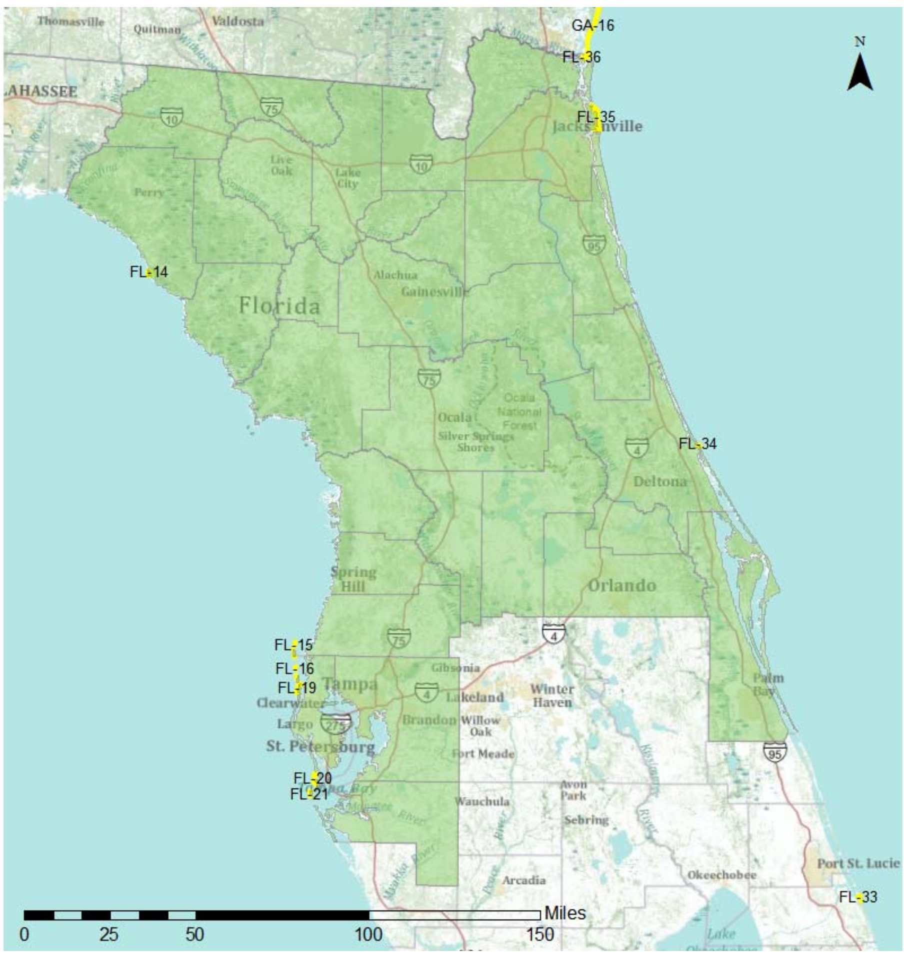


Figure 1 Piping plover designated Critical Habitat in the North Florida Ecological Services Field Office's area of responsibility**.**

On January 10, 1986, the piping plover was listed as endangered in the Great Lakes watershed and threatened elsewhere within its range, including migratory routes outside of the Great Lakes watershed and wintering grounds (Service 1985). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Protection of the species under the Act reflects the species' precarious status range-wide.

Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plovers in the Action Area include individuals from all three breeding populations. Piping plover subspecies are phenotypically indistinguishable, and most studies in the nonbreeding range report results without regard to breeding origin. Although a recent analysis shows strong patterns in the wintering distribution of piping plovers from different breeding populations, partitioning is not complete and major information gaps persist.

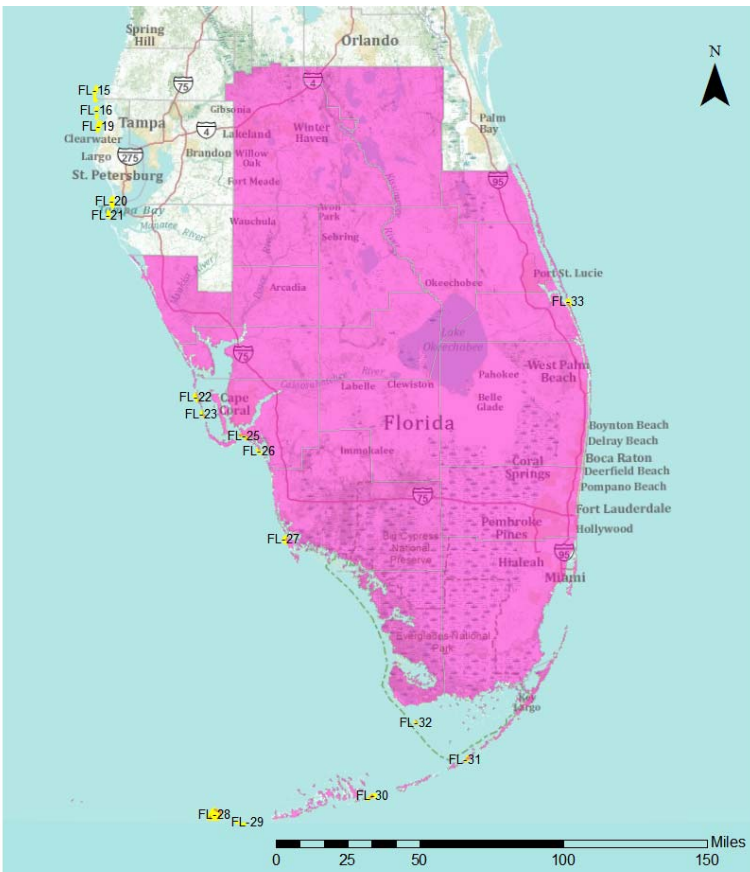


Figure 2 Piping plover designated Critical Habitat in the South Florida Ecological Services Field Office's area of responsibility.

The Service has designated Critical Habitat for the piping plover on three occasions. Two of these designations protected different piping plover breeding populations. Critical Habitat for the Great Lakes breeding population was designated May 7, 2001 (66 Federal Register [FR] 22938, Service 2001a), and Critical Habitat for the northern Great Plains breeding population was designated September 11, 2002 (67 FR 57637, Service 2002). The Service designated Critical Habitat for wintering piping plovers on July 10, 2001 (66 FR 36038, Service 2001b). Wintering piping plovers may include individuals from the Great Lakes and northern Great Plains breeding populations as well as birds that nest along the Atlantic Coast. The three separate designations of piping plover Critical Habitat demonstrate diversity of PCEs between the two breeding populations as well as diversity of PCEs between breeding and wintering populations.

Designated wintering piping plover Critical Habitat originally included 142 areas (the rule states 137 units; this is an error) encompassing approximately 1,793 miles of mapped shoreline and 165,211 acres of mapped areas along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas.

The PCEs for piping plover wintering habitat essential for the conservation of the species are those habitat components that support foraging, roosting, and sheltering, and the physical features necessary for maintaining the natural processes that support these habitat components. The PCEs are found in geographically dynamic coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide (Service 2001a). PCEs of wintering piping plover Critical Habitat include sand or mud flats, or both, with no or sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers (Service 2001a). Important components of the beach/dune ecosystem include surf-cast algae, sparsely vegetated back beach and salterns, spits, and washover areas. Washover areas are broad, unvegetated zones, with little or no topographic relief, that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action. The units designated as Critical Habitat are those areas that have consistent use by piping plovers and that best meet the biological needs of the species. The amount of wintering habitat included in the designation appears sufficient to support future recovered populations, and the existence of this habitat is essential to the conservation of the species. Additional information on each specific unit included in the designation can be found at 66 FR 36038 (Service 2001a).

Life history

Piping plovers live an average of 5 years, although studies have documented birds as old as 11 (Wilcox 1959) and 15 years. Plovers are known to begin breeding as early as 1 year of age (MacIvor 1990; Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu et al. 1990; Cross 1990; Goldin et al. 1990; MacIvor 1990; Hake 1993). Piping plovers generally fledge only a single brood per season, but may re-nest several times if previous nests are lost. The reduction in suitable nesting habitat due to a number of factors is a major threat to the species, likely limiting reproductive success and future recruitment into the population (Service 2009).

Plovers depart their breeding grounds for their wintering grounds between July and late August, but southward migration extends through November. More information about the three breeding populations of piping plovers can be found in the following documents:

a. Piping Plover, Atlantic Coast Population: 1996 Revised Recovery Plan (Service 1996);
b. 2009 Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation (Service 2009);
c. 2003 Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*) (Service 2003);
d. Questions and Answers about the Northern Great Plains Population of Piping Plover (Service 2002).

Piping plovers use habitats in Florida primarily from July 15 through May 15. Below (2010) surveyed plovers north of Marco Island, Florida, and found plovers color-banded during the surveys to have very high wintering site fidelity. Both spring and fall migration routes of Atlantic Coast breeders are believed to occur primarily within a narrow zone along the Atlantic Coast (Service 1996). The pattern of both fall and spring counts at many Atlantic Coast sites demonstrates that many piping plovers make intermediate stopovers lasting from a few days up to 1 month during their migrations (Noel and Chandler 2005; Stucker and Cuthbert 2006). Some midcontinent breeders travel up or down the Atlantic Coast before or after their overland movements (Stucker and Cuthbert 2006). Use of inland stopovers during migration is also documented (Pompei and Cuthbert 2004). The source breeding population of a given wintering individual cannot be determined in the field unless it has been banded or otherwise marked. Information from observation of color-banded piping plovers indicates that the winter ranges of the breeding populations overlap to a significant degree. While piping plover migration patterns and needs remain poorly understood, and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle.

Review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) found more than 3,400 fall and spring stopover records at 1,196 sites. Published reports indicated piping plovers do not concentrate in large numbers at inland sites and they seem to stop opportunistically. In most cases, reports of birds at inland sites were single individuals.

Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the Caribbean. Data based on four rangewide mid-winter (late January to early February) population surveys, conducted at 5-year intervals starting in 1991, show that total numbers have fluctuated over time, with some areas experiencing increases and others decreases. Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (*e.g.*, inlet relocation, dredging of shoals and spits). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Elliott-Smith et al. 2009). Similarly, the increase in the 2006 numbers in the Bahamas is attributed to greatly increased census efforts; the extent of additional habitat not surveyed remains undetermined (Elliott-Smith et al. 2009). Changes in wintering numbers may also be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area. Opportunities to locate previously unidentified wintering sites are concentrated in the Caribbean and Mexico (Elliott-Smith et al. 2009). Further surveys and assessment of seasonally emergent habitats (*e.g.*, seagrass beds, mudflats, oyster reefs) within bays lying between the mainland and barrier islands in Texas are also needed.

Midwinter surveys may underestimate the abundance of nonbreeding piping plovers using a site or region during other months. In late September 2007, 104 piping plovers were counted at the south end of Ocracoke Island, North Carolina (National Park Service 2007), where none were seen during the 2006 International Piping Plover Winter Census (Elliott-Smith et al. 2009). Noel et al. (2007) observed up to 100 piping plovers during peak migration at Little St. Simons Island, Georgia, where approximately 40 piping plovers wintered in 2003 to 2005. Differences among fall, winter, and spring counts in South Carolina were less pronounced, but inter-year fluctuations (*e.g.*, 108 piping plovers in spring 2007 versus 174 piping plovers in spring 2008) at 28 sites were striking (Maddock et al. 2009). Even as far south as the Florida Panhandle, monthly counts at Phipps Preserve in Franklin County ranged from a midwinter low of 4 piping plovers in December 2006, to peak counts of 47 in October 2006 and March 2007 (Smith 2007). Pinkston (2004) observed much heavier use of Texas Gulf Coast (ocean-facing) beaches between early September and mid-October (approximately 16 birds per mile) than during December to March (approximately 2 birds per mile).

Local movements of non-breeding piping plovers may also affect abundance estimates. At Deveaux Bank, one of South Carolina's most important piping plover sites, 5 counts at approximately 10-day intervals between August 27 and October 7, 2006, oscillated from 28 to 14 to 29 to 18 to 26 (Maddock et al. 2009). Noel and Chandler (2008) detected banded Great Lakes piping plovers known to be wintering on their Georgia study site in 73.8 $\pm$ 8.1 percent of surveys over 3 years.

Abundance estimates for non-breeding piping plovers may also be affected by the number of surveyor visits to the site. Preliminary analysis of detection rates by Maddock et al. (2009) found 87 percent detection during the midwinter period on core sites surveyed three times a month during fall and spring and one time per month during winter, compared with 42 percent detection on sites surveyed three times per year (Cohen 2009).

Gratto-Trevor et al. (2009) found strong patterns (but no exclusive partitioning) in winter distribution of uniquely banded piping plovers from four breeding populations (Figure 3).

All eastern Canada and 94 percent of Great Lakes birds wintered from North Carolina to southwest Florida. However, eastern Canada birds were more heavily concentrated in North Carolina, and a larger proportion of Great Lakes piping plovers were found in South Carolina and Georgia. Northern Great Plains populations were primarily seen farther west and south, especially on the Texas Gulf Coast. Although the great majority of Prairie Canada individuals were observed in Texas, particularly southern Texas, individuals from the U.S. Great Plains were more widely distributed on the Gulf Coast from Florida to Texas.

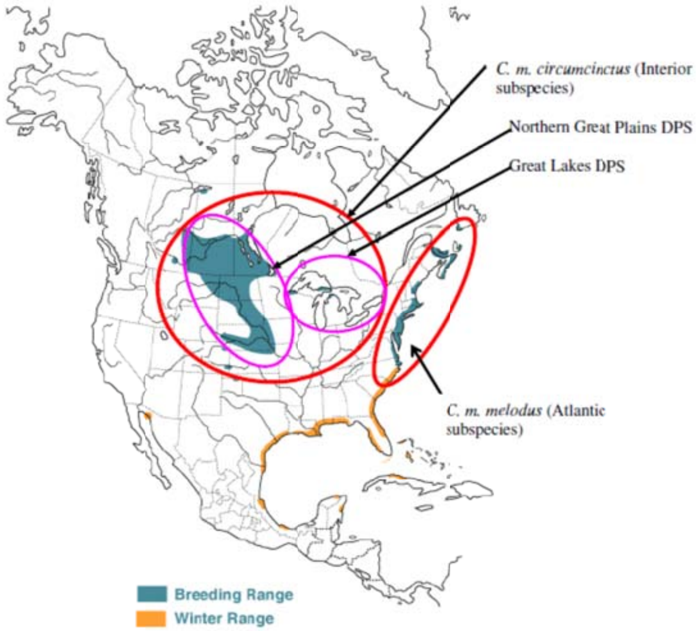


Figure 3 Distribution and range of *C. m. melodus:* Great Lakes DPS of *C. m. circumcinctus*, Northern Great Plains DPS of *C. m. circumcinctus* (base map from Elliott-Smith and Haig 2004 by permission of Birds of North America Online, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology). Note that this map is a conceptual presentation of subspecies and DPS ranges, and is not intended to convey precise boundaries.

The findings of Gratto-Trevor et al. (2009) provide evidence of differences in the wintering distribution of piping plovers from these four breeding areas. However, the distribution of birds by breeding origin during migration remains largely unknown. Other major information gaps include the wintering locations of the U.S. Atlantic Coast breeding population (banding of U.S. Atlantic Coast piping plovers has been extremely limited) and the breeding origin of piping plovers wintering on Caribbean islands and in much of Mexico.

Banded piping plovers from the Great Lakes, Northern Great Plains, and eastern Canada breeding populations showed similar patterns of seasonal abundance at Little St. Simons Island, Georgia (Noel et al. 2007). However, the number of banded plovers originating from the latter two populations was relatively small at this study area.

This species exhibits a high degree of intra- and interannual wintering site fidelity (Nicholls and Baldassarre 1990a; Drake et al. 2001; Noel and Chandler 2005; Stucker and Cuthbert 2006). Gratto-Trevor et al. (2009) reported that 6 of 259 banded piping plovers observed more than once per winter moved across boundaries of the 7 U.S. regions. Of 216 birds observed in different years, only 8 changed regions between years, and several of these shifts were associated with late summer or early spring migration periods (Gratto-Trevor et al. 2009). Total number of individuals observed on the wintering grounds was 46 for Eastern Canada, 150 for the U.S. Great Lakes, 169 for the U.S. Great Plains, and 356 for Prairie Canada.

Local movements are more common. In South Carolina, Maddock et al. (2009) documented many cross-inlet movements by wintering banded piping plovers as well as occasional movements of up to 11.2 miles by approximately 10 percent of the banded population. Larger movements within South Carolina were seen during fall and spring migration. Similarly, eight banded piping plovers that were observed in two locations during 2006 and 2007 surveys in Louisiana and Texas were all in close proximity to their original location (Maddock 2008).

In 2001, 2,389 piping plovers were located during a winter census, accounting for only 40 percent of the known breeding birds recorded during a breeding census (Ferland and Haig 2002). About 89 percent of birds that are known to winter in the U.S. do so along the Gulf Coast (Texas to Florida), while 8 percent winter along the Atlantic Coast (North Carolina to Florida).

The status of piping plovers on winter and migration grounds is difficult to assess, but threats to piping plover habitat used during winter and migration identified by the Service during its designation of Critical Habitat continue to affect the species. Unregulated motorized and pedestrian recreational use, inlet and shoreline stabilization projects, beach maintenance and nourishment, and pollution affect most winter and migration areas. Conservation efforts at some locations have likely resulted in the enhancement of wintering habitat.

The 2004 and 2005 hurricane seasons affected a substantial amount of habitat along the Gulf Coast. Habitats such as those along Gulf Islands National Seashore have benefited from increased washover events which created optimal habitat conditions for piping plovers. Conversely, hard shoreline structures are put into place following storms throughout the species range to prevent such shoreline migration (see *Factors Affecting the Species Habitat within the Action Area*). Four hurricanes between 2002 and 2005 are often cited in reference to rapid erosion of the Chandeleur Islands, a chain of low-lying islands in Louisiana where the 1991 International Piping Plover Census tallied more than 350 piping plovers. Comparison of imagery taken 3 years before and several days after Hurricane Katrina found that the Chandeleur Islands lost 82 percent of their surface area (Sallenger et al. in review), and a review of aerial photography prior to the 2006 Census suggested little piping plover habitat remained (Elliott-Smith et al. 2009). However, Sallenger et al. (in review) noted that habitat changes in the Chandeleurs stem not only from the effects of these storms, but rather from the combined effects of the storms, long-term (greater than 1,000 years) diminishing sand supply, and sea-level rise relative to the land.

The Service is aware of the following site specific conditions that affect the status of several habitats piping plover use while wintering and migrating, including Critical Habitat Units. In Texas, one Critical Habitat Unit was afforded greater protection due to the acquisition of adjacent upland properties by the local Audubon chapter. In another unit in Texas, vehicles were removed from a portion of the beach decreasing the likelihood of automobile disturbance to plovers. Exotic plant removal is occurring in another Critical Habitat Unit in South Florida. The Service and other government agencies remain in a contractual agreement with the U.S. Department of Agriculture for predator control within limited coastal areas in the Florida panhandle, including portions of some Critical Habitat Units. Continued removal of potential terrestrial predators is likely to enhance survivorship of wintering and migrating piping plovers. In North Carolina, one Critical Habitat Unit was afforded greater protection when the local Audubon chapter agreed to manage the area specifically for piping plovers and other shorebirds following the relocation of a nearby inlet channel.

Biogeography and Habitat Preferences

Wintering piping plovers prefer coastal habitats that include sand spits, islets (small islands), tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Harrington 2008). Sandy mud flats, ephemeral pools, and overwash areas are also considered primary foraging habitats. These substrate types have a richer infauna than the foreshore of high energy beaches and often attract large numbers of shorebirds (Cohen et al. 2008). Wintering plovers are dependent on a mosaic of habitat patches and move among these patches depending on local weather and tidal conditions (Nicholls and Baldassarre 1990a).

Recent study results in North Carolina, South Carolina, and Florida, complement information from earlier investigations in Texas and Alabama (summarized in the 1996 Atlantic Coast and 2003 Great Lakes Recovery Plans) regarding habitat use patterns of piping plovers in their coastal migration and wintering range. As documented in Gulf Coast studies, nonbreeding piping plovers in North Carolina primarily used sound (bay or bayshore) beaches and sound islands for foraging and ocean beaches for roosting, preening, and being alert (Cohen et al. 2008). The probability of piping plovers being present on the sound islands increased with increasing exposure of the intertidal area (Cohen et al. 2008). Maddock et al. (2009) observed shifts to roosting habitats and behaviors during high-tide periods in South Carolina.

LeDee et al. (2008) conducted a remote analysis of piping plover wintering sites, measuring 11 ecological parameters to determine their correlation to piping plover presence. Piping plover abundance was negatively correlated with urban area and total road length, and positively correlated with inter-tidal area, presence on the mainland (as opposed to the peninsula/island feature), and total inter-tidal and beach area (LeDee et al. 2008).

Recent geographic analysis of piping plover distribution on the upper Texas coast noted major concentration areas at the mouths of rivers, washover passes (low, sparsely vegetated barrier island habitats created and maintained by temporary, storm-driven water channels), and major bay systems (Arvin 2008). Earlier studies in Texas have drawn attention to washover passes, which are commonly used by piping plovers during periods of high bayshore tides and during the spring migration period (Zonick 1997; Zonick 2000). Elliott-Smith et al. (2009) reported piping plover concentrations on exposed seagrass beds and oyster reefs during seasonal low water periods in 2006.

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea-level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or the Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). West-central Florida beaches are considered to be low energy beaches with a gradual offshore slope and fine-grained, quartz sand beaches. The dynamics of the Florida shoreline are shaped by the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. The East coast may also experience erosion from late September through March due to nor'easters. Gulf beaches are largely protected from severe nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of 7 feet at the Florida-Georgia line to less than 2 feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than 3 feet (microtidal) except in the extreme south where it ranges from 3 to 4 feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Foraging/Food Habits

Behavioral observations of piping plovers on the wintering grounds suggest that they spend the majority of their time foraging (Nicholls and Baldassarre 1990a; Drake 1999a, 1999b). Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, and ephemeral pools, and adjacent salt marshes (Gibbs 1986; Zivojnovich and Baldassarre 1987; Nicholls 1989; Coutu et al. 1990; Nicholls and Baldassarre 1990a; Nicholls and Baldassarre 1990b; Hoopes 1993; Loegering 1992; Goldin 1993; Elias-Gerken 1994; Wilkinson and Spinks 1994; Zonick 1997; Service 2001a). Studies have shown that the relative importance of various feeding habitat types may vary by site (Gibbs 1986; Coutu et al. 1990; McConnaughey et al. 1990; Loegering 1992; Goldin 1993; Hoopes 1993). Feeding activities may occur during all hours of the day and night (Staine and Burger 1994; Zonick 1997), and at all stages in the tidal cycle (Goldin 1993; Hoopes 1993). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks found on top of the soil or just beneath the surface (Bent 1929; Cairns 1977; Nicholls 1989; Zonick and Ryan 1996).

As observed in Texas studies, Lott et al. (2009) identified bay beaches (bay shorelines as opposed to ocean-facing beaches) as the most common landform used by foraging piping plovers in southwest Florida. However in northwest Florida, Smith (2007) reported landform use by foraging piping plovers about equally divided between Gulf of Mexico (ocean-facing) and bay beaches. Exposed intertidal areas were the dominant foraging substrate in South Carolina (accounting for 94 percent of observed foraging piping plovers; Maddock et al. 2009) and in northwest Florida (96 percent of foraging observations; Smith 2007). In southwest Florida, Lott et al. (2009) found approximately 75 percent of foraging piping plovers on intertidal substrates.

Home Range

Plovers seem to exhibit strong site fidelity to nonbreeding areas. Plovers vary their habitat use, and it is suggested heterogeneous habitats may be more important than specific habitat features for plovers (Drake et al. 2001; Nicholls and Baldassarre 1990b). Mean home range size (95 percent of locations) for 49 radio-tagged piping plovers in southern Texas in 1997 through 1998 was 3,113 acres, mean core area (50 percent of locations) was 717 acres, and the mean linear distance moved between successive locations (1.97 $\pm$ 0.04 days apart) averaged across seasons, was 2.1 miles (Drake 1999a; Drake et al. 2001). Seven radio-tagged piping plovers used a 4,967-acre area (100 percent minimum convex polygon) at Oregon Inlet in 2005 and 2006, and piping plover activity was concentrated in 12 areas totaling 544 acres (Cohen et al. 2008). Noel and Chandler (2008) observed high fidelity of banded piping plovers along a 0.62 and 2.8 mile section of beach on Little St. Simons Island, Georgia.

Life Cycle

Piping plovers spend up to 10 months of their life cycle on their migration and at wintering grounds, generally July 15 through as late as May 15. Piping plover migration routes and habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from breeding or wintering piping plovers. Migration stopovers by banded piping plovers from the Great Lakes have been documented in New Jersey, Maryland, Virginia, and North Carolina (Stucker and Cuthbert 2006). Migrating breeders from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault et al. 2005). As many as 85 staging piping plovers have been tallied at various sites in the Atlantic breeding range (Perkins 2008), but the composition (*e.g.*, adults that nested nearby and their fledged young of the year versus migrants moving to or from sites farther north), stopover duration, and local movements are unknown. In general, distance between stopover locations and duration of stopovers throughout the coastal migration range remains poorly understood.

Predators and Competitors

Plovers face predation by avian and mammalian predators that are present year-round on the wintering grounds. There are minimal studies on the impacts of predation on migrating or wintering piping plovers, and investigations into effects of predation on nonbreeding piping plovers falls under the Great Lakes recovery plan. Predator control on their wintering and migration grounds is considered to be a low priority at this time, except for the threat of disturbance to roosting and feeding piping plovers posed by dogs off leash (Service 2009). Plovers must compete with other shorebirds for suitable foraging and roosting habitat.

Disease Factors

Neither the final listing rule nor the recovery plans state that disease is an issue for the species, and no plan assigns recovery actions to this threat factor. The Piping Plover 5-Year Review: Summary and Evaluation provides additional information on the limited concern of avian influenza and West Nile virus on the species (Service 2009).

Roosting

Several studies identified wrack (organic material including seaweed, seashells, driftwood, and other materials deposited on beaches by tidal action) as an important component of roosting habitat for nonbreeding piping plovers. Lott et al. (2009) found greater than 90 percent of roosting piping plovers in southwest Florida in old wrack with the remainder roosting on dry sand. In South Carolina, 18 and 45 percent of roosting piping plovers were in fresh and old wrack, respectively. The remainder of roosting birds used intertidal habitat (22 percent), backshore (defined as the zone of dry sand, shell, cobble and beach debris from the mean high water line up to the toe of the dune; 8 percent), washover (2 percent), and ephemeral pools (1 percent) (Maddock et al. 2009). Thirty percent of roosting piping plovers in northwest Florida were observed in wrack substrates with 49 percent on dry sand and 20 percent using intertidal habitat (Smith 2007). In Texas, seagrass debris (bayshore wrack) was an important feature of piping plover roosting sites (Drake 1999a). Mean abundance of two other plover species in California, including the listed western snowy plover, was positively correlated with an abundance of wrack during the nonbreeding season (Dugan et al. 2003).

Seven years of surveys, two to three times per month, along 8 miles of Gulf of Mexico (ocean-facing) beach in Gulf County, Florida, cumulatively documented nearly the entire area used at various times by roosting or foraging piping plovers. Birds were reported using the midbeach to the intertidal zone. Numbers ranged from 0 to 39 birds on any given survey day (Eells unpublished data).

Atlantic Coast and Florida studies highlighted the importance of inlets for nonbreeding piping plovers. Almost 90 percent of roosting piping plovers at ten coastal sites in southwest Florida were on inlet shorelines (Lott et al. 2009). Piping plovers were among seven shorebird species found more often than expected ($p = 0.0004$; Wilcoxon Test Scores) at inlet locations versus noninlet locations in an evaluation of 361 International Shorebird Survey sites from North Carolina to Florida (Harrington 2008).

Population dynamics

Population Size

The International Piping Plover Breeding Census is conducted throughout the breeding grounds every 5 years by the Great Lakes/Northern Great Plains Recovery Team of the U.S. Geological Survey (USGS). The census is the largest known, complete avian species census, and is coordinated by Elise Elliott Smith and various state and provincial coordinators. It is designed to determine species abundance and distribution throughout its annual cycle. The last survey in 2006 documented 3,497 breeding pairs, with a total of 8,065 birds throughout Canada and the U.S. A more recent 2010 Atlantic Coast breeding piping plover population estimate was 1,782 pairs, which was more than double the 1986 estimate of 790 pairs. This was determined to be a net increase of 86 percent between 1989 and 2010 (Service 2011). An associated winter census documented a total of 454 piping plovers in Florida (Elliott-Smith et al. 2009). For the Gulf Coast of Florida, the surveys documented 321 piping plovers at 117 sites covering approximately 522 miles of suitable habitat (Elliott-Smith et al 2009). A total of 133 plovers were observed along the Atlantic Coast during the 2009 survey, and Northwest Florida numbers for the 2006 International Piping Plover Census were 111, with an increased survey effort from previous years. This represents an increase from the 53 piping plovers sighted in the 2001 effort. More information on the results of past International Piping Plover Censuses and an analysis of the data is found in the 2009 Service's Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) and in the report published by the USGS (Elliott-Smith et al. 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. Although multiple observations of the same bird may have been documented, these reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR.

Population Variability

The pattern of population growth among the recovery units along the Atlantic Coast was uneven, and was accompanied by periodic declines in both overall and regional populations (Service 2011). Although there is some indication of recovery in the Atlantic Coast population, any optimism should be tempered by observed geographic and temporal variability in population growth.

Population Stability

The most consistent finding in the various population viability analyses conducted for piping plovers (Ryan et al. 1993; Melvin and Gibbs 1996; Plissner and Haig 2000; Wemmer et al. 2001; Larson et al. 2002; Amirault et al. 2005; Calvert et al. 2006; Brault 2007) indicates even small declines in adult and juvenile survival rates will cause increases in extinction risk. A banding study conducted between 1998 and 2004 in Atlantic Canada concluded lower return rates of juvenile (first year) birds to the breeding grounds than was documented for Massachusetts (Melvin and Gibbs 1996), Maryland (Loegering 1992), and Virginia (Cross 1996) breeding populations in the mid-1980s and very early 1990s. This is consistent with failure of the Atlantic Canada population to increase in abundance despite high productivity (relative to other breeding populations) and extremely low rates of dispersal to the U.S. over the last 15 plus years (Amirault et al. 2005). This suggests maximizing productivity does not ensure population increases. However, other studies suggest that survivability is good at wintering sites (Drake et al. 2001). Please see the Piping Plover 5-Year Review: Summary and Evaluation for additional information on survival rates at wintering habitats (Service 2009).

Status and distribution

Reasons for Listing

The 1985 final rule stated the number of piping plovers on the Gulf of Mexico coastal wintering grounds might be declining as indicated by preliminary analysis of the Christmas Bird Count data. Independent counts of piping plovers on the Alabama coast indicated a decline in numbers between the 1950s and early 1980s. At the time of listing, the Texas Parks and Wildlife Department stated 30 percent of wintering habitat in Texas had been lost over the previous 20 years. The final rule also stated, in addition to extensive breeding area problems, the loss and modification of wintering habitat was a significant threat to the piping plover.

Threats to Piping Plovers

The Piping Plover 5-Year Review: Summary and Evaluation (Service 2009) provides an analysis of threats to piping plovers in their migration and wintering range. The threats identified in this document that were of primary concern included the loss and modification of wintering habitat (including shoreline development, beach maintenance and nourishment, inlet dredging, and the construction of jetties and groins).

The Piping Plover 5-Year Review: Summary and Evaluation noted that overutilization for commercial, recreational, scientific, or educational purposes was not a current threat to piping plovers on their wintering and migration grounds. Disease was identified as being only a minor threat. The impacts of predation on nonbreeding populations are largely undocumented, but they remain a potential threat. However, the Service considers predator control on piping plover wintering and migration grounds to be a low priority at this time (Service 2009).

Neither the final listing rule nor the recovery plans state disease is an issue for piping plover, and no plan assigns recovery actions to this threat factor. Based on information available to date, West Nile virus and avian influenza are a minor threat to piping plovers (Service 2009).

Habitat loss and degradation on winter and migration grounds from shoreline and inlet stabilization efforts, both within and outside of designated Critical Habitat, remains a serious threat to all piping plover populations. In some areas, beaches that abut private property are needed by wintering and migrating piping plovers. However, residential and commercial developments that typically occur along private beaches may pose significant challenges for efforts to maintain natural coastal processes. The threat of habitat loss and degradation, combined with the threat of sea-level rise associated with climate change, raise serious concerns regarding the ability of private beaches to support piping plovers over the long term.

Future actions taken on private beaches will determine whether piping plovers continue to use these beaches or whether the recovery of piping plovers will principally depend on public property. As Lott et al. (2009) concludes, "The combination of development and shoreline protection seems to limit distribution of non-breeding piping plovers in Florida. If mitigation or habitat restoration efforts on barrier islands fronting private property are not sufficient to allow plover use of some of these areas, the burden for plover conservation will fall almost entirely on public land managers."

While public lands may not be at risk of habitat loss from private development, significant threats to piping plover habitat remain on many municipal, State, and federally owned properties. These public lands may be managed with competing missions that include conservation of imperiled species, but this goal frequently ranks below providing recreational enjoyment to the public, readiness training for the military, or energy development projects.

Public lands remain the primary places where natural coastal dynamics are allowed. Of recent concern are requests to undertake beach nourishment actions to protect coastal roads or military infrastructure on public lands. If project design does not minimize impediments to shoreline overwash which are necessary to help replenish bayside tidal flat sediments and elevations, significant bayside habitat may become vegetated or inundated, thereby exacerbating the loss of preferred piping plover habitat. Conversely, if beach fill on public lands is applied in a way that allows for "normal" system overwash processes, and sediment is added back to the system, projects may be less injurious to barrier island species that depend on natural coastal dynamics.

Maintaining wrack for food and cover in areas used by piping plovers may help offset effects that result from habitat degradation due to sand placement associated with berm and beach nourishment projects and ensuing human disturbance. Leaving wrack on private beaches may improve use by piping plovers, especially during migration when habitat fragmentation may have a greater effect on the species. In addition, using recreation management techniques, Great Lakes recovery action 2.14 may minimize the effects of habitat loss. Addressing off-road vehicles and pet disturbance may increase the suitability of existing piping plover habitat.

The dredging and mining of sediment from inlet complexes threatens the piping plover on its wintering grounds through habitat loss and degradation. The maintenance of deep draft navigation channels by dredging can alter the natural coastal processes on inlet shorelines of nearby barrier islands (Service 2012). Forty-four percent of the tidal inlets within the U.S. wintering range of the piping plover have been or continue to be dredged, primarily for navigational purposes. The dredging of navigation channels or relocation of inlet channels for erosion-control purposes contributes to the cumulative effects of inlet habitat modification by removing or redistributing the local and regional sediment supply. Dredging can occur on an annual basis or every 2 to 3 years, resulting in continual perturbations and modifications to inlets and their adjacent shoreline habitats (Service 2012).

As sand sources for beach nourishment projects have become more limited, ebb tidal shoals are being utilized as borrow areas more frequently. Exposed ebb and flood tidal shoals and sandbars are prime roosting and foraging habitats for piping plovers. In general, these shoals are only accessible by boat and tend to receive less human recreational use than nearby mainland beaches. This mining of material from inlet shoals for use as beach fill is not equivalent to the natural sediment bypassing due to the virtually instantaneous movement of sand. In a natural system, the sand would gradually and continuously move through the inlet system, providing a greater opportunity for emergent shoals to form (Service 2012).

The Deepwater Horizon oil spill, which started April 20, 2010, discharged into the Gulf of Mexico through July 15, 2010. According to government estimates, the leak released between 100 and 200 million gallons of oil into the Gulf. The U.S. Coast Guard estimates that more than 50 million gallons of oil have been removed from the Gulf, or roughly a quarter of the spill amount. Additional effects to natural resources may be attributed to the 1.84 million gallons of dispersant applied to the spill. As of July 2010, approximately 625 miles of Gulf Coast shoreline was oiled (approximately 360 miles in Louisiana, 105 miles in Mississippi, 66 miles in Alabama and 94 miles in Florida) (Joint Information Center 2010). These numbers reflect a daily snapshot of shoreline that experienced effects from oil; however, they do not include cumulative effects to date, or shoreline that has already been cleaned.

Piping plovers have continued to winter within the Gulf of Mexico shorelines. Researchers have and continue to document oiled piping plovers stemming from this spill. Oiling of designated piping plover Critical Habitat has been documented. Affects to the species and its habitat are expected, but their extent remains difficult to predict. The U.S. Coast Guard, the states, and responsible parties from the Unified Command, with advice from Federal and State natural resource agencies, initiated protective and cleanup efforts per prepared contingency plans to deal with petroleum and other hazardous chemical spills for each state's coastline. The contingency plans identify sensitive habitats, including all federally listed species' habitats, which receive a higher priority for response actions. Those plans allow for immediate habitat protective measures for cleanup activities in response to large contaminant spills. While such plans usually ameliorate the threat to piping plovers, it is yet unknown how much improvement will result in this case given the breadth of the effects associated with the Deepwater Horizon incident.

Based on all available data prior to the Deepwater Horizon oil spill, the risk of effects from contamination to piping plovers and their habitat was recognized, but the safety contingency plans were considered adequate to alleviate most of these concerns. The Deepwater Horizon incident has brought heightened awareness of the intensity and extent of impacts to fish and wildlife habitat from large-scale releases. In addition to potential direct habitat degradation from oiling of intertidal habitats and retraction of stranded boom, effects to piping plovers may occur from the increased human presence associated with boom deployment and retraction, cleanup activities, wildlife response, and damage assessment crews working along shorelines. Research studies are documenting the potential expanse of effects to the piping plover.

Analysis of the species/Critical Habitat likely to be affected

The proposed action has the potential to adversely affect wintering and migrating piping plovers and their habitat from all three breeding populations that may use the Action Area. The Atlantic Coast and Great Plains breeding populations of piping plover are listed as threatened, while the Great Lakes breeding population is listed as endangered. Therefore, this P^3BO considers the potential effects of this project on this species and its designated Critical Habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres (corresponding to approximately 47 miles of beach) as Critical Habitat for wintering piping plovers in peninsular Florida. There are no Corps civil works shore protection projects located in designated Critical Habitat. There are five Corps civil works navigation projects that typically place dredged material in Critical Habitat Units: King's Bay (Unit FL-36), Ponce Inlet (Unit FL-34), St. Lucie Inlet (Unit FL-33), Matanzas Pass (Unit FL-25), and Tampa Harbor (Unit FL-21). Maintenance dredging at these navigational channels typically occurs on 1 to 5 year intervals. These five units account for 1,749 acres (10 miles) of the 23,709 acres of total designated Critical Habitat in the Action Area (or 7.4 percent). These and other Critical Habitat Units may also be affected by non-Civil Works projects under Corps regulatory authority.

This P^3BO does not rely on the regulatory definition of "destruction or adverse modification" of Critical Habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to Critical Habitat.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area

As mentioned in Section II(C)1, the 2006 International Piping Plover Census surveys documented 321 wintering piping plovers at 117 sites covering approximately 522 miles of suitable habitat along the Gulf Coast of Florida, and an additional 133 plovers along the Atlantic Coast (Elliott-Smith et al 2009). In addition, bird populations throughout Florida are monitored by volunteers and The Conservancy of Southwest Florida. Launched in 2002, by the Cornell Lab of Ornithology and National Audubon Society, eBird provides data concerning bird abundance and distribution at a variety of spatial and temporal scales. eBird is sponsored in part by several

Service programs, research groups, non-government offices, and the University of the Virgin Islands. From January through November 2012, 703 reports of piping plovers were documented in the Action Area by eBird members. These reports included observations totaling 3,466 individuals; 240 reports with observations of 752 individuals located in the NFESO AOR, and 337 reports with observations of 2,032 individuals located in the SFESO AOR. It is important to note many of these observations may be multiple observations of the same specimen; therefore, these numbers do not represent a population estimate.

The Action Area encompasses 11 Critical Habitat Units in the NFESO's AOR (Figure 1), and an additional 11 Critical Habitat Units in the SFESO's AOR (Figure 2). The descriptions of the Critical Habitat Units associated with the proposed action vary, but generally include land from mean lower low water to where densely vegetated habitat or developed structures, not used by piping plovers, begin and where the PCEs no longer occur. The PCEs consist of intertidal flats including sand or mud flats with no or very sparse emergent vegetation. In addition, adjacent unvegetated or sparely vegetated sand, mud, or algal flats above high tide are important.

Factors affecting the species environment within the Action Area

Coastal development

Shoreline development throughout the wintering range poses a threat to all populations of piping plovers. Beach maintenance and nourishment, inlet dredging, and artificial structures, such as jetties and groins, can eliminate wintering areas and alter sedimentation patterns leading to the loss of nearby habitat. Structural development along the shoreline or manipulation of natural inlets upsets the dynamic processes and results in habitat loss or degradation (Melvin et al. 1991). Increased coastal development brings other recreational disturbances that are known to prevent bird usage of an area, including human disturbance, predation or disturbance by domestic animals, beach raking and cleaning, and habitat degradation by off-road vehicles (Service 2009).

Recreational management techniques, such as vehicle restrictions, pet restrictions, and symbolic fencing (usually sign posts and string) of roosting and feeding habitats, can help to address anthropogenic disturbances to wintering plovers. Educational materials, such as informational signs or brochures, can also provide valuable information to assist the public in understanding the need for conservation measures. Although these measures can be effective, they are not implemented consistently throughout the State.

Accelerated sea-level rise

Potential effects of sea-level rise on coastal beaches vary regionally due to subsidence or uplift as well as the geological character of the coast and nearshore (Service 2009). Low elevations and proximity to the coast make all nonbreeding coastal piping plover foraging and roosting habitats vulnerable to the effects of rising sea-level. Furthermore, areas with small astronomical tidal ranges (*e.g.*, portions of the Gulf Coast where intertidal range is less than 3.3 feet) are the most vulnerable to loss of intertidal wetlands and flats induced by sea-level rise (EPA 2009).

Inundation of piping plover habitat by rising seas could lead to permanent loss of habitat that lies immediately seaward of numerous structures or roads, especially if those shorelines are also armored with hardened structures. Without development or armoring, low undeveloped islands can migrate toward the mainland, pushed by the overwashing of sand eroding from the seaward side and being re-deposited in the bay (Scavia et al. 2002). Overwash and sand migration are impeded on developed portions of islands. Instead, as sea-level increases, the ocean-facing beach erodes and the resulting sand is deposited offshore. The buildings and the sand dunes then prevent sand from washing back toward the lagoons, and the lagoon side becomes increasingly submerged during extreme high tides (Scavia et al. 2002), diminishing both barrier beach shorebird habitat and protection for mainland developments.

A number of groups have met to discuss climate change and its potential impacts to Florida. In 2007, Governor Charlie Crist hosted "Serve to Preserve: A Florida Summit on Global Climate Change." To combat climate change, this summit focused on methods for reducing emissions to avoid contributing to climate change. It did not address efforts to limit coastal development or to encourage more natural coastal processes. Based on the present level of available information concerning the effects of global climate change on the status of the piping plover and its designated Critical Habitat, the Service acknowledges the potential for changes to occur in the Action Area.

Sand placement activities

Sand placement projects have the potential to alter piping plover habitat, including the PCEs of Critical Habitat. Beach nourishment can create a beach seaward of existing hard stabilization or heavy development, where the beach has been lost due to erosion and/or sea-level rise, restoring associated ecosystem functions. Although dredge and fill projects that place sand on beaches or dunes may restore lost or degraded habitat, these projects may degrade habitat by altering the natural sediment composition and depressing the invertebrate base in some areas. This hinders habitat migration with sea-level rise, and replaces the natural dune beach nearshore system with artificial geomorphology (Service 2012). Lott et al. (2009) found a strong negative correlation between sand placement projects and the presence of plovers on the Gulf Coast of Florida; however, he noted that additional research was needed to clarify whether the cause was the sand placement project or the tendency for these projects to be located on highly developed shorelines. Harrington (2008) noted the need for a better understanding of the potential effects of inlet-related projects, such as jetties, on bird habitats.

In areas where the shoreline is highly eroded, sand placement activities can improve piping plover foraging and roosting habitat (National Research Council 1995). Sand placement activities add sand to the sediment budget, increasing the beach width and providing a sand source for emergent nearshore features to form. Although there is some research related to the management of beach nourishment projects to better maintain the habitat for piping plovers, much of this research is focused on beaches in the northern U.S. where breeding occurs (Melvin et al. 1991; Houghton 2005; Maslo et al. 2010). In their wintering grounds, increasing beach width is an important aspect of beach nourishment projects in highly developed, eroding areas. The timing of the project is also important in preventing impacts to piping plovers as a result of sand placement activities.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on wintering piping plovers within the Action Area. The analysis includes effects of interrelated and interdependent activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by wintering piping plovers. Since piping plovers can be present on these beaches for up to 10 months per year, construction is likely to occur while the species is utilizing these beaches and associated habitats. Short-term and temporary impacts to piping plover activities could result from project work occurring on the beach that flushes birds from roosting or foraging habitat. Long-term impacts could include a hindrance in the ability of wintering plovers to recuperate from their migratory flight from their breeding grounds, survive on their wintering areas, or to build fat reserves in preparation for migration back to their breeding grounds. Long-term impacts may also result from changes in the physical characteristics of the beach from the placement of the sand.

Proximity of the action

Maintenance dredging of navigational inlets occurs throughout the state in both Federal and non-Federal channels. Sand placement activities (resulting from both shore protection projects and placement of dredged materials as a result of maintenance dredging activities) would occur within and adjacent to wintering piping plover foraging and roosting habitats. Groin and jetty repair or replacement would occur adjacent to inlets, or along beach habitats where they may be used to stabilize the beach and limit erosion.

Distribution

Sand placement activities that may impact piping plover roosting and foraging would occur along both the Gulf of Mexico and the Atlantic Ocean coasts. The Service expects the proposed construction activities could directly and indirectly affect the availability of habitat for migrating and wintering piping plovers to roost and forage. The proposed construction activities are also expected to cause piping plovers usage of Critical Habitat Units located within the Action Area to temporarily decrease.

Timing

The timing of maintenance dredging, sand placement, and groin/jetty repairs or replacement activities may occur during or outside of the migration and wintering period for piping plovers (July 15 to May 15). For projects occurring outside of the migration and wintering period, the Service expects indirect effects to occur later in time.

Nature of the effect

Although the Service expects direct short-term effects from disturbance during project construction, it is anticipated the action will also result in direct, and indirect, long term effects to piping plovers and Critical Habitat. The Service expects there may be morphological changes to piping plover habitat, including roosting and foraging habitat, and to Critical Habitat within the Action Area. Activities that affect or alter the use of optimal habitat, Critical Habitat, or increase disturbance to the species may decrease the survival and recovery potential of the piping plover. Effects to piping plovers and their habitat as a result of groin and jetty repair or replacement will primarily be due to construction ingress and egress when construction is required to be conducted from land. In addition, construction materials and equipment may need to be stockpiled on the beach. These effects would be more likely to be experienced with repair or replacement of groin structures that are located in shallower water, as the majority of work done to jetties is conducted from the water or from the crest of the structure (Martin 2013).

Duration

Time to complete the project construction varies depending on the project size, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). According to Corps estimations, project work could take as little as 1 month and as long as 2 years. Piping plover habitats would remain disturbed until the project is completed and the habitats are restored. Beach restoration projects would typically be complete in 6 to 12 months. The direct effects would be expected to be short-term in duration, until the benthic community reestablishes within the new beach profile. Indirect effects from the activity, including those related to altered sand transport systems, may continue to occur as long as sand remains on the beach.

The effects of the proposed action are of a temporary quantitative and qualitative nature. The habitat will be temporarily unavailable to wintering plovers during the construction period, and the quality of the habitat will be reduced for several months following project activities. Dredging in inlets where emergent shoals have formed would result in a loss of optimal piping plover habitat, which may or may not reform in the same quality or quantity in the future. Dredging inlets, repairing and replacing groins or jetties, or sand placement during months when piping plovers are present causes disturbance that disrupts the birds' foraging efficiency and hinders their ability to build fat reserves over the winter and in preparation for migration, as well as their recuperation from migratory flights (Service 2009). The mean linear distance moved by wintering plovers from their core area is estimated to be approximately 2.1 miles (Drake et al.

2001), suggesting they could be negatively impacted by temporary disturbances anywhere in their core habitat area. The PCEs associated with designated Critical Habitat would be temporarily adversely affected during and following sand placement, but may also experience some positive benefits from the increase in available beach and its associated new wrack.

Disturbance frequency

The frequency of maintenance dredging activities varies greatly, and can be as often as annually or semiannually at some inlets that experience high rates of shoaling, or as infrequently as once every 7 years at inlets that do not experience high rates of shoaling. Sand placement activities as a result of shore protection activities typically occur once every 5 to 7 years. Dredging and sand placement can occur at any time during the year based on availability of funding, other applicable species' windows, and the availability of dredges to conduct the work.

The disturbance frequency related to groin and jetty repair and replacement varies greatly based on the original construction methodology, the construction materials, and the conditions under which the structure is placed. Most structures in Florida are constructed with Florida limerock or granite (preferred). Granite structures can last 50 years or more without requiring maintenance, while limerock structures may require maintenance on a slightly more frequent basis due to their lower densities. On average, hard structures are designed to require only minor repairs (such as replacing dislocated rock) that would only be expected approximately every 20 years (Martin 2013).

Disturbance severity

The Action Area encompasses a large percentage of the wintering range of the piping plover; however, the overall intensity of the disturbance is expected to be minimal. The intensity of the effect on piping plover habitat may vary depending on the frequency of the sand placement activities, the existence of staging areas, and the location of the beach access points. The severity is also likely to be slight, as plovers located within the Action Area are expected to move outside of the construction zone due to disturbance; therefore, no plovers are expected to be directly taken as a result of this action.

Analyses for effects of the action

The Action Area encompasses peninsular Florida within the AORs of the NFESO and the SFESO on both the Atlantic and Gulf coasts of Florida. It consists mostly of designated piping plover Critical Habitat Units and publicly owned land that exhibits the following features: located within 1 mile of an inlet; emergent nearshore sand bars; washover fans; emergent bayside and Ocean/Gulf-side shoals and sand bars; bayside mudflats, sand flats, and algal flats; or bayside shorelines of bays and lagoons.

Direct effects

Sand placement projects that utilize beach compatible material from either an appropriate borrow site or from the authorized Federal channel, have the potential to elevate the beach berm and widen the beach, providing storm protection and increasing recreational space. The construction window (*i.e.,* sand placement, dredging, groin and jetty repair/replacement) for each event is likely to extend through a portion of at least one piping plover migration and winter season. If material is placed on the beach, heavy machinery and equipment (*e.g.,* trucks and bulldozers operating on Action Area beaches, the placement of the dredge pipeline, and sand placement) may adversely affect migrating and wintering piping plovers in the Action Area by disturbing and disrupting normal activities such as roosting and feeding, and possibly forcing birds to expend valuable energy reserves to seek available habitat in adjacent areas along the shoreline. Sand placement may occur in and adjacent to habitat that appears suitable for roosting and foraging piping plovers, or that will become more optimal with time. Short-term and temporary construction effects to piping plovers will occur if the birds are roosting and feeding in the area during a migration stopover. The deposition of sand may temporarily deplete the intertidal food base along the shoreline and temporarily disturb roosting birds during project construction.

For some highly eroded beaches, sand placement will have a beneficial effect on the habitat's ability to support wintering piping plovers. Narrow beaches that do not support a productive wrack line may see an improvement in foraging habitat available to piping plovers following sand placement. The addition of sand to the sediment budget may also increase a sand-starved beach's likelihood of developing habitat features valued by piping plovers, including washover fans and emergent nearshore sand bars.

Maintenance dredging of shallow-draft inlets can occasionally require the removal of emergent shoals that may have formed at the location of the Federally-authorized channel from the migration of the channel over time. In these cases, the dredging activities would result in a complete take of that habitat. However, this take could be either temporary or more permanent in nature depending upon the location of future shoaling within the inlet.

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979; Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983; Pilkey et al. 1984). As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water, where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983). The proposed activities associated with this P^3BO only include the repair and replacement of existing groins and jetties. Since the primary effects associated with groins and jetties are associated with their alteration of sand movement, the effects would not change with the proposed action. Temporary adverse effects to the piping plover from disruption in the immediate vicinity of the project would occur during construction.

Indirect effects

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. During sand placement, suffocation of invertebrate species will occur and degrade the suitability of the habitat for foraging. The effects to the benthic communities and the indirect effects to the piping plover will occur even if sand placement activities occur outside the piping plover migration and wintering seasons. Timeframes projected for benthic recruitment and re-establishment following sand placement are between 6 months and 2 years. Tilling to loosen compacted sand, sometimes required following beach nourishment to minimize effects to nesting sea turtles, may affect wrack that has accumulated on the beach. However, tilling is usually conducted above the wrack line. This may affect feeding and roosting habitat for piping plovers since they often use wrack for cover and foraging.

Natural, undeveloped barrier islands need storms and overwash to maintain the physical and biological environments they support (Young et al. 2006). Sand placement may limit washover fans from developing, which could accelerate the successional state of sand flats such that they will likely become vegetated within a few years (Leatherman 1988). This may reduce an area's value to foraging and roosting piping plovers. The piping plover's rapid response to habitats formed by washovers from the hurricanes in 2004 and 2005 in the Florida panhandle at Gulf Islands National Seashore and Eglin Air Force Base's Santa Rosa Island, and similar observations of their preferences for overwash habitats at Phipps Preserve and Lanark Reef in Franklin County, Florida, and elsewhere in their range, demonstrate the importance of these habitats for wintering and migrating piping plovers.

Restoration of beaches through sand placement may increase recreational pressures within the project area. Recreational activities, including increased pedestrian use, have the potential to adversely affect piping plovers through disturbance and through increased presence of predators, including both domestic animals and feral animals attracted by the presence of people and their trash. Long-term effects could include a decrease in piping plover use of habitat due to increased disturbance levels.

Pilkey and Dixon (1996) stated beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development, which leads to the need for more and larger protective measures. Greater development may also support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas. Optimal habitat for the piping plover often occurs on publicly owned lands where human development may be limited; however, development of roads, bridges, and recreational facilities may be subject to scenarios similar to those described above.

Species' response to the proposed action

The Service bases this P^{3}BO on anticipated direct and indirect effects to piping plovers (wintering and migrating) and their Critical Habitat as a result of dredging, sand placement on beaches, and groin and jetty repair/replacement, which may prevent the maintenance or formation of habitat that piping plovers consider optimal for foraging and roosting. Heavy machinery and equipment (*e.g.*, trucks and bulldozers operating on project area beaches, the placement of the dredge pipeline along the beach, and sand disposal) may adversely affect migrating and wintering piping plovers in the project area by disturbance and disruption of normal activities such as roosting and forging, and possibly forcing piping plovers to expend valuable energy reserves to seek available habitat elsewhere. In addition, foraging in suboptimal habitat by migrating and wintering piping plovers may reduce the fitness of individuals. Furthermore, increased and continual disturbance within optimal habitat, including Critical Habitat Units, could have effects on all three breeding populations of piping plovers.

Cumulative effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the Action Area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

It is reasonably certain coastal development, human occupancy, and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. However, areas identified as optimal piping plover habitat are not as likely to be affected by coastal development and human occupancy, since they are primarily protected areas that are relatively undeveloped compared to other beaches in Florida. Optimal Piping Plover Areas may still experience heavy recreational use. It is unknown how much influence beach nourishment will contribute to the development and recreational use of the shoreline. Most activities affecting designated piping plover Critical Habitat would require Federal permits or funding. The Service is unable to identify any specific activities that would be considered cumulative effects.

CONCLUSION

There are 2,340 miles of sandy shoreline available (although not necessarily suitable) throughout the piping plover wintering range within the conterminous U.S. The primary effects of the proposed activities are to piping plover foraging and roosting habitat, and these effects are typically limited to the first year following project construction. Beach wrack and the benthic community are often reestablished between 6 months and 1 year following project construction.

In the long-term, sand placement activities will add sediment to the system that could otherwise be removed as part of inlet maintenance, and increase the availability of suitable habitat for the species.

After reviewing the current status of the northern Great Plains, Great Lakes, and Atlantic Coast wintering piping plover populations, the environmental baseline for Action Area, the effects of the proposed activities, the Conservation Measures proposed by the Corps, and the cumulative effects, it is the Service's biological opinion that implementation of these actions, as proposed, is not likely to jeopardize the continued existence of the piping plover.

In addition, after reviewing the current status of the affected species, the environmental baseline for the Action Area, the effects of the proposed activities, and the cumulative effects, it is the Service's biological opinion the action, as proposed, will not adversely modify designated critical habitat for the reason given below.

Although some Critical Habitat Units may be impacted by project activities, these would most frequently be units or portions of units that are highly eroded and where habitat for piping plovers has become degraded. In these instances, the adverse effects of project activities would be offset over time by beneficial effects associated with the restoration of beaches. In all cases, neither the negative nor the positive effects of beach nourishment are likely to be permanent due to the dynamic nature of shoreline processes. Project activities would not affect a Critical Habitat Unit to the extent that, over time, the unit would be unable to serve its intended purposes. Therefore, any loss of habitat would not have a significant effect on the species' persistence or on the function of these Critical Habitat Units as a whole.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be implemented by the Corps so they become binding conditions of any permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the Terms and

Conditions or, (2) fails to adhere to the Terms and Conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. In order to monitor the effects of incidental take, the Corps must report the progress of the action and its effects on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

It is difficult for the Service to estimate the exact number of piping plovers that could be migrating through or wintering within the Action Area at any one point in time and place during project construction. Disturbance to suitable habitat resulting from both dredging and sand placement activities within the Action Area would affect the ability of an undetermined number of piping plovers to find suitable foraging and roosting habitat during the migrating and wintering periods of any given year. Because the number of piping plovers that would be affected by projects cannot be determined, the Service will use the annual disturbance in shoreline miles as a surrogate for take.

The FDEP's Critically Eroded Beaches in Florida report identified 204.2 miles of critically eroded beaches on the Atlantic Coast of Florida, and an additional 102.3 miles of critically eroded beaches on the Gulf Coast of Florida in the Action Area (FDEP 2012). FDEP's definition of "critically eroded" requires upland development, recreation, wildlife habitat, or important cultural resources to be threatened. Due to the threat to upland interests, it is anticipated that beaches identified by FDEP to be critically eroding would be the most likely to be affected by the proposed action. Of the 204.2 miles of critically eroded beaches on the Atlantic Coast, approximately 49.4 miles are located on public lands primarily managed for conservation purposes; on the Gulf Coast, approximately 14.7 miles of the 102.3 miles of critically eroded beaches are located on public lands, for a total of 64.1 miles in the Action Area that are most likely to be affected. We acknowledge some additional public lands that are not defined as critically eroded and not included in the estimate above may also be affected. However, not all public lands have habitat elements that support migrating or wintering piping plover on a regular basis; therefore, some public lands included in the estimate above are not optimal piping plover habitat.

The July 10, 2001, FR notice designated approximately 27,328 acres, corresponding to approximately 47 miles of beach, as Critical Habitat for wintering piping plovers in peninsular Florida. Most designated Critical Habitat is publicly owned (see Appendix A) and the Critical Habitat most likely to be disturbed would fall under the critically eroded, publicly owned category, part of the estimated 64.1 miles of beach cited above.

An additional 15.0 miles of beach in six units are defined as optimal piping plover habitat, but not located on publically-owned lands or Critical Habitat Units. Over time, most or all of these areas may be subject to project-related disturbance. Therefore, the total shoreline (optimal piping plover habitat) estimated to be effected by the proposed action is 79.1 miles, rounded for our purposes to 80 miles. It is estimated approximately 10 percent or less of the total 80 miles of potentially affected optimal habitat would be impacted in any given year (or approximately 8 miles). In years following emergency events, the impacted area is expected to increase to approximately 25 percent or less of the total mileage, or 20 miles of shoreline. Over the past 10 years, two Congressional Orders occurred due to emergency events (2004-2005 hurricane season, and the 2012 hurricane season). The increased sand placement activities due to emergency events are anticipated to occur once in a 7-year period. This estimate is considered to be conservative, as many of the lands identified as optimal piping plover habitat are undeveloped. Since upland development is generally not threatened in these areas, the cost of placing sand on these shorelines is not justified.

Sand placement resulting from maintenance dredging projects is the most likely activity to affect these areas due to the preference to keep sand within the littoral system. It is expected the exact mileage of shoreline affected by the proposed action will vary from year to year. Maintenance dredging and sand placement activities may result in an unspecified number of piping plovers occupying these areas to be taken in the form of harm (*e.g.*, death, injury) and harassment as a result of this action.

EFFECT OF THE TAKE

In this P^3BO, the Service determined the proposed project is not likely to result in jeopardy to the piping plover.

REASONABLE AND PRUDENT MEASURES

The Service has determined the following Reasonable and Prudent Measures are necessary and appropriate to minimize take of the piping plover in the Action Area. If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the Term and Condition is not reasonable and prudent for the specific project or activity and request exception under the P^3BO; or

2. Initiate consultation with the Service for the specific project or activity.

The Service may respond by either of the following:

1. Allowing an exception to the Terms and Conditions under the P^3BO; or

2. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

The post construction survey requirements are described in Reasonable and Prudent Measure #5 and Term and Condition #8. These requirements are subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps will notify the Service when initiating consultation for the project.

1. All sand placed on the beach or in the nearshore shall be compatible with the existing beach and will maintain the general character and functionality of the existing beach.

2. The Corps or the Applicant will notify the Service of the commencement of projects that utilize this P^3BO for the purposes of tracking incidental take of the species.

3. The Corps shall protect habitat features considered preferred by plovers outside of the project footprint in accordance with Terms and Conditions 3, 4, 5, and 6.

4. The Corps will facilitate awareness of piping plover habitat by educating the public on ways to minimize disruption to the species.

5. The Corps, the Applicant, or the local sponsor shall provide the mechanisms necessary to monitor impacts to piping plovers within the Action Area.

6. The Corps shall facilitate an annual meeting with the Service to assess the effectiveness of the protection and minimization measures outlined in this P^3BO.

TERMS AND CONDITIONS

1. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

2. The Corps or the Permittee must provide the following information to the Service Field Supervisor of the appropriate Field Office at least 10 business days prior to the commencement of work:

    a. Project location (include FDEP Range Monuments and latitude and longitude coordinates);
    b. Project description (include linear feet of beach, actual fill template, access points, and borrow areas);
    c. Date of commencement and anticipated duration of construction; and
    d. Names and qualifications of personnel involved in piping plover surveys.

3. Prior to construction, the Corps shall delineate preferred piping plover habitat (intertidal portions of ocean beaches, ephemeral pools, washover areas, wrack lines) adjacent to or outside of the project footprint that might be impacted by construction activities. Obvious identifiers shall be used (for example, pink flagging on metal poles) to clearly mark the beginning and end points to prevent accidental impacts to use areas.

4. Piping plover habitat delineated adjacent to or outside of the project footprint shall be avoided to the maximum extent practicable when staging equipment, establishing travel corridors, and aligning pipeline.

5. Driving on the beach for construction shall be limited to the minimum necessary within the designated travel corridor, which will be established just above or just below the primary "wrack" line.

6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of piping plovers. Workers shall be briefed on the importance of not littering and keeping the project area trash and debris free. See Appendix B for examples of suitable receptacles.

7. Educational signs shall be installed at public access points within the project area with emphasis on the importance of the beach habitat and wrack for piping plovers. When the project area has a pet or dog regulation, the provisions of the regulation shall be included on the educational signs.

8. For one full piping plover migration and winter season (beginning July 15 to May 15) prior to construction, and 2 years following each dredging and sand placement event, bi-monthly (twice-monthly) surveys for piping plovers shall be conducted in the beach fill and in any other intertidal or shoreline areas within or affected by the project. If a full season is not available, at least 5 consecutive months with three surveys per month spaced at least 9 days apart are required. During emergency projects, the surveys will begin as soon as possible prior to, and up to implementing the project. Piping plover identification, especially when in non-breeding plumage, can be difficult. If pre-construction monitoring is not practicable, it will be so indicated in the notification to the Service (see Term and Condition #2 above) and the Service will decide whether to require a separate individual consultation. See introductory paragraph to Reasonable and Prudent Measures earlier in this document.

9. The person(s) conducting the survey must demonstrate the qualifications and ability to identify shorebird species and be able to provide the information listed below.
   The following will be collected, mapped, and reported:

a. Date, location, time of day, weather, and tide cycle when survey was conducted;
b. Latitude and longitude of observed piping plover locations (decimal degrees preferred);
c. Any color bands observed on piping plovers;
d. Behavior of piping plovers (*e.g*., foraging, roosting, preening, bathing, flying, aggression, walking);
e. Landscape features(s) where piping plovers are located (*e.g*., inlet spit, tidal creeks, shoals, lagoon shoreline);
f. Habitat features(s) used by piping plovers when observed (*e.g*., intertidal, fresh wrack, old wrack, dune, mid-beach, vegetation);
g. Substrata used by piping plovers (*e.g*., sand, mud/sand, mud, algal mat);
h. The amount and type of recreational use (*e.g*., people, dogs on or off leash, vehicles, kite-boarders); and
i. All other shorebirds/waterbirds seen within the survey area.

All information shall be provided in an Excel spreadsheet. Monitoring results shall be submitted (datasheets, maps, database) on standard electronic media (*e.g*., CD, DVD) to the appropriate Field Office by July 31 of each year in which monitoring is completed. If an appropriate web based reporting system becomes available, it would be used in lieu of hard copy/media.

[NOTE: As a condition to a permit from the FDEP, the bird monitor may also be required to report shorebird data to the Florida Fish and Wildlife Conservation Commission (FWC) https://public.myfwc.com/crossdoi/shorebirds/SigninExploreData.aspx.]

10. The Corps shall meet with the Service and the FWC (and BOEM as appropriate) annually to discuss the effectiveness of the avoidance measures and additional measures to include for future projects. The agencies will also review the projects utilizing this P^{3}BO the previous year to ensure that the reporting requirements for calculating the extent of take are adequate. This meeting will also explore:

    a. The possibility of using dredged materials to enhance potential or existing piping plover habitat within and adjacent to the project area;
    b. Methods for funding beneficial use opportunities for dredged materials that are not least-cost disposal to benefit piping plovers and their habitat;
    c. The development of shore protection design guidelines that can be utilized during future project planning to protect and/or enhance piping plover habitat; and
    d. Incorporating artificial lagoons or ephemeral pools into project designs adjacent to inlets where sand placement is proposed.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or Critical Habitat, to help implement recovery plans, or to develop information.

1. The Corps will facilitate a meeting between the Applicant or the local sponsor, the FWC, and the Service to discuss steps for the long-term protection of wrack within the project area; and

2. The Service encourages continued investigation into opportunities for increasing monitoring for Civil Works operations and maintenance projects.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

The amount or extent of incidental take for piping plovers will be considered exceeded if sand is placed on more than 8 miles of optimal piping plover shoreline during a nonemergency year, and a maximum of 20 miles of optimal piping plover shoreline during or following an emergency event (declared disaster or Congressional Order) as a result of this programmatic action. If the anticipated level of incidental take is exceeded during the course of this action, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or Critical Habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or Critical Habitat not considered in this opinion; or (4) a new species is listed or Critical Habitat designated that may be affected by the action. Reinitiation of formal consultation is also required 10 years after the issuance of this P^3BO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

MIGRATORY BIRD TREATY ACT

Migratory Bird Treaty Act (MBTA) for all Projects:

Comply with the FWC's standard shorebird protection guidelines to protect against impacts to nesting shorebirds during implementation of these projects on the Gulf Coast during the periods from February 15-August 31 or on the Atlantic Coast from April 1- August 31. All sand placement events could impact nesting shorebirds protected under the MBTA.

***The MBTA implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA it is unlawful by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

LITERATURE CITED

Amirault, D.L., F. Shaffer, K. Baker, A. Boyne, A. Calvert, J. McKnight, and P. Thomas. 2005. Preliminary results of a five year banding study in Eastern Canada – support for expanding conservation efforts to non-breeding sites? Unpublished Report. Canadian Wildlife Service; Ontario, Canada.

Arvin, J. 2008. A survey of upper Texas coast critical habitats for migratory and wintering piping plover and associated resident "sand plovers". Gulf Coast Bird Observatory's interim report to Texas Parks and Wildlife Department; Austin, Texas.

Below, T.H. 2010. Wintering and winter site-fidelity of Piping Plovers *Charadrius melodus* in SW Florida, USA. *Wader Study Group Bulletin.* 117(1):51–55.

Bent, A.C. 1929. Life histories of North American Shorebirds. *U.S. Natural Museum Bulletin* 146:236-246.

Brault, S. 2007. Population viability analysis for the New England population of the piping plover (*Charadrius melodus*). Report 5.3.2-4. Prepared for Cape Wind Associates, L.L.C.; Boston, Massachusetts.

Cairns, W.E. 1977. Breeding biology and behaviour of the piping plover *Charadrius melodus* in southern Nova Scotia. M.S. thesis. Dalhousie University; Halifax, Nova Scotia.

Calvert, A.M., D.L. Amirault, F. Shaffer, R. Elliot, A. Hanson, J. McKnight, and P.D. Taylor. 2006. Population assessment of an endangered shorebird: The piping plover (*Charadrius melodus melodus*) in eastern Canada. *Avian Conservation and Ecology* 1(3):4.

Cohen, J.B., S.M. Karpanty, D.H. Catlin, J.D. Fraser, and R.A. Fischer. 2008. Winter ecology of piping plovers at Oregon Inlet, North Carolina. *Waterbirds* 31:472-479.

Cohen, J. 2009. Feasibility and utility of survival modeling for detecting differences in piping plover survival across their breeding and wintering range. Report to U.S. Fish and Wildlife Service; Sudbury, Massachusetts. 10 pp.

Coutu, S.D., J.D. Fraser, J.L. McConnaughy, and J.P. Loegering. 1990. Piping plover distribution and reproductive success on Cape Hatteras National Seashore. Unpublished report. Cape Hatteras National Seashore; Manteo, North Carolina.

Cross, R.R. 1990. Monitoring, management and research of the piping plover at Chincoteague National Wildlife Refuge. Unpublished report. Virginia Department of Game and Inland Fisheries; Richmond, Virginia.

Cross, R.R. 1996. Breeding ecology, success, and population management of the piping plover at Chincoteague National Wildlife Refuge, Virginia. M.S. thesis. College of William and Mary; Williamsburg, Virginia.

Dean, R.G. 1999. Design considerations for coastal zones exposed to hurricane-induced wave action. *New Orleans Structures Congress*.

Drake, K. L. 1999a. Time allocation and roosting habitat in sympatrically wintering piping and snowy plovers. M. S. thesis. Texas A&M University; Kingsville, Texas.

Drake, K.R. 1999b. Movements, habitat use and survival of wintering piping plovers. M.S. thesis. Texas A&M University; Kingsville, Texas.

Drake, K.R., J.E. Thompson, K.L. Drake, and C. Zonick. 2001. Movements, habitat use, and survival of non-breeding piping plovers. *Condor* 103:259–267.

Dugan, J.E., D.M. Hubbard, M.D. McCrary, and M.O. Pierson. 2003. The response of macrofauna communities and shorebirds to macrophyte wrack subsidies on exposed sandy beaches of southern California. *Estuarine, Coastal and Shelf Science* 58:25-40.

Eells, B. Unpublished data. Piping plover winter and migration survey data collected from Indian Pass to Cape San Blas, Gulf County, Florida from 2002-2009.

Elias-Gerken, S.P. 1994. Piping plover habitat suitability on central Long Island, New York barrier islands. M.S. thesis. Virginia Polytechnic Institute and State University; Blacksburg, Virginia.

Elliott-Smith, E. and S. M. Haig. 2004. Piping plover *(Charadrius melodus), in* The birds of North America online (A. Poole, ed). Ithaca: Cornell Lab of Ornithology. Available at http://bna.birds.cornell.edu/bna/species/002/articles/introduction, accessed April 2013.

Elliott-Smith, E., S.M. Haig, and B.M. Powers. 2009. Data from the 2006 International Piping Plover Census: U.S. Geological Survey Data Series 426. 332 pp.

Environmental Protection Agency (EPA). 2009. Coastal Zones and sea level rise. Accessed on 18 December 2012 at http://www.epa.gov/climatechange/impacts-adaptation/coasts.html.

Ferland, C.L. and S.M. Haig. 2002. 2001 International piping plover census. U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center; Corvallis, Oregon.

Florida Department of Environmental Protection (FDEP). 2012. Critically eroded beaches in Florida. Bureau of Beaches and Coastal Systems, Division of Water Resource Management. Updated, June 2012. Accessed online at http://www.dep.state.fl.us/beaches/publications/pdf/critical-erosion-report-2012.pdf.

Gibbs, J.P. 1986. Feeding ecology of nesting piping plovers in Maine. Unpublished report. The Nature Conservancy; Topsham, Maine.

Goldin, M.R., C. Griffin, and S. Melvin. 1990. Reproductive and foraging ecology, human disturbance, and management of piping plovers at Breezy Point, Gateway National Recreational Area, New York, 1989. Progress Report. U.S. Fish and Wildlife Service; Newton Corner, Massachusetts.

Goldin, M.R. 1993. Piping plover (*Charadrius melodus*) management, reproductive ecology, and chick behavior at Goosewing and Briggs Beaches, Little Compton, Rhode Island, 1993. The Nature Conservancy; Providence, Rhode Island.

Gratto-Trevor, C., D. Amirault-Langlais, D. Catlin, F. Cuthbert, J. Fraser, S. Maddock, E. Roche, and F. Shaffer. 2009. Winter distribution of four different piping plover breeding populations. Report to U.S. Fish and Wildlife Service. 11 pp.

Haig, S.M. 1992. Piping plover. *In* The Birds of North America, No. 2 (A. Poole, P. Stettenheim, and F. Gill, eds). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union. 17 pp.

Haig, S.M. and E. Elliott-Smith. 2004. Piping Plover. The Birds of North America Online [Internet]. Cornell Laboratory of Ornithology; Ithaca, New York [cited January 6, 2011]. Available from: http://bna.birds.cornell.edu/BNA/account/Piping_Plover/

Hake, M. 1993. 1993 summary of piping plover management program at Gateway NRA Breezy Point district. Unpublished report. Gateway National Recreational Area; Long Island, New York.

Harrington, B.R. 2008. Coastal inlets as strategic habitat for shorebirds in the Southeastern United States. Technical Notes Collection ERDC TN-DOER-E25. U.S. Army Corps of Engineers Research and Development Center; Vicksburg, Mississippi.

Hoopes, E.A. 1993. Relationships between human recreation and piping plover foraging ecology and chick survival. M.S. Thesis. University of Massachusetts. 106 pp.

Houghton, L.M. 2005. Piping plover population dynamics and effects of beach management practices on piping plovers at West Hampton Dunes and Westhampton Beach, New York (Doctoral dissertation). Virginia Polytechnic Institute and State University. Accessed online at http://scholar.lib.vt.edu/theses/available/etd-08222005-172829/unrestricted/LarryHoughtonETD.pdf.

Joint Information Center. 2010. News release [Internet]. [cited July 28, 2010]. Available from: http://app.restorethegulf.gov/go/doc/2931/832251/

Kaufman, W. and O.H. Pilkey. 1979. The beaches are moving: The drowning of America's shoreline. Duke University Press; Durham, North Carolina. 336 pp.

Komar, P.D. 1983. Handbook of coastal processes and erosion. CRC Press; Boca Raton, Florida. 305 pp.

Larson, M.A., M.R. Ryan, and R.K. Murphy. 2002. Population viability of piping plovers: Effects of predator exclusion. *Journal of Wildlife Management* 66:361-371.

Leatherman, S.P. 1988. Barrier Island Handbook. Coastal Publications Series. University of Maryland; College Park, Maryland.

LeDee, O.E., F.J. Cuthbert, and P.V. Bolstad. 2008. A remove sensing analysis of Coastal Habitat Composition for a Threatened Shorebird, the Piping Plover (*Charadrius melodus*). *Journal of Coastal Research.* 24(3):719-726.

Loegering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. thesis. Virginia Polytechnic Institute and State University; Blacksburg, Virginia.

Lott, C.A., C.S. Ewell Jr., and K.L. Volanky. 2009. Habitat associations of shoreline-dependent birds in barrier island ecosystems during fall migration in Lee County, Florida. Technical Report. Prepared for U.S. Army Corps of Engineers, Engineer Research and Development Center; Washington, D.C.

MacIvor, L.H. 1990. Population dynamics, breeding ecology, and management of piping plovers on outer Cape Cod, Massachusetts. M.S. thesis. University of Massachusetts; Amherst, Massachusetts.

Maddock, S.B. 2008. Wintering piping plover surveys 2006-2007, East Grand Terre, Louisiana to Boca Chica, Texas, December 20, 2006 - January 10, 2007, final report. Unpublished report prepared for the Canadian Wildlife Service, Environment Canada, Edmonton, Alberta.

Maddock, S., M. Bimbi, and W. Golder. 2009. South Carolina shorebird project, draft 2006-2008 piping plover summary report. Audubon North Carolina and U.S. Fish and Wildlife Service; Charleston, South Carolina. 135 pp.

Martin, T. 2013. Personal communication. Coastal engineer. Discussion related to groin and jetty construction, to their repair and replacement frequency, and to the nature of potential impacts to piping plover habitat during repair and replacement activities. March 18, 2013, Jacksonville, Florida.

Maslo, B., S.N. Handel, and T. Pover. 2010. Restoring beaches for Atlantic Coast piping plovers (*Charadrius melodus*): A classification and regression tree analysis of nest-site selection. *Restoration Ecology,* 19(201):194-203.

McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loegering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report to National Park Service.

Melvin, S.M., C.R. Griffin, and L.H. MacIvor. 1991. Recovery strategies for piping plovers in managed coastal landscapes. *Coastal Management* 19:21-34.

Melvin, S.M. and J.P. Gibbs. 1996. Viability analysis for the Atlantic Coast population of piping plovers. Pages 175-186 *in* Piping plover (*Charadrius melodus*), Atlantic Coast population, revised recovery plan. U.S. Fish and Wildlife Service; Hadley, Massachusetts.

National Park Service. 2007. Cape Hatteras National Seashore 2007 annual piping plover (*Charadrius melodus*) report. Cape Hatteras National Seashore; Manteo, North Carolina.

National Research Council. 1995. Beach nourishment and protection. Committee on Beach Nourishment and Protection, Marine Board, Commission on Engineering and Technical Systems. National Academy Press; Washington, DC.

Nicholls, J.L. 1989. Distribution and other ecological aspects of piping plovers (*Charadrius melodus*) wintering along the Atlantic and Gulf Coasts. M.S. thesis. Auburn University; Auburn, Alabama.

Nicholls, J.L. and G.A. Baldassarre. 1990a. Habitat selection and interspecific associations of piping plovers along the Atlantic and Gulf Coasts of the United States. M.S. thesis. Auburn University; Auburn, Alabama.

Nicholls, J.L. and G.A. Baldassarre. 1990b. Habitat associations of piping plovers wintering in the United States. *Wilson Bulletin* 102(4):581-590.

Noel, B.L. and C.R. Chandler. 2005. Report on migrating and wintering piping plover activity on Little St. Simons Island, Georgia in 2003-2004 and 2004-2005. Report to U.S. Fish and Wildlife Service; Panama City, Florida. 38 pp.

Noel, B.L., C.R. Chandler, and B. Winn. 2007. Seasonal abundance of nonbreeding piping plovers on a Georgia barrier island. *Journal of Field Ornithology* 78:420-427.

Noel, B.L., and C.R. Chandler. 2008. Spatial distribution and site fidelity of nonbreeding piping plovers on the Georgia coast. *Waterbirds* 31:241-251.

Palmer, R.S. 1967. Piping plover. Pages 183-184 *in* G.D. Stout, ed. The shorebirds of North America. Viking Press; New York, New York.

Perkins, S. 2008. Personal communication. Ornithologist. E-mail to the U.S. Fish and Wildlife Service dated 29 September 2008. Massachusetts Audubon Society; Chatham, Massachusetts.

Pilkey, O.H., Jr., D.C. Sharma, H.R. Wanless, L.J. Doyle, O.H. Pilkey, Sr., W.J. Neal, and B.L. Gruver. 1984. Living with the East Florida shore. Duke University Press; Durham, North Carolina.

Pilkey, O.H. and K.L. Dixon. 1996. The Corps and the Shore. Island Press; Washington, D.C., 272 pp.

Pinkston, J. 2004. Observations of wintering piping plovers using Gulf of Mexico barrier beaches along the Central Texas coast. Year One research summary report to U.S. Fish and Wildlife Service Corpus Christi, Texas, Field Office. July 2004. One page + maps and tables.

Plissner, J.H. and S.M. Haig. 2000. Viability of piping plover *Charadrius melodus* metapopulations. *Biological Conservation* 92:163-173.

Pompei, V.D., and F.J. Cuthbert. 2004. Spring and fall distribution of piping plovers in North America: Implications for migration stopover conservation. Report to the U.S. Army Corps of Engineers. University of Minnesota; St. Paul, Minnesota.

Ryan, M.R., B.G. Root, and P.M. Mayer. 1993. Status of piping plover in the Great Plains of North America: A demographic simulation model. *Conservation Biology*. 7:581-585.

Sallenger, A.H. Jr., C.W. Wright, P. Howd, and K. Doran. In review. Barrier island failure modes triggered by Hurricane Katrina: implications for future sea-level-rise impacts. Submitted to *Geology*.

Scavia, D., J.C. Field, D.F. Boesch, R.W. Buddemeier, V. Burkett, D.R. Cayan, M. Fogarty, M.A. Harwell, R.W. Howarth, C. Mason, D.J. Reed, T.C. Royer, A.H. Sallenger, and J.G. Titus. 2002. Climate change impacts on U.S. coastal and marine ecosystems. *Estuaries* 25:149-164.

Smith, B.S. 2007. 2006-2007 nonbreeding shorebird survey, Franklin and Wakulla counties, Florida. Final report to the U.S. Fish and Wildlife Service in fulfillment of Grant # 40181-7-J008. Apalachicola Riverkeeper; Apalachicola, Florida. 32 pp.

Staine, K.J. and J. Burger. 1994. Nocturnal foraging behavior of breeding piping plovers (*Charadrius melodus*) in New Jersey. *The Auk* 111(3):579-587.

Stucker, J.H. and F.J Cuthbert. 2006. Distribution of nonbreeding Great Lakes piping plovers along Atlantic and Gulf coastlines: 10 years of band resightings. Report to the U.S. Fish and Wildlife Service, East Lansing, Michigan and Panama City, Florida Field Offices. 20 pp.

U.S. Fish and Wildlife Service (Service). 1985. Endangered and Threatened Wildlife and Plants; Determination of Endangered and Threatened Status for the Piping Plover. Federal Register 50(238):50726-50734.

U.S. Fish and Wildlife Service (Service). 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Prepared by the Atlantic Coast Piping Plover Recovery Team for the U.S. Fish and Wildlife Service, Region Five. Hadley, Massachusetts. Accessed online at http://www.fws.gov/northeast/pipingplover/pdf/summary.pdf.

U.S. Fish and Wildlife Service (Service). 2001a. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for Wintering Piping Plovers. Federal Register 66:36038-36143.

U.S. Fish and Wildlife Service (Service). 2001b. Endangered and Threatened Wildlife and Plants; Final Determination of Critical Habitat for the Great Lakes Breeding Population of the Piping Plover. Federal Register 66:22938-22969.

U.S. Fish and Wildlife Service (Service). 2002. Questions and Answers about the Northern Great Plains Population of Piping Plover. Webpage accessed at http://www.fws.gov/mountain-prairie/species/birds/pipingplover/Piping_Plover_Great_Plains_Q&A_Sept5.htm.

U.S. Fish and Wildlife Service (Service). 2003. Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*). Region 3, Fort Snelling, Minnesota. Accessed online at http://www.fws.gov/northeast/nyfo/es/GLplover03.pdf.

U.S. Fish and Wildlife Service (Service). 2009. Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation. Northeast Region, Hadley, Massachusetts, and the Midwest Region's East Lansing Field Office, Michigan. Accessed online at http://www.fws.gov/northeast/endangered/PDF/Piping_Plover_five_year_review_and_summary.pdf.

U.S. Fish and Wildlife Service (Service). 2011. Abundance and productivity estimates – 2010 update: Atlantic Coast piping plover population. Sudbury, Massachusetts. 4 pp.

U.S. Fish and Wildlife Service (Service). 2012. Comprehensive Conservation Strategy for the Piping Plover (*Charadrius melodus*) in its Coastal Migration and Wintering Range in the Continental United States. East Lansing, Michigan.

Wemmer, L.C., U. Ozesmi, and F.J. Cuthbert. 2001. A habitat-based population model for the Great Lakes population of the piping plover (*Charadrius melodus*). *Conservation Biology* 99(2):169-181.

Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk* 76:129-152.

Wilkinson, P. M. and M. Spinks. 1994. Winter distribution and habitat utilization of piping plovers in South Carolina. *Chat* 58(2):33-37.

Witherington, B.E. 1986. Human and natural causes of marine turtle clutch and hatchling mortality: and their relationship to hatchling production on an important Florida nesting beach. M.S. thesis. University of Central Florida; Orlando, Florida.

Young, R.S., C. Alexander, J. Kelley, S. Riggs, D. Barber, W.J. Neal, S.K. Boss, C. Fletcher, A. Trembanis, O.H. Pilkey, D.M. Bush, A. Coburn, N.P. Psuty, J. Donoghue, D. Heron, C. Houser, and S.Culver. 2006. In letter submitted to M.A. Bomar, Director, National Park Service; Washington, D.C.

Zivojnovich, M. J. and G.A. Baldassarre. 1987. Habitat selection, movements and numbers of piping plovers wintering in coastal Alabama. Alabama Department of Conservation and Natural Resources.

Zonick, C. 1997. The use of Texas barrier island washover pass habitat by piping plovers and Other coastal waterbirds. National Audubon Society. A Report to the Texas Parks and Wildlife Department and the US Fish and Wildlife Service.

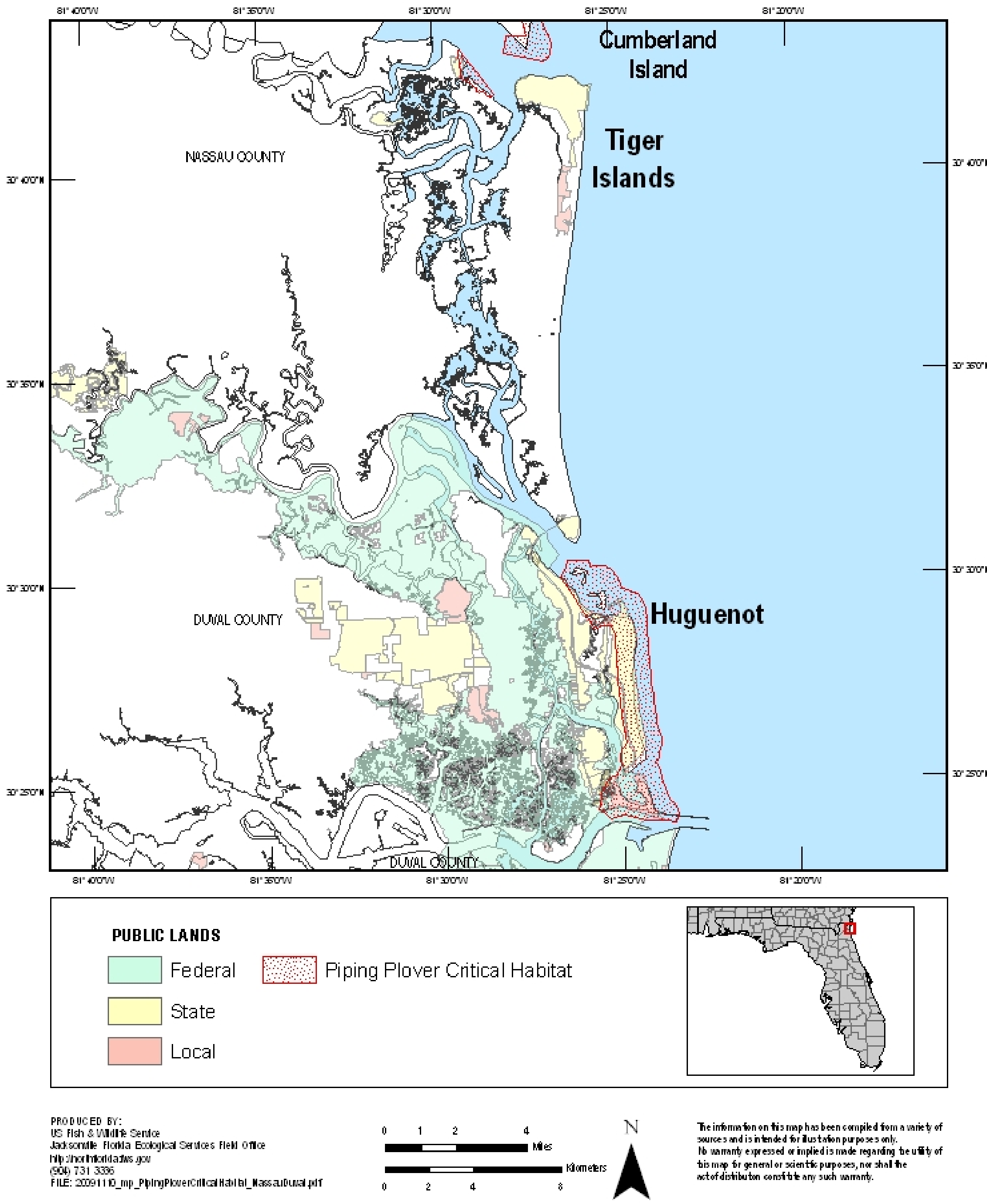
Zonick, C.A. 2000. The winter ecology of piping plovers (*Charadrius melodus*) along the Texas Gulf Coast. Doctoral dissertation. University of Missouri-Columbia; Columbia, Missouri.

Zonick, C. and Ryan, M. 1996. The ecology and conservation of piping plovers (*Charadrius melodus*) wintering along the Texas Gulf Coast. Department of Fisheries and Wildlife, University of Missouri, Columbia, Missouri. 1995 Annual report. 49 pp.

APPENDIX A: PIPING PLOVER CRITICAL HABITAT UNITS IN THE ACTION AREA

U.S. Fish & Wildlife Service

PIPING PLOVER CRITICAL HABITAT



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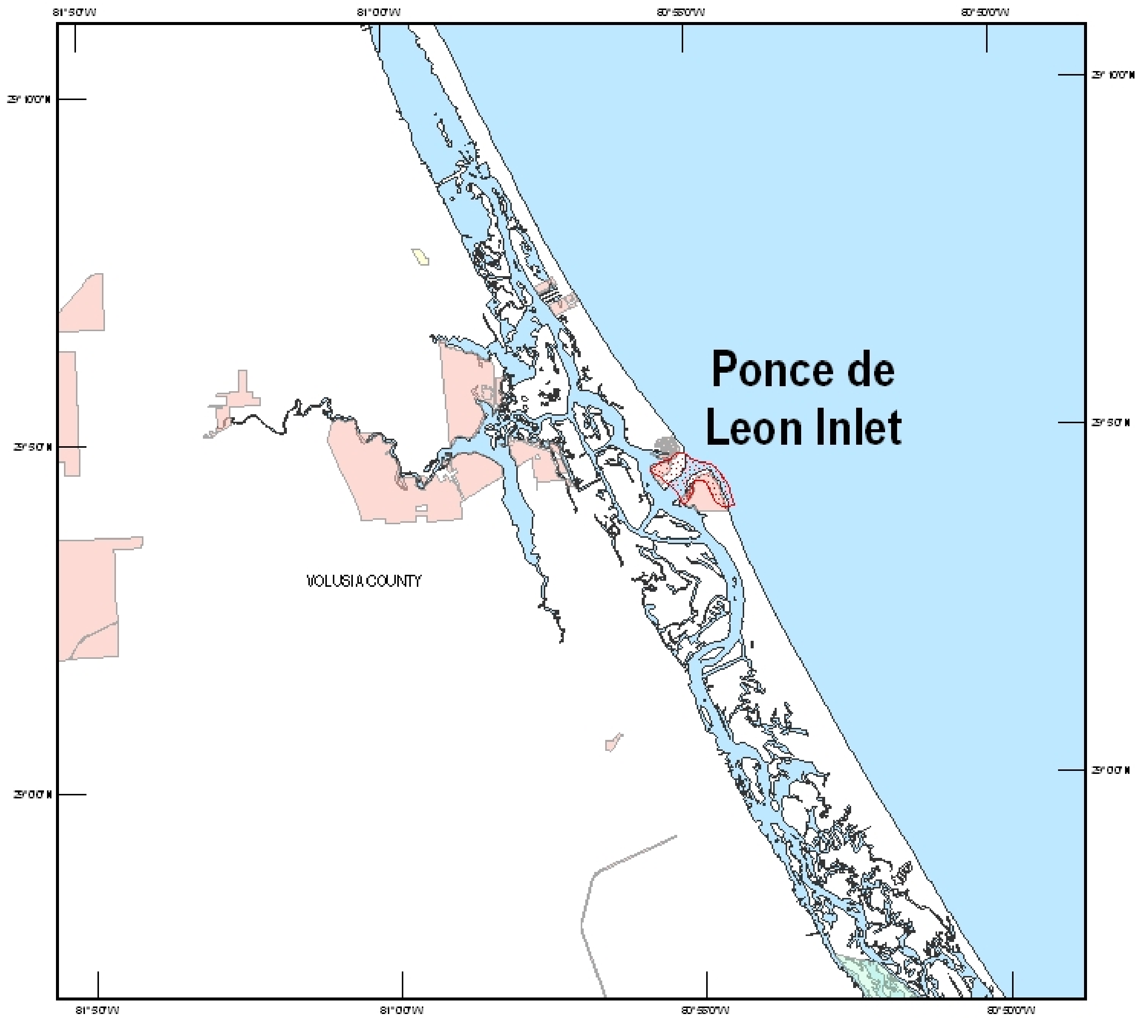
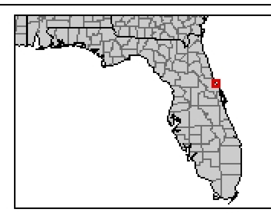
PIPING PLOVER CRITICAL HABITAT



PUBLIC LANDS

- Federal
- State
- Local
- Piping Plover Critical Habitat



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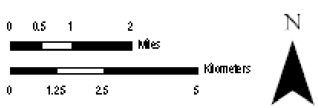

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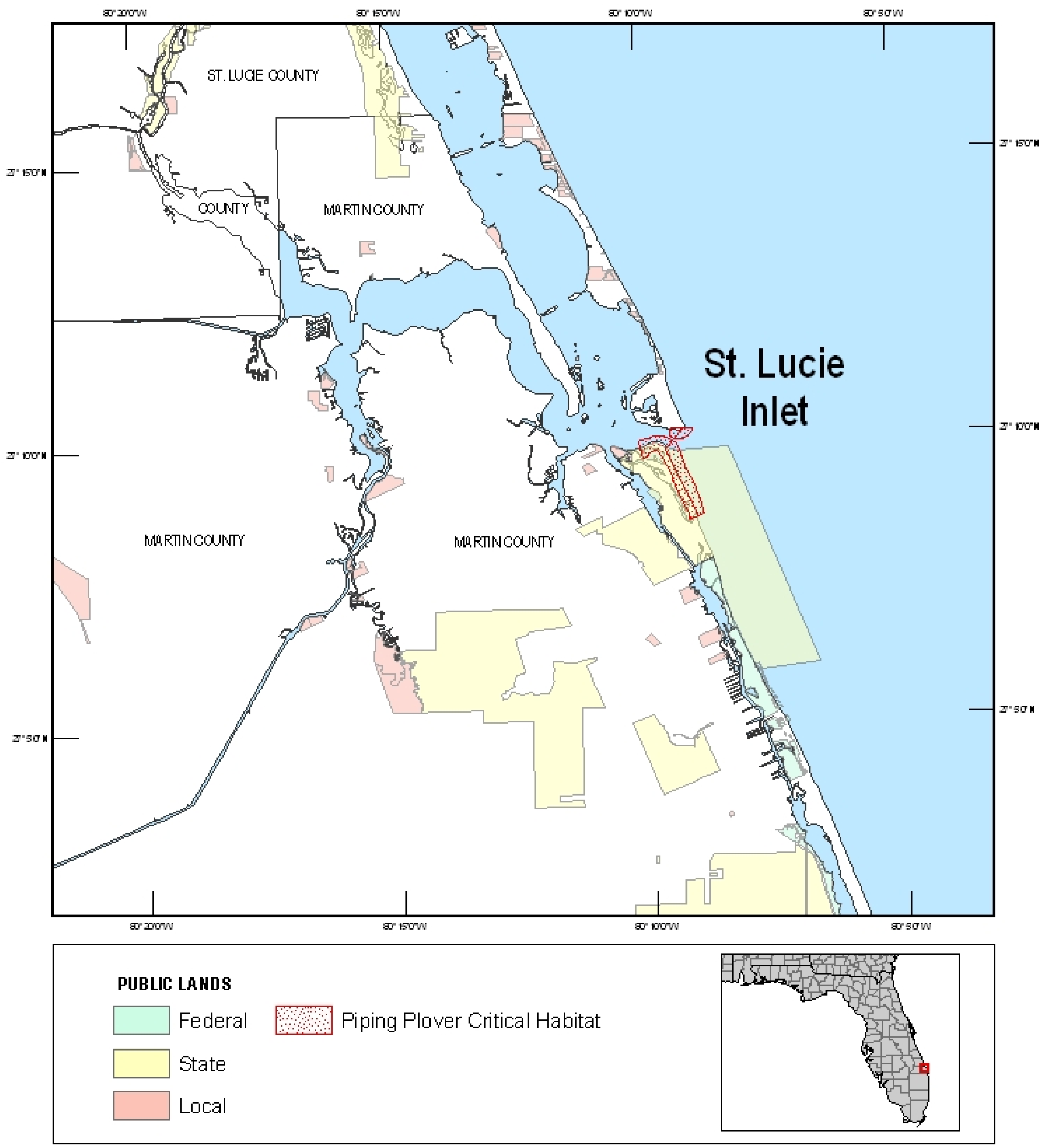
PIPING PLOVER CRITICAL HABITAT



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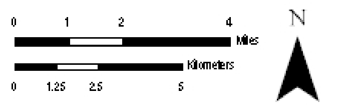

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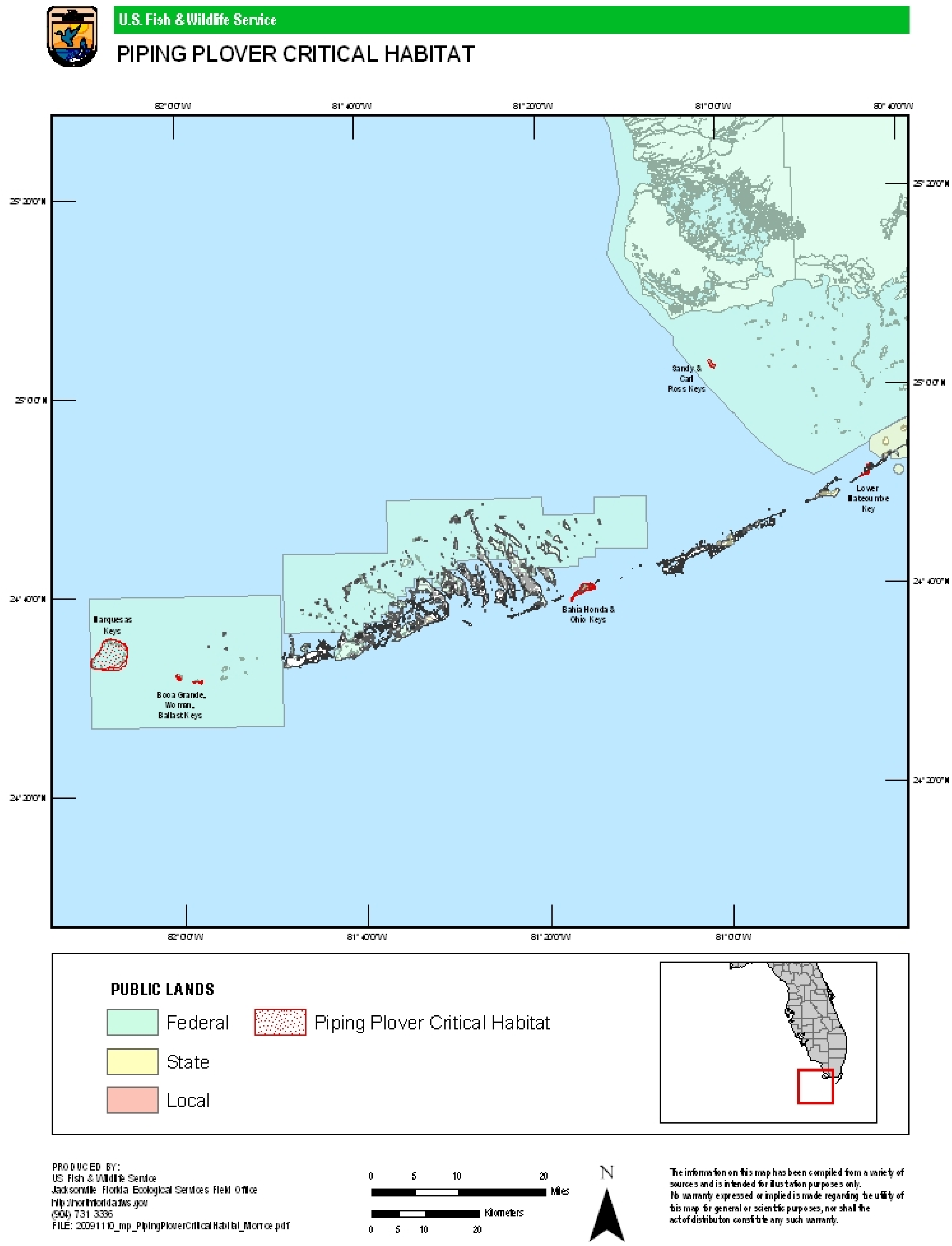
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
Sandy & Carl Ross Keys
Lower Matecumbe Key
Bahia Honda & Ohio Keys
Marquesas Keys
Boca Grande, Woman, Ballast Keys
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
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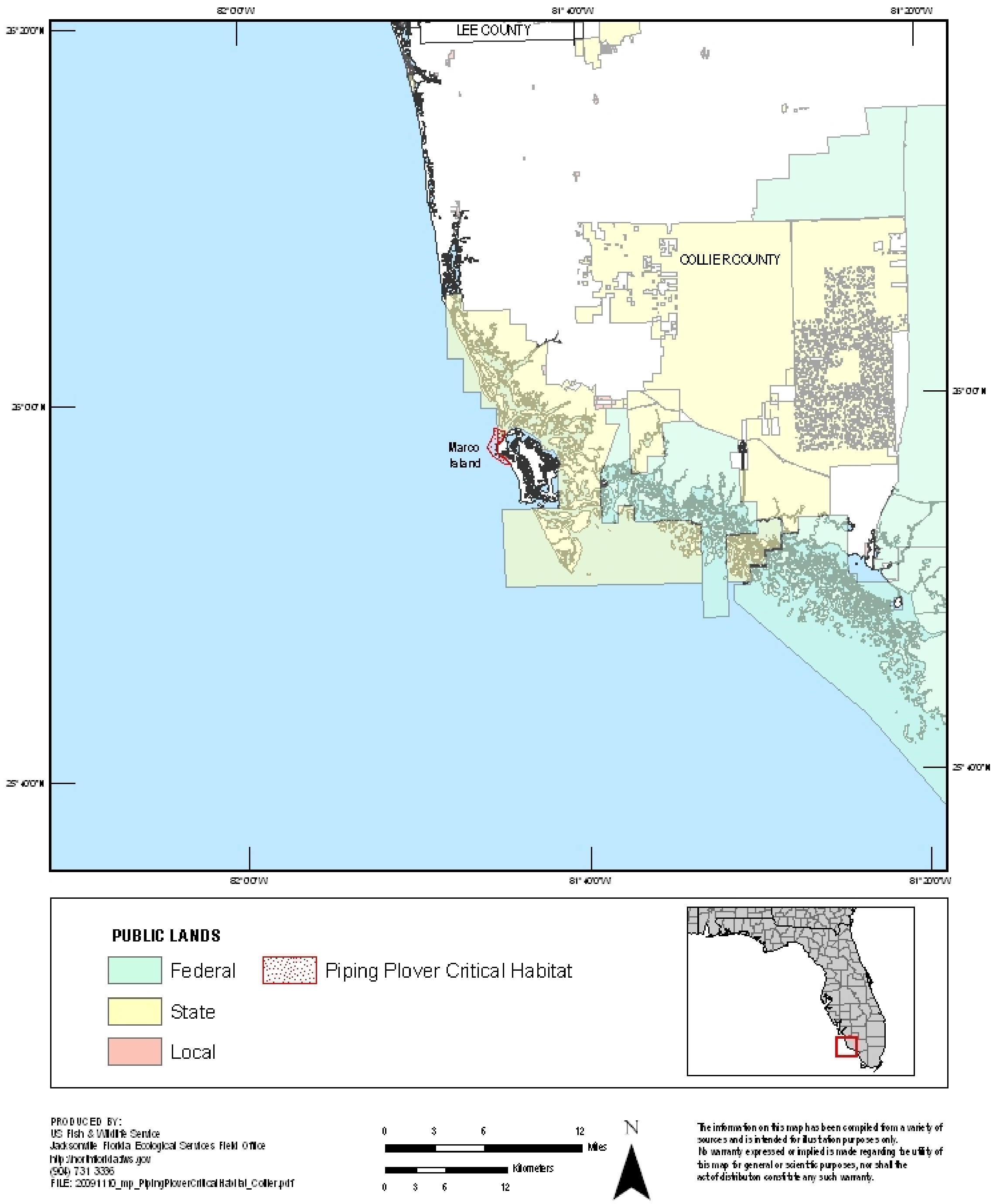
PIPING PLOVER CRITICAL HABITAT



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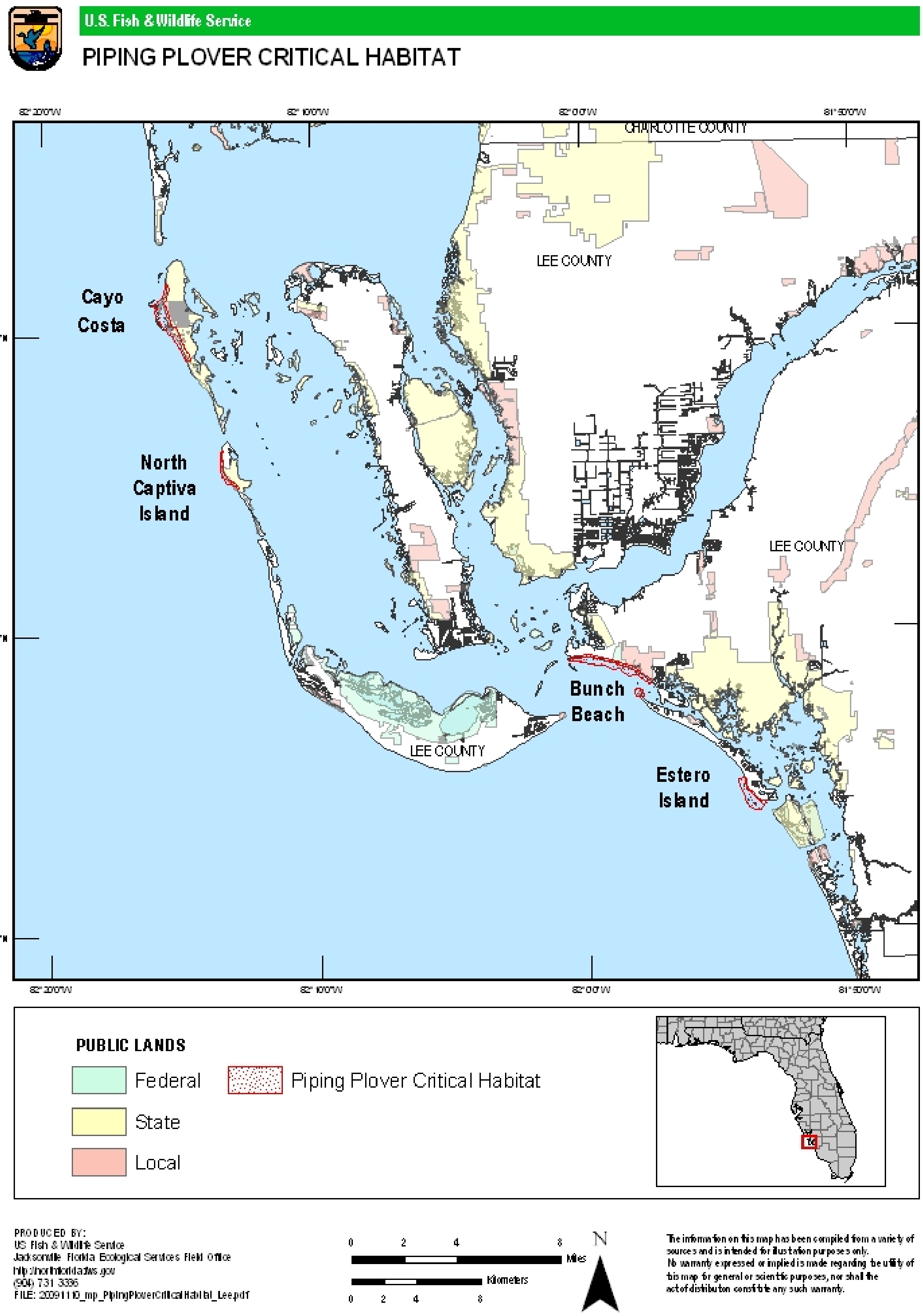
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
CHARLOTTE COUNTY
LEE COUNTY
Cayo Costa
North Captiva Island
Bunch Beach
Estero Island
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
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Jacksonville Florida Ecological Services Field Office
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Miles
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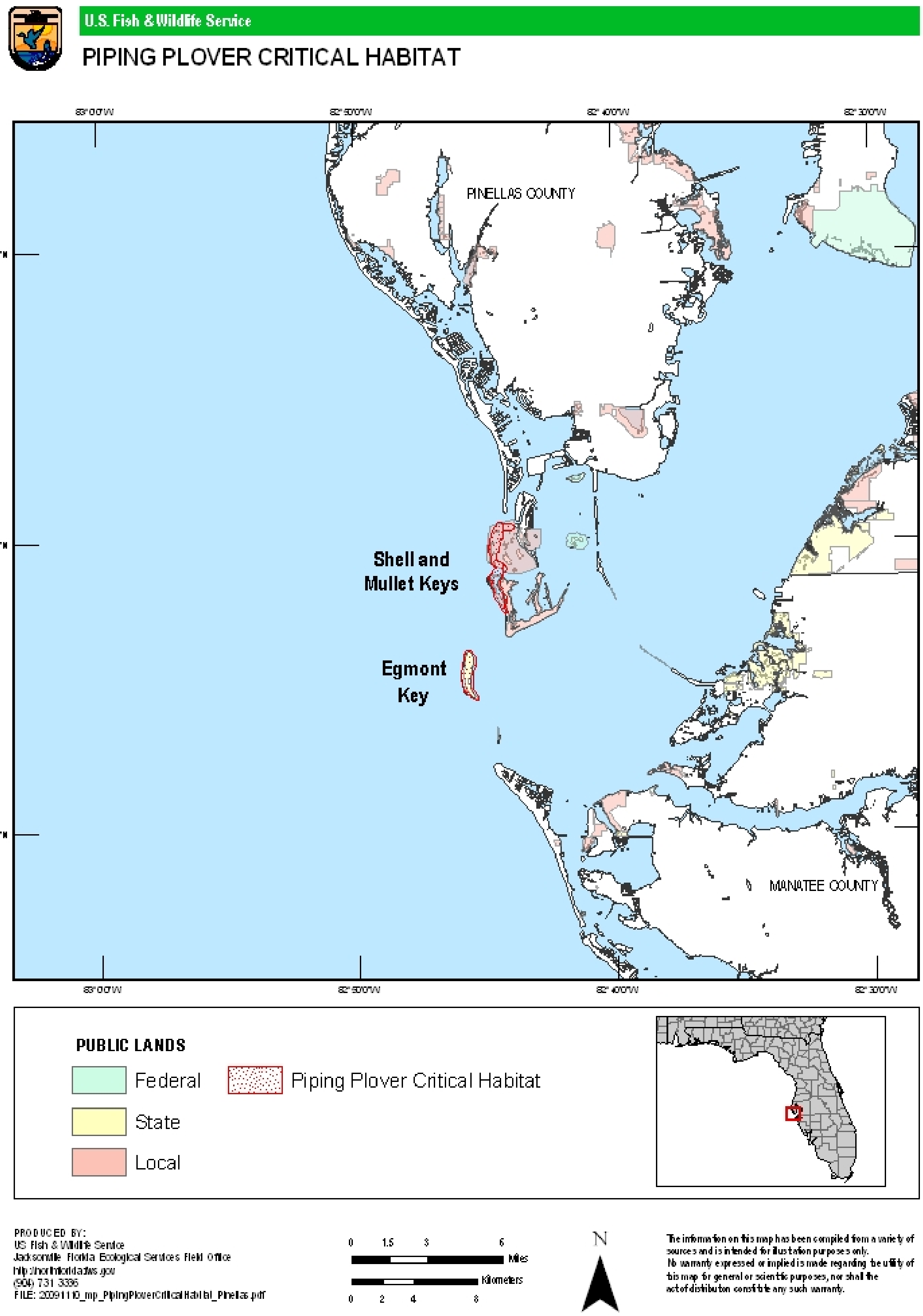
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
PINELLAS COUNTY
Shell and Mullet Keys
Egmont Key
MANATEE COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
PRODUCED BY:
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Jacksonville Florida Ecological Services Field Office
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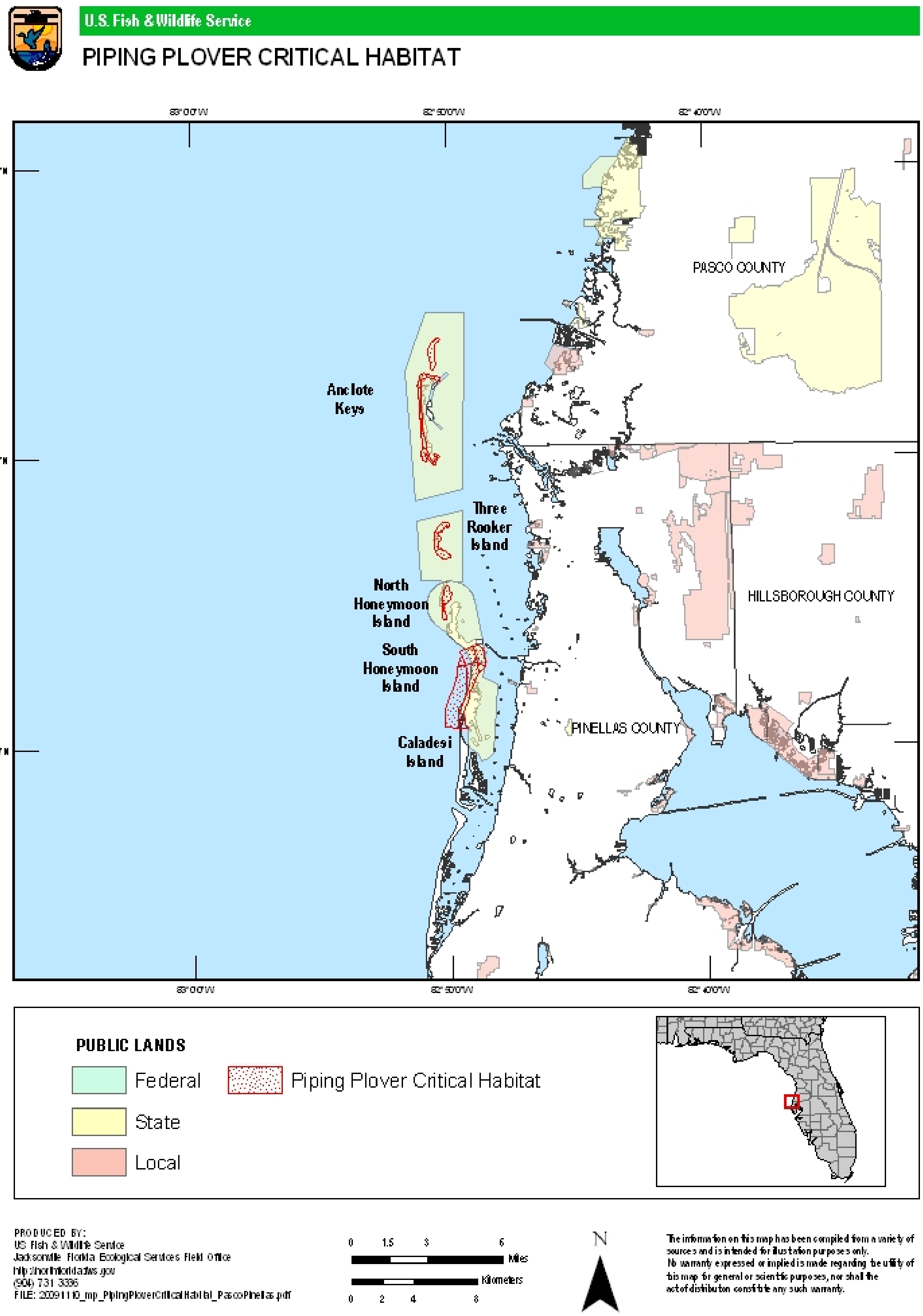
U.S. Fish & Wildlife Service
PIPING PLOVER CRITICAL HABITAT
Anclote Keys
Three Rooker Island
North Honeymoon Island
South Honeymoon Island
Caladesi Island
PASCO COUNTY
HILLSBOROUGH COUNTY
PINELLAS COUNTY
PUBLIC LANDS
Federal
State
Local
Piping Plover Critical Habitat
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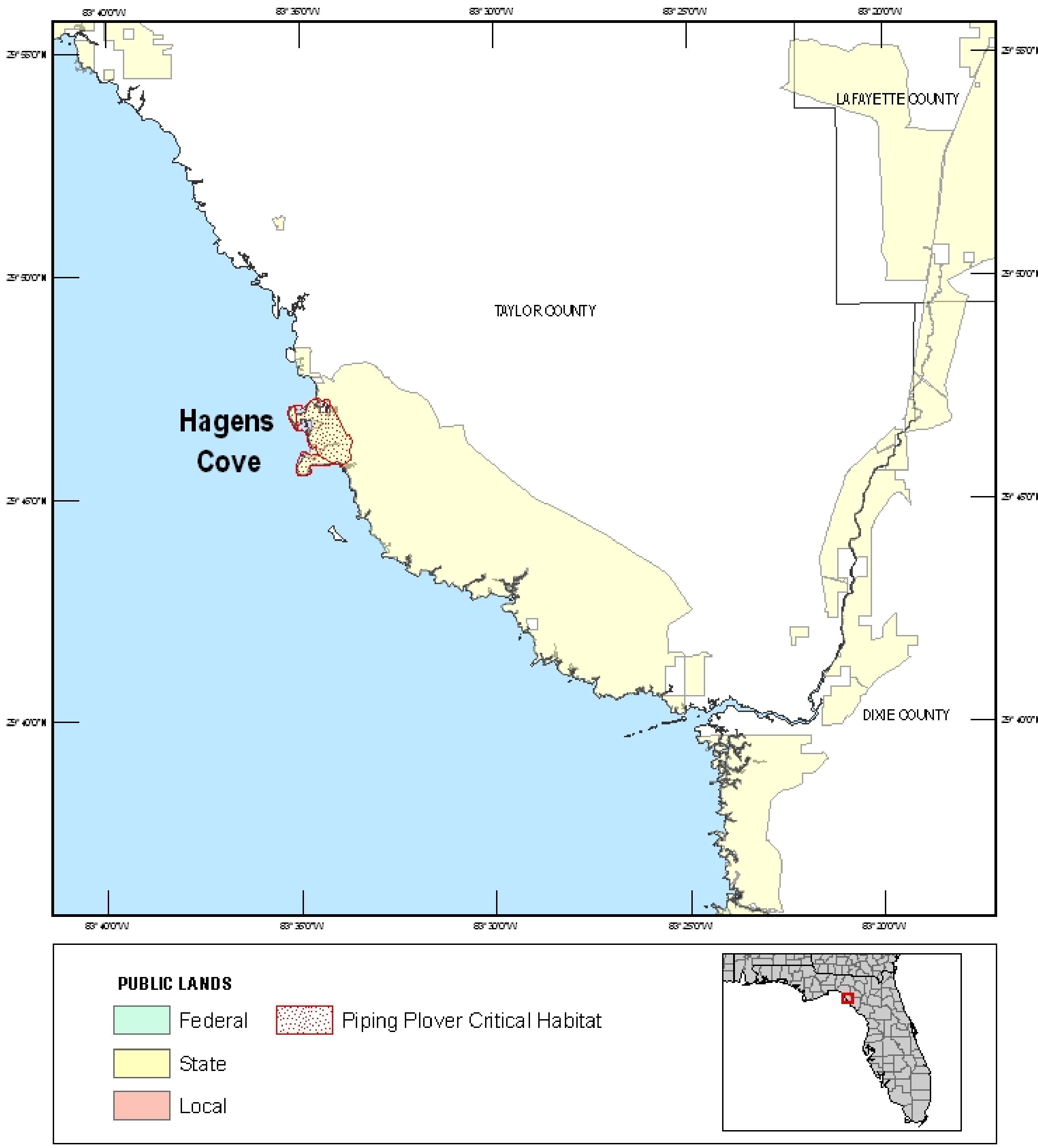
PIPING PLOVER CRITICAL HABITAT



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APPENDIX B: EXAMPLE PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle that is secured and heavy enough not to easily be turned over.

APPENDIX A - PERMITS

USACE PERMIT - BIOLOGICAL OPINION:

NMFS GULF REGIONAL BIOLOGICAL OPINION FOR HOPPER DREDGES/BEACH NOURISHMENT (GRBO) (19 NOV 2003)

128 PAGES

SAJ-2014-00606 (SP-MEP)

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: United States Army Corps of Engineers (COE)

Activity Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287)

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Approved by: Roy E. Crabtree, Ph.D., Regional Administrator
NOAA Fisheries, Southeast Regional Office
St. Petersburg, Florida

Date Issued: NOV 19 2003

Contents

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect a protected species, that agency is required to consult with either the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) or the U.S. Fish and Wildlife Service (FWS), depending upon the protected species that may be affected.

This document represents NOAA Fisheries' biological opinion (Opinion) based on our review of the regular maintenance hopper dredging of navigation channels, and offshore sand mining for beach restoration/nourishment activities, in the U.S. Gulf of Mexico by the COE's Jacksonville, Mobile, New Orleans, and Galveston Districts, and its effects on green sea turtles *(Chelonia mydas)*, leatherback sea turtles (*Dermochelys coriacea*), hawksbill sea turtles *(Eretmochelys imbricata)*, loggerhead sea turtles (*Caretta caretta*), Kemp's ridley sea turtles *(Lepidochelys kempii)*, Gulf sturgeon (*Acipenser oxyrinchus desotoi*), and Gulf sturgeon critical habitat, in accordance with section 7 of the ESA.

Formal consultations are required when action agencies determine that a proposed action "may affect" listed species or designated critical habitat. Formal consultations on most listed marine species are conducted between the action agency and NOAA Fisheries. Consultations are concluded after NOAA Fisheries' issuance of an Opinion that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The Opinion also states the amount or extent of incidental taking that may occur. Non-discretionary measures ("reasonable and prudent measures" - RPMs) to reduce the likelihood of takes are developed, and conservation recommendations are made. Notably, there are no reasonable and prudent measures associated with critical habitat, only reasonable and prudent alternatives.

This Opinion is based on dredging schedules and biological assessments provided by the various Gulf of Mexico COE Districts for channel dredging and beach nourishment projects involving the use of hopper dredges, meetings between NOAA Fisheries and the COE, annual take reports, dredge observer reports, dredging project completion reports, and annual dredging project summary reports provided by the COE Districts. Draft versions of this Opinion were provided to the COE Districts for input and comments, and resulted in significant revisions to the final draft.

1.0 Consultation History

This Opinion is a result of reinitiation of consultation on the September 22, 1995, Regional Biological Opinion (RBO) issued to the U.S. Army Corps of Engineers, New Orleans and Galveston Districts, on hopper dredging of channels in Texas and Louisiana. At the time that the Galveston and New Orleans Districts requested reinitiation of consultation on the RBO, NOAA Fisheries' Southeast Regional Office requested that the Mobile District and the Jacksonville District–the other two COE Districts that conduct hopper dredging operations in the Gulf of Mexico–also enter into formal ESA consultation with NOAA Fisheries and provide biological assessments (BA) on the effects of their Districts' maintenance dredging projects and beach nourishment projects on threatened and endangered species under NOAA Fisheries' purview in the Gulf of Mexico. This allowed NOAA Fisheries to prepare the present comprehensive regional biological opinion to cover all hopper dredging activities in the Gulf of Mexico which involve maintenance dredging or sand mining by or under the auspices of the U.S. Army Corps of Engineers.

The Galveston District's BA and request for reinitiation of formal consultation were submitted on October 11, 2000.

The New Orleans District's BA and request for reinitiation of formal consultation were received on April 9, 2001.

The COE's Mobile District provided information on hopper dredging projects within its area of jurisdiction on December 21, 2001, and additional information was provided at a meeting between NOAA Fisheries and COE representatives in Mobile on April 15, 2002. The Mobile District's BA was received on June 12, 2002.

The Jacksonville District submitted a BA dated April 29, 1999, on the Lee County Shore Protection Project, Estero Island Segment (Gasparilla Island) hopper dredging; additional information on this project was received on April 4, 2000. The Jacksonville District requested formal consultation and submitted a BA on their Florida west coast hopper dredging projects on November 28, 2000. On July 17, 2001, the Jacksonville District submitted a separate BA and request for formal consultation on the Lido Key Shore Protection Project. NOAA Fisheries requested additional information on the Lido Key project on August 9, 2001, which was provided by the COE on September 7, 2001. In their letter, the COE agreed to NOAA Fisheries' request to include the Lido Key project in the present Opinion. On August 22, 2001, the COE provided information on the Pinellas County Shore Protection Project; a BA and request for formal consultation was provided on October 30, 2002. That consultation is included in the present Opinion. In March 2002, NOAA Fisheries received a request for formal consultation from the COE on the Pensacola Beach Restoration Project and decided to include and evaluate the proposed action in the present Opinion, since the project called for hopper dredge use. Ultimately, the latter project was consulted on separately from the present Opinion, in a biological opinion issued in October 2002. On May 9, 2003, and again on August 8, 2003, NOAA Fisheries received a request for formal consultation on the proposed Sarasota County, Venice Beach Shoreline Protection Project since hopper dredging of offshore sand mining sites may be involved. That project is included in this Opinion.

The COE's Mobile District provided information on hopper dredging projects within its area of jurisdiction on December 21, 2001, and additional information was provided at a meeting between NOAA Fisheries and COE representatives in Mobile on April 15, 2002. The Mobile District's BA was received on June 12, 2002.

The Mobile District provided written comments on draft versions of this Opinion on September 6, 2002, and October 30, 2002.

The COE's South Atlantic Division provided comments on the draft Opinion on October 1, 2002, (e-mail, Barnett to Nitta) and on November 14, 2002 (e-mail, Small to Hawk).

The COE's Wilmington District provided comments on the draft Opinion on September 11 and 13, 2002 (e-mails, Adams to Hawk).

The COE's Jacksonville District provided comments on the draft Opinion on September 13, 2002 (Jordan to Adams). Additional comments (Haberer to Hawk) were received on April 29, 2003.

The COE's South Atlantic Division (SAD) compiled comments received from the COE's South Atlantic, Mississippi Valley, and Southwest Divisions, and the Jacksonville, Mobile, New Orleans, and Galveston Districts on the August 24, 2003, final draft Opinion, and provided these to NOAA Fisheries on September 9, 2003. NOAA Fisheries responded to these comments verbally to South Atlantic Division staff on September 25, 2003, made revisions to the final draft, and provided revised copies to the COE on October 15, 2003 for final comment. NOAA Fisheries requested that comments be submitted by October 21, 2002, although comments received through October 29, 2003 were considered.

A complete administrative record of this consultation is on file at the NOAA Fisheries' Southeast Regional Office, St. Petersburg, Florida.

Background to Proposed Action

Consultation History of Channel Dredging in the United States

The construction and maintenance of Federal navigation channels have been identified as a source of turtle mortality since turtle takes were first documented during hopper dredging operations in Canaveral Channel, Florida, in 1980. A total of 71 turtle takes by hopper dredge was documented in the Canaveral Channel over the period of July 11 through November 13, 1980 (NMFS 1991a). Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore sand mining areas, move relatively rapidly and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. In contrast to hopper dredges, pipeline dredges are relatively stationary, and therefore act on only small areas at any given time. In the 1980s, observer coverage was required by NOAA Fisheries at pipeline outflows during several dredging projects deploying pipeline dredges along the Atlantic coast. No turtles or turtle parts were observed in the outflow areas. Additionally, the COE's South Atlantic Division (SAD) office in Atlanta, Georgia, charged with overseeing the work of the individual COE Districts along the Eastern Seaboard from North Carolina through Florida, provided documentation of hundreds of hours of informal observation by COE inspectors during which no takes of listed species were observed. Additional monitoring by other agency personnel, conservation organizations, and the general public has never resulted in reports of turtle takes by pipeline dredges (NMFS 1991a).

U.S. Gulf of Mexico

Historically, section 7 consultations conducted on dredging impacts in the Gulf of Mexico were limited by the paucity of information available on the seasonal and spatial distribution of sea turtles; information was also lacking on adverse impacts of hopper dredging on local species under NOAA Fisheries' jurisdiction. Studies conducted by the COE (Dickerson et al. 1994) documented turtle distribution and abundance in 6 channels along the Atlantic seaboard but there was no evidence that indicated that sea turtles in Gulf channels aggregate like those along the southeast U.S. Atlantic coast.

A brief history (beginning 1990) of section 7 consultations conducted on dredging activities in the northern and western Gulf of Mexico follows. All of these consultations concluded that dredging was not likely to jeopardize listed species in the Gulf of Mexico.

New Orleans District

Beginning in 1991, the COE New Orleans District has held annual dredging conferences and has compiled a conference notebook requesting section 7 consultation on anticipated dredging projects for the upcoming fiscal year. Information on the proposed maintenance dredging dates, anticipated dredge types, and amount of material to be dredged is included within the conference notebook. The annual consultations resulting from the projects within the conference notebook were generally concluded informally, with a concurrence from NOAA Fisheries that hopper dredging in these channels was not likely to adversely affect any listed species or critical habitat. Since 1990, reporting conditions have been implemented that required precautionary measures to improve the information available on interactions between sea turtles and hopper dredge activities in the Gulf. The COE New Orleans District was asked to (1) advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles, and the civil penalties that apply; (2) instruct the captain of the hopper dredge to avoid any turtles encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the COE if sea turtles were seen in the vicinity; and (3) notify NOAA Fisheries if sea turtles were observed in the dredging area in order to coordinate further precautions to avoid impacts to turtles.

A COE-funded research program was conducted during 1993 and 1994 to assess the occurrence of sea turtles in the vicinity of Calcasieu Pass, Louisiana. The COE New Orleans District suggested that ongoing research assessing sea turtle occurrence in the vicinity of the channel during the dredging period, and observations by dredge workers and COE observers, were sufficient to preclude the need for NOAA Fisheries-approved observers.

The COE requested consultation in summer 1994 for FY 1995 channel dredging within the New Orleans District where a hopper dredge was likely to be used. Dredging areas included Calcasieu Pass, Mississippi River - Gulf Outlet (MR-GO), and the Mississippi River - Southwest Pass (MR-SWP). Preliminary studies of sea turtle occurrence in Calcasieu and Sabine passes suggested that sea turtles may congregate in the vicinity of some passes along the northern Gulf of Mexico at specific times of the year. Also, high levels of sea turtle strandings had been documented over the past few years on Louisiana beaches, despite the lack of a dedicated, organized stranding network.

In response to the COE New Orleans District's request for consultation, NOAA Fisheries issued a letter dated January 30, 1995, indicating that NOAA Fisheries-approved observers were necessary to verify the reported absence of dredging impact in these channels on listed sea turtle species. The letter also suggested that formal consultation would be required in 1995 incorporating the results of the Calcasieu sea turtle study and observer reports. NOAA Fisheries also suggested that the newly-developed rigid deflector draghead be immediately deployed on the dredges if possible.

During FY 1995, the COE New Orleans District determined that observers would not be deployed in the MR-SWP since the channel consisted primarily of fresh, high flow waters. Additionally, the complexity of dredging operations in MR-SWP results in up to seven hopper dredges operating at any time in any part of the MR-SWP, often with less than ten days notice, making deploying observers difficult. Dredging effort and location are dependant on weather, resultant flow, and siltation from up-river (International Dredging Review 1995). Variable dredging demands make it difficult to obtain 100% observer coverage at the appropriate extents of the MR-SWP.

However, NOAA Fisheries-approved observers were deployed on a hopper dredge operating in Calcasieu Pass during maintenance dredging operations between April 27 and July 8, 1995. No sea turtle takes were observed. Reports indicated that sufficient screening and observer effort were present to have observed a potential take. NOAA Fisheries-approved endangered species observers also attended maintenance dredging operations in the MR-GO between March 18 and May 10, 1995. No sea turtles were taken nor observed in the vicinity. Very little biological material was observed in the dredge spoil.

COE New Orleans District requested formal consultation in March 1995 on the effects of the proposed District-wide dredging and submitted a BA in July 1995. The resulting RBO on the use of hopper dredges to conduct maintenance dredging in Texas and Louisiana channels, issued on September 22, 1995 (NMFS 1995a), concluded that hopper dredging in the northern Gulf of Mexico was likely to adversely affect listed sea turtles, but was not likely to jeopardize the continued existence of sea turtle populations.

While the RBO authorized the New Orleans District an annual incidental take, lethal or injurious, by hopper dredge of 15 loggerhead, three green, seven Kemp's ridley, and one hawksbill sea turtle (NMFS 1995a), this take limit has not been reached for any species since the RBO was issued. In most years, New Orleans District takes have been <u>far</u> fewer than authorized (except in May 2002, when loggerhead takes in the MR-GO reached 75% of the authorized loggerhead limit). For example, from May 11, 1995, to September 13, 2003, June 1, 2003, a total of only 41 sea turtles (including 32 loggerheads, seven Kemp's ridleys, and two unidentified) has been reported lethally taken by hopper dredges in the New Orleans District. However, ten turtles, all loggerheads, were taken by the New Orleans District in FY2003, all in the MR-GO.

One of the measures implementing the RBO Incidental Take Statement (ITS) required observer presence in the seaward extent of MR-SWP between April 1 and November 30. A study proposed and conducted by COE New Orleans District in 1996 further characterized the habitat of the MR-SWP and helped identify the likelihood of turtle presence. Results indicated that the MR-SWP was an area not likely utilized by sea turtles. The 1996 sea turtle observer reports confirmed the absence of sea turtles, and the scarcity of sea turtle prey species found in hopper dredge inflow screens during dredging in the MR-SWP. On January 13, 1997, after reviewing their BA and MR-SWP habitat characterization study, NOAA Fisheries advised COE New Orleans District that further observer deployment in MR-SWP, as per the sea turtle observer monitoring requirements outlined in the ITS, was no longer required. There have been no documented takes of sea turtles in MR-SWP since the September 22, 1995, Opinion was issued.

Galveston District

Before the 1995 RBO, consultations had been conducted on a channel-by-channel basis within the COE's Galveston District. During a consultation conducted on the Sabine-Neches Waterway, NOAA Fisheries concurred on May 14, 1992, with COE Galveston District's finding that hopper dredging in the Waterway was not likely to adversely affect listed species. The conclusion for the Sabine-Neches Waterway was based on the lack of documented takes in the project area. However, NOAA Fisheries noted that the preliminary data collected in the project area suggested sea turtle presence in the channel area. As a precaution, NOAA Fisheries suggested that the COE Galveston District implement identical measures (1-3 above) as those required by the COE New Orleans District. These measures were followed on most hopper dredging projects conducted within the Galveston District between 1992 and May 1995.

Formal consultation conducted on hopper dredging in the Port Mansfield Channel resulted in an Opinion issued on September 12, 1992, restricting the use of hopper dredges during December through March. During these winter months, sea turtle observations by dredge personnel and COE dredge inspectors were required. The Opinion recommended the use of pipeline or bucket dredges during all months of the year as an alternative to hopper dredging in this channel. The Opinion also recommended that the COE adhere to National Park Service recommendations regarding dredge operations and disposal activities, and conduct studies to determine the seasonal abundance of sea turtles in the channel.

Informal consultation conducted on winter dredging of the Galveston Harbor and Channel in early 1995 indicated that formal consultation should be conducted for northern Gulf of Mexico hopper dredging projects between April and November due to new information collected by COE-funded research suggesting sea turtles were abundant in waters adjacent to channels. The need for formal consultation and requirements beyond COE observers was further demonstrated during take in a project within Brazos Pass, south Texas. Dredging began in February 1995, a time of year when historical information suggests that the relative abundance of sea turtles is low. On February 7 and 8, 1995, anterior portions of sea turtles were discovered on beaches adjacent to the Pass. Inquiries to the COE's Galveston District revealed two unreported observations by COE inspectors of live green turtles onboard the dredge the day after dredging began. Four additional strandings of green turtles with injuries indicative of dredging, and two lethal takes of green turtles were observed before dredging operations were halted on February 26. A Kemp's ridley lethal take was also observed. Total sea turtle take for the Brazos Pass project was 5 lethal and four non-lethal during 19 days, recording the first documentation of sea turtle takes by hopper dredges in Gulf of Mexico channels. The COE Galveston and New Orleans Districts were subsequently requested to initiate formal consultation as a result of both these documented takes and the new data describing the abundance of sea turtles near Gulf channels. Formal consultation was requested by Galveston on March 23, 1995, and by New Orleans on March 31, 1995, and a BA was submitted by the New Orleans District on July 20, 1995. The COE New Orleans District identified annual maintenance dredging needs and anticipated hopper dredge use for the lower Mississippi River, the bar channel of the

MR-GO, and the bar channel of the lower Calcasieu River. The COE Galveston District identified the Sabine-Neches Waterway, the Galveston Harbor Channel, Freeport Harbor, the Matagorda Ship Channel, the Corpus Christi Ship Channel, Port Mansfield, and the Brazos Island Harbor as maintenance dredging project areas requiring the use of hopper dredges.

September 22, 1995, Regional Biological Opinion (RBO)
NOAA Fisheries' RBO (NMFS 1995a) responded to both the New Orleans and Galveston Districts' consultation requests jointly and considered the effects of annual maintenance dredging by hopper dredges on listed sea turtles. Seasonal observers, screening, and deflector draghead requirements were instituted for most channel dredging. An incidental take level for each COE District by fiscal year was established. For the COE Galveston District, incidental take, by injury or mortality, was set at seven documented Kemp's ridleys, five green turtles, one hawksbill, and 15 loggerhead turtles. This take allotment represented a total allowable take per fiscal year for all channel dredging in the Galveston District. As noted previously, the RBO authorized the New Orleans District an annual incidental take, lethal or injurious, by hopper dredge of 15 loggerhead, three green, seven Kemp's ridley, and one hawksbill sea turtle. The Galveston District was allocated two additional green turtles in their incidental take statement due to their greater abundance in south Texas waters. Reasonable and prudent measures recommended were: (1) temporal windows for hopper dredge operation to reduce the probability of sea turtle interaction, (2) the use of shipboard endangered species observers to document incidental take when water temperatures were 12°C (53.6°F) or greater, (3) inflow and overflow screening of dredged materials to enable observers to identify take, and (4) use of the rigid turtle deflector dragheads in all channel areas of the Gulf of Mexico where take had either been documented or during periods of known sea turtle concentrations. After a Kemp's ridley was lethally taken on May 14, 2002, NOAA Fisheries reinitiated consultation with the New Orleans District COE and required that the sea turtle deflecting draghead be installed for Calcasieu River and Pass navigational channel dredging and during all hopper dredging projects in the New Orleans District, excepting MR-SWP (the COE had not previously been using the deflecting draghead at Calcasieu Pass).

Because relocation trawling had shown limited success in east coast channels (e.g., Canaveral and Brunswick) at temporarily reducing the abundance of sea turtles during periods in which dredging is required, a conservation recommendation was included in the RBO for the COE to consider conducting sea turtle relocation trawling in advance of hopper dredging in certain circumstances. Specifically, the RBO recommended that relocation trawling "should be considered if takes are documented early in a project that requires the use of a hopper dredge during a period in which large numbers of sea turtles may occur."

Since 1995, all Galveston and New Orleans District hopper dredging projects in the Gulf of Mexico, with the exception of the Houston-Galveston Navigation Channels (H-GNC) (which was the subject of a separate Opinion and corresponding ITS for widening and deepening of existing channels, and cutting of new channels), have been conducted under the authority and subject to the take limits of the RBO. Hopper dredging projects under the jurisdiction of the Mobile and Jacksonville Districts were consulted on by individual project requiring individual Opinions and ITS's (e.g., Tampa Bay and Charlotte Harbor, Florida); or in the case of the Mobile District, every five years under informal section 7 consultation procedures.

<u>COE Jacksonville District, Florida West Coast</u>
Informal consultation on the proposed dredging of 750,000 cubic yards (CY) of shoal material and biannual maintenance dredging of 265,000 CY of shoal material in Boca Grande Pass, Charlotte Harbor Entrance Channel (located about 60 miles south of Tampa Bay), was initiated on March 31, 1992, by the

Planning Division, Jacksonville District COE. A BA was transmitted pursuant to section 7 of the ESA. On April 29, 1992, NOAA Fisheries determined that the proposed maintenance dredging action by hopper, hydraulic pipeline, or mechanical dredge would not adversely affect listed species under NOAA Fisheries' purview.

On February 6, 1995, the COE Planning Division, Jacksonville District informed NOAA Fisheries that, as a result of positive testing results, the new turtle excluder "rigid deflector" draghead would be utilized both in Boca Grande Pass and on all other hopper dredging projects. The rigid deflector was developed under controlled conditions by the COE's Waterways Experimental Station (WES), now known as the Engineering Research and Development Center (ERDC).

NOAA Fisheries issued an Opinion to the COE on June 2, 1995, regarding the effects of hopper dredging of approximately 13.3 miles of channels leading into and within Tampa Bay. The Tampa Harbor Navigation Channel Opinion required the COE to (1) conduct pre-dredge trawling surveys for turtles prior to commencement of dredging operations, (2) utilize the newly developed turtle excluder rigid deflector on all dragheads, (3) provide 100% screening of the overflows, and the maximum possible screening of the inflows, (4) disengage dredging pumps when dragheads were not firmly on the bottom, and (5) provide NOAA Fisheries-approved observer monitoring of dredging operations at all (100%) times. The Opinion established an incidental take limit of two documented Kemp's ridley, hawksbill, leatherback or green turtles, in any combination, or three loggerheads, for maintenance hopper dredging of Egmont Bar Channel (Cut 1 and 2), Mullet Key Cut, and Cut A in the navigation channel to Tampa Bay.

The COE reinitiated formal consultation with NOAA Fisheries for the Tampa Harbor Navigation Channel hopper dredging project on April 2, 1996, following the lethal take of two Kemp's ridleys. The resultant Opinion, signed April 9, 1996, suggested additional conservation measures and established an additional incidental take level (in addition to the two Kemp's previously taken), and the deflecting draghead position was adjusted. Additional incidental take was designated as eight sea turtles, however no more than five sea turtles could be Kemp's ridley, hawksbill, leatherback, or green (i.e., up to eight loggerheads could be taken, but no more than five of the other four species combined, NMFS 1996c). Immediately after this new Opinion was issued, three sea turtles (two loggerheads and one Kemp's ridley) were lethally taken by the hopper dredge STUYVESANT during March 3-April 18, 1997 maintenance dredging of the Egmont Bar Channel. These takes occurred despite a pre-dredge trawl survey (conducted from February 13-18, encompassing approximately 30 hours of trawling) that captured, tagged, and relocated three Kemp's ridleys. Subsequent dragging (trawling) operations conducted from March 16 - April 26 during the dredging period resulted in three loggerhead sightings, but no sea turtle captures. In retrospect, it is likely that the pre-dredge trawling occurred too long before the actual hopper dredging to be of maximum benefit.

On October 30, 1998, a loggerhead sea turtle was taken by a hopper dredge conducting maintenance dredging of Charlotte Harbor Entrance Channel (Boca Grande Pass). On November 3, 1998, the COE requested formal consultation on periodic maintenance dredging of Charlotte Harbor Entrance Channel using a hopper dredge to remove approximately 265,000 CY of shoal material every two or three years. Maintenance dredging of Charlotte Harbor Entrance Channel, between October 20, 1998, and January 13, 1999, resulted in one loggerhead (non-lethal) take and three loggerhead surface sightings within 300 yards of the operating hopper dredge.

On June 8, 1999, during consultation on Charlotte Harbor Entrance Channel hopper dredging, NOAA Fisheries requested that the COE-Jacksonville District submit dredging schedules for all District projects to be performed over the next five years, and suggested that the District request initiation of consultation for a Regional Biological Opinion (RBO) to include *all* potential dredging sites within the Jacksonville District, including Tampa Bay and the ongoing Charlotte Harbor consultation. Subsequently, an Opinion for maintenance dredging of Charlotte Harbor Entrance Channel was issued on October 26, 1999, authorizing the incidental take of two loggerheads or Kemp's ridleys or greens or hawksbill sea turtles, and one Gulf sturgeon, per biennial dredging cycle. The Charlotte Harbor Opinion, because of reported incidental take of Gulf sturgeon by gill net fishermen in Boca Grande Pass, was the first Gulf of Mexico hopper dredging Opinion to anticipate dredge interactions with Gulf sturgeon. Previously, NOAA Fisheries had addressed hopper dredging impacts on Gulf sturgeon in section 7 consultations for channel maintenance dredging, believing that the projects were not likely to adversely affect the species given either the project's limited scope and/or the unlikely presence of Gulf sturgeon. While no Gulf sturgeon takes by hopper dredges have been reported since, allopatric sturgeon species on the Atlantic Seaboard have been taken occasionally by hopper dredge. The existing SAD RBO for hopper dredging between North Carolina through Florida limits the incidental take of shortnose sturgeon to five. Recent reports confirm the take of five shortnose sturgeon by a hopper dredge operating in the Kennebec River, Maine (Julie Crocker, NMFS NER, October 15, 2003, pers. comm. to Stephania Bolden, NMFS SER). Thus, NOAA Fisheries considers it prudent to address potential Gulf sturgeon takes by hopper dredges operating in the Gulf of Mexico as we presume the species can be taken given the evidence from two morphologically and ecologically similar Atlantic sturgeon species.

On September 5, 2000, the COE requested consultation on maintenance dredging of St. Petersburg Harbor Entrance Channel, within Tampa Bay, using a hopper dredge. NOAA Fisheries concluded that the ITS and conclusions of the 1996 Tampa Harbor Navigation Channel Opinion remained valid and included this within-bay maintenance dredging. A pre-dredging assessment trawl survey from September 21-28 (approximately 29 hours of trawling) in the proposed dredging area resulted in the capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. Subsequent dredging operations conducted from late September to October 2000, resulted in surface sightings of three turtles, but no captures.

2.0 Description of the Action Area and Proposed Action

The action area (defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action") for this action is the coastal waters, navigation channels, and sand mining areas in the U.S. Gulf of Mexico, from the Texas-Mexico marine border to Key West, Florida.

The proposed action includes:

1) Federal, federally-permitted, or federally-sponsored hopper dredging for maintenance of all U.S. Gulf of Mexico navigation channels within all of the COE's Gulf of Mexico Districts (Galveston, New Orleans, Mobile, and Jacksonville), including intracoastal waterways, maintenance dredging associated

with the Houston-Galveston navigation channels,[1] and maintenance dredging associated with the Corpus Christi Ship Channel Improvement Project.[2]

2) Federal, federally-permitted, or federally-sponsored hopper dredging of all U.S. Gulf of Mexico sand mining areas ("borrow sites") and virgin (previously unused) sand mining areas for beach nourishment, restoration, and protection projects, outside of designated Gulf sturgeon critical habitat, in state waters.

3) Hopper dredging projects including Federal civil works projects, Federal non-civil works projects authorized by COE regulatory permits, and non-Federal projects authorized by COE regulatory permits including privately-sponsored projects and cost-shared projects (part private, part Federal funding).

4) Maintenance (maintenance dredging is defined as keeping channels at specified depths and widths; improving means making them deeper or wider) hopper dredging of Gulf of Mexico navigation channels previously dredged by non-hopper type dredges.

5) Hopper dredging tests, in state waters, to determine a site's sand characteristics and suitability for future sand mining and beach restoration activities.

6) Emergency hopper dredging necessary due to disasters, storms, hurricanes, floods, etc., and national defense.

7) Disposal of hopper-dredged material in approved disposal areas. The COE has stated that economic concerns (e.g., time-of-transit to disposal sites versus time spent actually dredging) dictate that disposal of dredged materials occurs in the vicinity of the dredge sites, usually alongside or downdrift of the channels being dredged in designated placement areas or nearby designated ocean placement sites, often just off barrier island passes. Descriptions of dredged material disposal/placement sites are included herein by reference to charts and figures provided by the Gulf of Mexico COE Districts.

8) Hopper dredging of channels and turning basins <u>beyond</u> previously authorized depths and dimensions (i.e., "new material" dredging) <u>if</u> the action is described in the following project descriptions by COE District (e.g., Jacksonville District's Alafia River project) <u>and</u> only when the project is located outside of designated Gulf sturgeon critical habitat.

9) "New material" hopper dredging including widening, deepening, and extending of existing navigation channels and turning basins to previously authorized dimensions for channels and turning basins outside of designated Gulf sturgeon critical habitat.

10) Bed-leveler mechanical dredging of channels, turning basins, dredged material disposal areas, etc., located outside of designated Gulf sturgeon critical habitat using plows, I-beams, or other bed-leveling mechanical dredging devices used during or after hopper dredging or by themselves to lower high spots in the channel bottom or dredged material deposition areas.

[1] A separate Opinion for the Houston-Galveston navigation channels was previously issued to cover takes during widening, extending, and deepening.

[2] A separate Opinion was finalized in December 2002 on this project to cover takes during widening, extending, and deepening.

Except as noted in 8) and 9) above, "new material"dredging, i.e., hopper dredging to build, deepen, widen, or extend channels and turning basins, is not considered part of the proposed action evaluated in this Opinion and must be consulted on individually by the appropriate COE Districts.

This Opinion does NOT include:

1. Improvement (maintenance dredging is defined as keeping channels at specified depths and widths; improving means making them deeper or wider) of channels to depths or widths not previously authorized throughout the project area.

2. Dredging in areas within designated Gulf sturgeon critical habitat. Such dredging is limited to maintaining the current dimensions of channels at the time of this consultation (i.e., length, width, and depth) regardless of previous authorization. As addressed throughout the rule designating Gulf sturgeon critical habitat, dredging is an activity that may adversely modify critical habitat and therefore must be evaluated on a case-by-case basis.

3. Disposal in areas within designated Gulf sturgeon critical habitat. Such disposal is not authorized nor considered within this Opinion. As addressed throughout the rule designating Gulf sturgeon critical habitat, dredging is an activity that may destroy or adversely modify critical habitat and therefore must be evaluated on a case-by-case basis.

4. Hopper dredging permitted by other Federal agencies (e.g., Minerals Management Service - MMS) for characterizing or obtaining sand for beach renourishment projects in the Gulf of Mexico; although disposal of said sand obtained from outside state waters (i.e., from waters under the permitting purview of MMS, not the COE) is considered part of the proposed action, except for sand disposal within designated Gulf sturgeon critical habitat. Note: Although the COE may issue permits for the disposal in state waters of hopper dredged sand obtained from outside state waters (i.e., from Federal waters under MMS permitting authority), this Opinion does not consider (or hold the COE responsible for) any threatened or endangered species takes arising from non-COE permitted hopper dredging of sand sources outside of the COE's permitting authority.

New Orleans District

The COE New Orleans District has identified the following channels where regular maintenance dredging is required and use of hopper dredges is anticipated.

1. Mississippi River, Baton Rouge to the Gulf of Mexico, Southwest Pass - the lower Mississippi River (mile 4.0 above Head of Passes to mile 22.0 below Head of Passes, Southwest Pass): Maintenance dredging is required, conducted by private (contract) and government-owned hopper dredges for 8-12 months each year. Last dredged in 2002, the FY2004 dredging conference notebook indicates that maintenance dredging of the MR-SWP and the associated bar channel will be conducted by a cutterhead, hopper, and dustpan dredge beginning December 2003 continuing for approximately 8 months to remove approximately 18.8 million CY of material (25% sand, 50% silt, 25% clay). Authorized channel depth is 55 feet. Currently the channel is maintained to 45 feet. Disposal will occur in open water by agitation, placement in a designated ocean placement site, wetland creation and bank nourishment.

2. Mississippi River, Deep Draft Crossings - New Orleans Harbor to Baton Rouge: Maintenance dredging is required, conducted by government-owned hopper dredge and contract dustpan dredge for six months each year. The FY2004 dredging conference notebook, submitted in May 2003 indicates that maintenance dredging of the 45-ft deep x 500-ft wide channel will be conducted by both hopper and

dustpan dredge beginning June 2004 and continuing for approximately 6 months, to remove approximately 16.5 million CY of material (100% sand) between miles 230.7 and 114.8. Open water disposal is proposed in the deep water in vicinity of the crossings.

3. Mississippi River - Gulf Outlet: Maintenance dredging of the MR-GO channel involves non-continuous work from mile -66.0 to mile -9.0, and requires both hopper and cutterhead dredges. Routine maintenance dredging and disposal plans (non-emergency status) by cutterhead dredge can be performed throughout the entire project reach; hopper dredging is utilized in the bar channel reach only. Normally, the reach of the bar channel between mile -3.3 and -9.0 is maintained by hopper dredge. Maintenance dredging is conducted for approximately three months annually by both contract and government-owned hopper dredges. Last dredged in FY 2002, during FY2004 maintenance dredging on the MR-GO bar channel between mile -4.0 and -9.38 is anticipated to begin in September 2004 and continue for approximately 60 days, to remove approximately 1.5-2.5 million CY of material (33% sand, 57% silt, 10% clay). Open water dredged material placement is proposed between miles -4.0 and -9.38 in the ocean dredged material disposal site alongside the channel or on Breton Island. Additionally, hopper dredging work may occur between miles 23.0 and 12.0. Last dredged in 2002, approximately 2.0-6.0 million CY of material is proposed to be dredged, by cutterhead and hopper, starting in June 2004, for 90 days. Unconfined disposal is planned for wetland development behind South Jetty.

The COE New Orleans District requested on April 8, 2002, that hopper dredges be permitted to remove shoal material in the MR-GO navigational channel between mile 27.0 and -9.38 in the event that emergency maintenance dredging is required, only when cutterhead dredges are either unable to perform such work or are unable to provide project dimensions in a timely manner. On April 29, 2003, the District requested that hopper dredges be permitted to remove shoal material in the MR-GO navigational channel between mile 27.0 and -0 under the same conditions as previously noted. Conditions noted by the District that would precipitate emergency hopper dredge sidecasting of dredged material within authorized channel dimensions for later cutterhead dredge removal and disposal include: (a) extreme weather working conditions that prevent safe and timely operation of a cutterhead dredge to restore safe passage in the most expeditious manner, (b) lack of cutterhead dredge availability, (c) unacceptable cutterhead dredge mobilization/start-up response time, (d) excess project cost, and (e) inadequate estimated or actual cutterhead dredging production rates.

4. The Calcasieu River and Pass navigation channel and bar channel (miles 0.0 to -32.0, with the majority of dredging occurring between mile 0.0 to -10.0): Maintenance dredging is required for 2-3 months per year. During FY 2004, this project is scheduled to begin November 2003 and take approximately 60-90 days to remove eight million CY of material (9% sand, 45% silt, 46% clay) and maintain the 40-ft x 400-ft channel between jetties and the 42-ft x 800-ft channel to the 42-ft contour depth in the Gulf. The proposed disposal method is open water disposal at the ocean dredged material disposal sites located from mile 0 to mile -32.0 alongside the channel.

No sea turtle takes have ever been reported from the MR-SWP. A habitat characterization study conducted in 1996 by the New Orleans District COE, including endangered species observer deployment from April through November 1996, indicates that the strength and speed of the Mississippi River's current in Southwest Pass, which causes severe shoaling and resultant constant dredging demand, also preclude the establishment of benthic communities of sea turtle forage species. On January 17, 1997, NOAA Fisheries agreed with the New Orleans District COE's study assessment that sea turtles were not likely to occur within the Southwest Pass of the Mississippi River, and notified the new Orleans District COE that further deployment of sea turtle deflecting dragheads and sea turtle observers in Southwest Pass was unnecessary as the habitat is believed to be unsuitable for sea turtles. NOAA Fisheries has no new evidence that would alter the conclusions of the previous assessment.

The Atchafalaya River and Bayous Chene, Boeuf, and Black are dredged for about 40 days each annually, usually by cutterhead, and between 2-3 million CY of mostly sand (80% sand; 20 % silt) is removed to maintain a channel 20 feet wide by 400 feet long. The project area includes both a bay and a bar channel. A hopper dredge was first used during 2002 (January 30-February 9) in an attempt to better remove "fluff." "Fluff" is fluid mud that returns to channel shortly after dredging and interferes with the passage of certain types of vessels. NOAA Fisheries is not aware of any previously documented take of either sea turtles or Gulf sturgeon during dredging in this channel. Hopper dredging may again occur at these locations in the future.

Galveston District

Hopper dredges are used for maintenance dredging in the Galveston District channels listed below. To date, all beach nourishment projects in the Galveston District have been with dredge materials associated with channel dredging (i.e., sand mining sites were not used) and Galveston District does not anticipate any change to this scenario (Hauch, e-mail comm. to Hawk, Nov. 15, 2000). Hopper dredges deployed since May 1995 have had 100% observer coverage, 100% inflow/overflow screening, rigid deflector dragheads, and dragarm operators have attempted to disengage dredge pumps when dragheads were suspended in the water column. Galveston District also attempts to schedule all hopper dredging during the December 1- March 31 recommended window. During FY02, four maintenance hopper dredging projects were completed: Port Mansfield Channel and Brazos Island Harbor, March; Freeport Harbor, July-August; and Sabine-Neches Waterway, July-August. During FY2003, maintenance dredging was accomplished at Brownsville Entrance Channel (December) and Aransas Pass (April-July).

The COE Galveston District has identified the following channels where maintenance dredging is or will be required and use of hopper dredges is anticipated.

1. The Sabine-Neches Waterway: Annual maintenance dredging is required in this channel, conducted by both contract and government-owned hopper dredges. In FY2003, the COE plans to commence dredging in May for about three months. The last reported takes in this waterway were a Kemp's ridley in March 1997, and a loggerhead in August 2002 during COE dredging of 2.88 million CY of material from July 27-August 13, 2002.

2. Galveston Harbor and Channel: This project was subsumed by the Houston-Galveston Navigation Channels (H-GNC) widening and deepening project which was the subject of a December 7, 1998, Opinion (F/SER/1998/00010). Although incidental take associated with *new material* dredging (i.e., non-maintenance type dredging such as widening and deepening) at H-GNC is covered by the Incidental Take Statement of the December 7, 1998, Opinion, regular maintenance dredging will be required at the Entrance Channel with Extension, Outer Bar Channel, Inner Bar Channel, Bolivar Roads Channel, and the Anchorage Basin and is included in the present Opinion. Authorized channel dimensions are: Entrance Channel (49 ft by 800-1,239 ft); Outer Bar Channel (47-49 ft by 800-1,239 ft); Inner Bar Channel (47 ft by 800-1,189 ft); Bolivar Roads Channel (47 ft by 800-1,000 ft); and Anchorage Basin (36 ft by 2,870-9,760 ft). The total length of these channels is 76,000 feet. Frequency of dredging along this project is expected to average approximately 1.5 years. Although it is not presently known what shoaling patterns will emerge, if the entire project were to be maintained under a single contract, approximately 3.5 million CY of material would need to be excavated requiring about six months of dredging. A more reasonable expectation would be that the project would be broken down into sections that would be dredged with varying frequencies. Maintenance operations will be performed by either contract or

government-owned hopper dredges. One Kemp's ridley and one green were taken during FY99 and one Kemp's ridley was taken in FY2003 in H-GNC dredging. The Houston-Galveston Entrance and Jetty Channel dredging work was scheduled to begin in June 2003 and continue for about three months. In addition, the Galveston District reinitiated consultation with NOAA Fisheries on December 3, 2002, on new material dredging for a proposed new barge channel within the H-GNC system but not considered by the December 7, 1998, Opinion. NOAA Fisheries completed consultation informally on the barge channel dredging (I/SER/2002/01438) on December 8, 2003, since non-hopper type dredges will be used.

3. Freeport Harbor: Dredging frequency has increased since the last consultation, from annual to biannual maintenance dredging by contract hopper requiring about two months of work. The average volume of material removed per contract has increased to about 1.6 million CY. A total of eight sea turtles (all loggerheads) has been taken at this site: one in October 1995, four in June-July 1996, one in October 1998, and two in August 2000. The COE dredged 2.0 million CY of material from July 13-September 24, 2002. FY03 dredging is scheduled to start in June 2003, for about four months.

4. Matagorda Ship Channel: Maintenance dredging is conducted for about 1.5 months every four years using contract hopper dredge. The last lethal take at this site was a loggerhead in October 1996.

5. Corpus Christi Ship Channel: Maintenance dredging is conducted every 1.5 years by contract or government-owned hopper dredge and requires approximately two months. One loggerhead was lethally taken during clean-up in the Port Aransas entrance channel area in September1995; three additional turtles (all loggerheads) were lethally taken in June 1999. Aransas Pass Entrance Channel dredging began in April 9, 2003 and was completed on July 7, 2003, after moving ca 1,153,000 CY of material. Four loggerheads and one Kemp's ridley turtle were taken by the dredge during the project; 71 turtles (55 loggerheads, 15 Kemp's ridleys, and one leatherback) were safely removed from the action area by relocation trawlers.

6. Corpus Christi Ship Channel Improvement Project: Deepening of the Corpus Christi Ship Channel and nearshore approaches to Corpus Christi Bay from about 6 miles offshore. The proposed deepening of the Corpus Christi Shipping Channel (CCSC) from Viola Basin in the Inner Harbor to the end of the jetties in the Gulf of Mexico to –52 ft from –45 ft mean low tide (MLT), plus advanced maintenance and allowable overdepth; deepening the remainder of the channel into the Gulf of Mexico to 54 ft (depths will be increased roughly 10,000 ft into the Gulf of Mexico to the –56 ft isobath); widening of the Upper bay and Lower Bay reaches (from Port Aransas to Harbor Bridge) to 530 ft (existing widths are 500 ft between Port Aransas and La Quinta Junction and 400 ft between La Quinta Junction and the Harbor Bridge); construction of 200-ft wide barge shelves (-12 ft MLT) on both sides of the ship channel from La Quinta Junction to the Harbor Bridge, across the Upper bay portion of the CCSC; and extending La Quinta Channel 7,200 ft to a depth of –40 ft MLT and a width of 400 ft and including a turning basin. It is estimated that approximately 40 million cubic yards of new work will require seven separate dredging contracts to complete. NOAA Fisheries completed formal consultation on this project, and issued an Incidental Take Statement, in December 2002. To date, no turtles have been taken. Any takes associated with future maintenance dredging associated with this project are included in the present Opinion's ITS.

7. Brazos Island Harbor (includes Brazos Santiago Pass - the Brownsville Entrance Channel): Maintenance dredging is conducted every two years by contract hopper dredge and requires approximately 1.5 months. Brazos was dredged in February 1995 and two green turtles and one Kemp's ridley were observed to be taken lethally. A Kemp's ridley and a loggerhead were lethally taken in late April and mid-June of 1997, respectively. Two greens were taken between mid-February and early March 1999. Two greens were taken in a 24-hour period between March 18-19, 2002, causing the COE to terminate the dredging before project completion. The dredge returned in December when waters

temperatures were slightly cooler. Two green turtles were taken between December 15-19, 2002, and work was again suspended due to the lethal takes.

8. Port Mansfield: Maintenance dredging is required every three years by hopper or pipeline dredge, except for the channel seaward of the jetties which requires approximately one month of hopper dredging during maintenance years. Dredging in FY02 occurred from March 4-20, 2002. The first ever reported takes at this site were March 19-20, 2002, when two green turtles were lethally taken within 24 hours. The COE decided to forego additional dredging during FY02 at this site since four of their five green turtles allotted for the COE fiscal year had been taken while two additional major navigation projects remain to be dredged (Freeport Harbor Entrance and Jetty Channels; Sabine Pass Outer Bar and Sabine Bank Channels).

Mobile District

The Mobile District COE has responsibility for civil works activities in the Florida Panhandle west of (but not including) the Aucilla River Basin (including the St. Marks River, Florida) to the Rigolets, Louisiana (up to but not including the Mississippi River). Hopper dredges are routinely used to maintain ocean bar and entrance pass channels leading from the Gulf of Mexico through passes between offshore barrier islands into Mobile Bay, Mississippi Sound, and Pensacola Bay. However, prior to the present Opinion, consultations with the Mobile District on hopper dredging activities were concluded informally every five years, as NOAA Fisheries did not believe until recently that protected species were likely to be impacted as COE observers aboard dredges in Mobile Bay in the early 1990s did not detect evidence of sea turtle entrainment (Henwood, pers. comm. 2002).

The COE Mobile District has identified the following channels in which regular maintenance dredging is required and use of hopper dredges is anticipated.

1. Gulfport Harbor, Mississippi: The Mississippi Sound portion of the project is maintained on a roughly 18-24 month basis. The Mississippi Sound portion of the channel (includes the Sound Channel, Gulfport Ship Channel, Commercial Small Craft Harbor Entrance Channel, and Anchorage Basin) is maintained by pipeline dredge, though the Anchorage Basin may be rarely dredged by hopper dredge. Average yearly dredged material removed from the Anchorage Basin has been about 376,000 CY. The Pass (Ship Island Pass bar channel) and the Gulf entrance channel are maintained on a 12-month basis. Prior to 1992, the majority of this material was removed by hopper dredge and placed in the ocean disposal sites; since 1992 the material from the bar channel has been removed by pipeline dredge and placed downdrift. About 400,000-450,000 CY are removed annually from each entrance channel (Pass and Gulf). The Gulf entrance channel is maintained by hopper dredge with the material placed in ocean sites located on either side of the entrance channel. Currently the Gulf Channel, Bar Channel, Sound Channel, and Gulfport Ship Channel are maintained at their authorized depths of 38, 38, 36, and 36 feet, respectively. The COE Mobile District has initiated a study to investigate potential improvements to the Gulfport Harbor project, including widening and deepening.

2. Pascagoula Harbor, Mississippi: The Mississippi Sound portion of this project is maintained on an 18-24 month basis, typically by pipeline dredge. On occasion, a hopper dredge is utilized within the Mississippi Sound, Bayou Casotte, and Pascagoula River portions of the navigation project, including Pascagoula Naval Station channels. The bar channels (includes the Gulf entrance channel and Horn Island Pass) are maintained on an approximate annual basis. The Pass portion of the project is maintained with a pipeline dredge; the Gulf entrance channel leading to the Pass, and the Horn Island impoundment basin, is usually maintained by hopper dredge with about 538,000 CY removed in each annual dredging cycle. Dredged material is typically disposed of in designated disposal areas alongside the entrance

channel within Mississippi Sound near the Pass, and just outside and southwest of the Pass in nearby designated offshore disposal areas.

3. Mobile Harbor, Alabama: Prior to 1986, all material from the Mobile Bay portion of the project (Mobile Harbor Channel) was dredged by pipeline and sidecast adjacent to the channel. Since 1986 this area (Mobile Bay Ship Channel) has been typically dredged annually by hopper dredge on a continuous basis. Theodore Ship Channel, located about mid-way down the Mobile Harbor Channel, is typically maintained by pipeline dredge but occasionally, when the required dredging is in the vicinity of the juncture with the Mobile Ship Channel, this area will be dredged by hopper dredge. Dredging of the entrance channel leading from the Gulf to Mobile Pass is typically on a 24-month basis. Due to the hydrodynamics of the Mobile Pass, very little dredging is required between Miles 30 and 34, which encompasses the Pass (bar channel) into Mobile Bay between Fort Morgan and Fort Gaines. However, required dredging in the southern portion of the project (Pass and Gulf entrance channel) is typically performed by deep-draft hopper dredges. Annually, an average of 6.1 million CY of material are dredged from Mobile Bay channels; 888,000 CY are dredged from the bar channel; and 1.2 million CY are dredged (by pipeline dredge) from Mobile River channels.

4. Orange Beach and Gulf Shores Beach Nourishment Project: The District has received a proposal from the cities of Orange Beach and Gulf Shores to nourish 11 miles of Gulf beaches, in four segments. The easternmost segment occupies 1.1 miles of Perdido Key from the Alabama/Florida state line westward to the Florida Point unit of Alabama Gulf State Park, Orange Beach, Alabama. The central segment occupies the western 3.6 miles of shoreline in Orange Beach and the eastern 1.9 miles of shoreline in the Gulf State Park, east of the park fishing pier. The western segment lies along 3.3 miles of west Gulf Shores, beginning approximately 0.25 mile west of the entrance to Little Lagoon. The final segment is approximately one mile in length and lies immediately west of the entrance to Little Lagoon in Gulf Shores. Segments 1, 2, and 3 will receive 50-100 cubic yards per linear foot of shoreline, which is expected to advance the shoreline over 200 feet seaward in most areas. Segment 4 is a dune restoration only; no more than 10 cubic yards of sand will be placed per linear foot of shoreline and all fill will be placed above the mean high tide line. A total of seven million cubic yards of sand would be dredged from four offshore sand mining sites. The sites are located approximately 1-3 miles offshore, between Gulf Highlands and Perdido Pass.

5. Pensacola Harbor, Florida: COE Mobile District is currently developing a long-term maintenance plan for civil works projects in Pensacola Bay. In the past COE Mobile District has not routinely maintained these civil works projects, instead they have typically acted as an agent for the U.S. Navy whose channel subsumes the Federal channel at Pensacola. Hopper dredge use is common in Pensacola Bay. The Pensacola Pass Channel (also called Perdido Key Pass) between Santa Rosa Island and Perdido Key has been dredged by pipeline and hopper dredge. Dredged materials are typically disposed of in a nearby designated disposal area just seaward and west of Pensacola Pass, alongside the entrance channel (Caucus Channel).

It is expected that occasional emergencies will arise necessitating limited hopper dredge use in Perdido Key Pass or Pensacola Harbor, including the Navy Channel, Inner Harbor Channel, and Approach Channels to accommodate national defense needs or to deal with unexpected, hazardous shoaling caused by major storms, floods, hurricanes, etc. An emergency hopper dredging project was required in Perdido Key Pass in 2000. NOAA Fisheries also consulted in February 2001 with the COE Jacksonville District, Regulatory Division on a U.S. Navy-requested emergency hopper dredging project to remove approximately 130,000 CY of sandy material from the entrance channel to the Pensacola Harbor and Pensacola Naval Air Station. Although this work requested by the U.S. Navy was under the regulatory responsibility of the Jacksonville District, it was actually performed by the Mobile District, which acted as the Navy's agent and was therefore responsible for obtaining all the required permits (e.g., a regulatory permit from the Jacksonville District, and a permit from the state of Florida). NOAA Fisheries recently completed a formal consultation with the Mobile District on dredging of Pensacola Pass in the U.S. Gulf of Mexico and the deposition of the dredging spoil in the littoral zone off Perdido Key to the west of Pensacola Pass by hopper dredge (F/SER/2003/00053; August 4, 2003). The COE Jacksonville District was the permitting authority; the Mobile District COE, acting as an agent for the U.S. Navy (specifically, Naval Air Station Pensacola), contracted for the hopper dredging/relocation trawling work.

The Mobile District began voluntarily putting endangered species observers on civil works hopper dredging projects within the District in late-summer 2002, following meetings and numerous discussions with NOAA Fisheries. Prior to this, observers were not routinely placed aboard hopper dredges within the District. The Mobile District to date has not required hopper dredges in their District to operate with sea turtle deflectors on their dragheads ("deflector dragheads"), citing lack of evidence of significant sea turtle presence in District waters, and also stating their belief that to prove this it is necessary to dredge without deflecting dragheads in order to gather unbiased evidence that sea turtles are not present in District waters. Hopper dredges operating in the District are required to have hopper inflow screening (4-inch mesh).

Jacksonville District (Florida West Coast - Aucilla River Basin, Florida to Key West, Florida)
Jacksonville District's civil works boundaries generally follow river basins and drainage areas rather than state lines. Jacksonville District is responsible for all of Florida, with the following two exceptions: Mobile District is responsible for the area west of the Aucilla River basin in Florida's panhandle, and Savannah District maintains the St. Mary's River watershed in northeast Florida except for the Fernandina entrance channel that is maintained by Jacksonville District. In addition, Jacksonville District is also responsible for the watersheds of the Suwannee, Withlacoochee, and Alapaha rivers in southern Georgia. Jacksonville District also constructs civil works projects in Puerto Rico and the U.S. Virgin Islands.

Of the numerous navigation projects along the Gulf coast under the Jacksonville District's purview, only the navigation channels in Tampa Bay and Charlotte Harbor are likely to be dredged by hopper dredge; however, there are several beach nourishment projects along the Gulf coast in Pinellas, Collier, Manatee, Sarasota, Escambia, and Lee Counties where hopper dredges may be used. Hopper dredges may be used in the larger nourishment projects where offshore sand mining sites are involved, including but not limited to the Johns Pass, Pass-a-Grille, Egmont Shoal, Estero Island, Pensacola Beach, Venice Beach, Pinellas County, and Lido Key sand mining areas. It is likely that new sand mining sites will soon be required, located, and identified as beach nourishment needs grow and old sites are depleted.

The COE Jacksonville District has identified the following channels and beach restoration projects in which regular maintenance dredging is required and use of hopper dredges is anticipated.

1. Tampa Harbor Navigation Project: Egmont Key (Tampa Bay Entrance Channel) is typically dredged every ten years, and was last dredged in the spring of 1997. Since 1995, three Kemp's ridleys and two loggerheads have been taken by hopper dredges maintaining Tampa Bay navigation channels.

2. St. Petersburg Harbor and Entrance Channel: Last dredged in fall of 2000, a pre-dredging risk assessment trawl survey over eight days (approximately 29 hours of trawling) in the proposed dredging area resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. Hopper dredging (September-October 2000) resulted in surface sightings of three turtles but no takes. Dredged material was used for renourishment of Egmont Key beaches.

3. Boca Grande Pass (Charlotte Harbor Entrance Channel): Since 1992, the Pass has been dredged every 2-3 years, with about 265,000 CY of shoal material removed during each dredging event. Maintenance dredging between October 20, 1998, and January 13, 1999, resulted in one loggerhead (non-lethal) take

and three loggerhead surface sightings within 300 yards of the operating hopper dredge. Dredged materials are typically used to renourish Gasparilla Island beaches.

The Jacksonville District COE has stated that the Boca Grande Pass will not likely require continued maintenance dredging. Although Florida Power and Light (FPL) previously maintained a coal-unloading pier on the southeast side of Gasparilla Island, which was used to offload coal-laden barges pulled by tugboats through the Pass, as a result of FPLs conversion from coal to natural gas, the dock is no longer utilized and therefore dredging is not required. Currently, the majority of boat traffic through the Pass consists of shallow draft recreational vessels. Nevertheless, economic and other considerations may at some point cause FPL to revert to coal, thus re-establishing COEs requirement to dredge the Pass for tugs and barge traffic.

4. Lido Key Shore Protection Project: Three proposed new sand mining areas located approximately 8-10 miles offshore have been identified for the project. Side scan sonar deployed near the sand mining areas provided some evidence of low-relief hardground communities. Sand mining areas will be designated to ensure that dredging will not occur within a minimum of 200 feet from any hardground area.

5. Lee County Shore Protection Project, Gasparilla and Estero Islands: The COE proposes to nourish 2.8 miles of shore on Gasparilla Island with approximately 803,000 CY of material from the Gasparilla Island sand mining area located in the Gulf approximately 3,000 feet offshore of the south end of Gasparilla Island; and 4.7 miles of shore on Estero Island with about 1,023,000 CY of material dredged from the Estero Island sand mining area located approximately 16 miles west of the island. Gasparilla Island would be renourished every seven years; Estero Island every three years.

6. Sarasota County, Manasota Key, Shore Protection Project: The Jacksonville District proposes to conduct a periodic renourishment of Venice Beach using sand taken from one or more of four sand mining sites located from 6-10 miles offshore of Venice Inlet. The proposed action, scheduled to commence in early-winter 2003 will last approximately 3-6 months and will involve placement of sand on 3.2 miles of shoreline using an estimated 800,000 to 1,000,000 cubic yards of material. Due to the distance to the mining sites, a hopper dredge may be used.

7. Pinellas County Shore Protection Project: This project has historically obtained beach quality fill from inlet borrow areas and the Egmont Channel Shoal for nourishment of Pinellas County beaches including, but not limited to, Sand Key, Long Key, and Treasure Island. To accommodate future nourishment needs, alternative mining sites which are closer to the beach fill sites have been identified. Nine new offshore mining sites located between 2-6 miles offshore of Pinellas County and four ebb-tidal shoals, as well as a segment of Egmont Channel Shoal and an area within Passe-a-Grille Channel, are being investigated.

8. Pensacola Beach Restoration Project: The COE Jacksonville District Regulatory Division initiated section 7 consultation with NOAA Fisheries and issued a regulatory permit to the Santa Rosa Island Authority to restore Pensacola Beach shoreline with approximately four million CY of sand dredged from an offshore (~3.5 miles) mining site with either a hopper or pipeline dredge, starting in winter 2002. A biological opinion (F/SER/2002/00091) issued by SERO on October 11, 2002, analyzed project effects and authorized potential takes associated with this project. The present Opinion only considers future periodic maintenance dredging requirements for the Pensacola Beach Restoration Project, not the placement of sand into designated critical habitat, once the initial restoration project is completed.

9. Alafia River Channel and Turning Basin Expansion (Hillsborough Harbor, Tampa Bay): The Alafia River Channel branches off from the main ship channel about 28 miles from the Gulf entrance, and

extends 3.6 miles easterly to terminals at the mouth of the Alafia River. It has an authorized depth of 32 feet Mean Lower Low Water (MLLW) over a bottom width of 200 feet. The turning basin has an authorized depth of 32 feet over a bottom area 700 feet wide and 1,200 feet long. The Tampa Port Authority desires to modify the existing project by deepening and widening the Federal channel and turning basin. In May 2002, the COE submitted an environmental assessment (EA) for a plan for expansion of the Alafia River channel and turning basin.

The preferred alternative in the EA involves widening the channel 50 feet to the south and deepening the channel to a project depth of 42 ft MLLW, and recommends that the turning basin be widened to provide a 1,200-ft diameter area at the channel depth of 42 feet. Disposal of dredged materials (approximately 5.5 million CY) would be at the designated Offshore Dredged Material Disposal site, with some material going into beneficial use areas. Although it is anticipated that material will be removed with a clamshell/scow operation, hopper dredge use is not excluded. Explosives will likely be used, therefore the COE will need to consult separately with NOAA Fisheries on that aspect of the project, since this Opinion only addresses use of hopper dredges.

10. Manatee Harbor (Port Manatee) Navigation and Berth Improvements (Phase 2): NOAA Fisheries received a draft EA on April 1, 2002, for the proposed work. The recommended plan includes construction of wideners along both the north and south sides of the channel at the intersection with the Tampa Harbor Channel, and construction of a 900-ft diameter turning basin at the eastern end of the Manatee Harbor Channel. The project features would be dredged to the existing authorized depth of 40 feet. NOAA Fisheries consulted with the COE on this project on December 22, 1999, concluding that no adverse effects were expected if hopper dredges were not used.

11. Stump Pass Channel Realignment and Beach Nourishment Project: The Charlotte County Board of County Commissioners, via regulatory permit from the COE's Jacksonville District, proposes to realign Stump Pass, at the southern tip of Manasota Key, from its current configuration to its 1980 configuration. The creation of a new channel will require dredging of approximately 500,000 CY of material of nearshore submerged areas in the Gulf of Mexico, beach dune, and inshore submerged areas in Lemon Bay. The newly-aligned channel will be 400 feet wide, 1 mile long. The 500,000 CY of spoil material will be placed on 2.7 miles of beach at two separate areas. The County proposes to periodically maintenance dredge Stump Pass' realigned channel (every 3-5 years) and deposit the spoil material on Don Pedro Island.

12. Naval Air Station Pensacola, Channel Maintenance Dredging: The Mobile District acted as an agent for the Navy to conduct maintenance hopper dredging operations in a portion of the Pensacola Channel in 2003, via regulatory permit issued by the COE's Jacksonville District. The hopper dredging activity was limited to a small area of the channel between Santa Rosa Island and Perdido Key, which is where the most shoaling has occurred. About 150,000-200,000 CY was dredged, with thin layer disposal in the littoral zone to the west of the Pensacola Pass and south of Perdido Key. NOAA Fisheries issued a biological opinion for this activity on August 4, 2003 (F/SER/2003/00053). Future maintenance dredging activities of this channel using hopper dredges are included in the present Opinion, but not dredge spoil deposition in Gulf sturgeon critical habitat.

Scheduling

The Galveston, New Orleans, Mobile, and Jacksonville Districts shall attempt to schedule hopper dredging operations between December 1 and March 31 ("hopper dredging window"), wherever feasible. A 1991 jeopardy Opinion to the COE's SAD on hopper dredging of southeastern U.S. channels first identified this window as necessary to minimize sea turtle interactions. Subsequent studies by the COE (Dickerson et al. 1994) in six southeastern channels suggested that the existing windows were accurate. Sea turtles are generally less abundant in coastal waters of both the Southeast and the Gulf of Mexico during this time period compared to other times of the year since water temperatures are coolest. However, it is unlikely that the COE Districts can schedule all of their hopper-dredging projects during this time frame due to the lack of availability of the hopper dredge fleet, safety considerations, and unforseen emergencies such as those created by hurricanes and flooding which may cause sudden, hazardous shoaling of navigation channels; therefore, projects may need to occur outside of the window. Hopper dredging priorities are developed by COE Districts that utilize these dredges along both the Atlantic and Gulf coasts. Priorities are determined after considering the dredging requirements, and resident sea turtle populations within the Districts. Additionally, shoaling patterns in some channels and bays (e.g., Freeport Harbor, Mobile Bay, MR-GO, and MR-SWP) preclude the option of dredging only during the cooler months.

Inflow Screen Mesh

Since 1995, all maintenance hopper dredges working in the Galveston, New Orleans, and Jacksonville Districts, and South Atlantic Districts, have been equipped with 100% inflow/overflow screening. The standard mesh size used during maintenance dredging operations is 4-inch by 4-inch. One hundred percent inflow screening is required, unless waived by NOAA Fisheries because it would otherwise be impossible to implement and still carry out the project, and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced, but 100% overflow screening is then required. Whenever the clay or debris content of dredged materials causes excessive clogging, as verified by onboard endangered species observers, the COE consults with NOAA Fisheries and inflow screening is usually waived (often, inflow screen mesh size is gradually increased) until the substrate changes and clogging is no longer a problem. Whenever the inflow screening is removed due to potential clogging difficulties, 100% overflow screening is mandatory. Due to differences in overflow screen design, some hopper dredge vessels have overflow screens which are more efficient (i.e., easier to sample, more effective at retaining fragments of dismembered protected species) than others; e.g., horizontal overflow screens are much more efficient than vertical overflow screens. On the hopper dredge EAGLE 1, vertical overflow screening makes sampling for protected species' remains difficult and inconclusive.

For the Galveston District's H-GNC Entrance and Jetty Channels deepening and widening project, new material with high clay concentrations would be dredged. Taking this potential clogging problem into consideration, NOAA Fisheries' December 7, 1998, Opinion allowed successive modifications (increasing mesh size) to be made to hopper inflow screens if the standard 4-inch screens proved unworkable due to excessive clogging. NOAA Fisheries agreed that if the dredge operator, in consultation with observers and any onboard COE or NOAA Fisheries' personnel, determined that the draghead was clogging and reducing production substantially, the inflow screen mesh size could be gradually increased, and even eliminated entirely if necessary.

Occasionally, inflow screens are damaged by the pressure of the dredge slurry on the clogged mesh, requiring screens to be either opened or removed for repairs. When screens are removed, effective monitoring for sea turtle and sturgeon parts is not possible. As a result, COE Galveston District has suggested that in the present regional Opinion, a graduated mesh option–as was previously authorized for the H-GNC deepening and widening project–be authorized Gulf-wide. Graduated mesh would be permitted when clogging of the smaller mesh becomes excessive. Mesh size could then be increased incrementally. This provision for graduated mesh would allow better, more effective monitoring (compared to screen opening or removal), particularly in Freeport and Galveston channels where clogging is a problem during maintenance dredging.

3.0 Status of Listed Species and Critical Habitat

Much of the information for this section, as well as additional detailed information relating to the species biology, habitat requirements, threats, and recovery objectives, can be found in the recovery plan for each species (see "References Cited" section). The following listed species under the jurisdiction of NOAA Fisheries are known to occur in the Gulf of Mexico:

Endangered	
Green sea turtle[3]	*Chelonia mydas*
Leatherback sea turtle	*Dermochelys coriacea*
Hawksbill sea turtle	*Eretmochelys imbricata*
Kemp's ridley sea turtle	*Lepidochelys kempii*
Sperm whale	*Physeter catodon*
Humpback whale	*Megaptera novaeangliae*
Fin whale	*Balaenoptera physalus*
Blue whale	*Balaenoptera musculus*
Sei whale	*Balaenoptera borealis*
Northern right whale	*Eubalaena glacialis*
Smalltooth sawfish	*Pristis pectinata*
Threatened	
Loggerhead sea turtle	*Caretta caretta*
Gulf sturgeon	*Acipenser oxyrinchus desotoi*

Critical Habitat
Within the Gulf of Mexico, critical habitat has only been designated for the Gulf sturgeon.

Species Not Likely to Be Affected
Leatherback sea turtles (*Dermochelys coriacea*) are generally found in deep, pelagic, offshore waters though they occasionally may come into shallow waters to feed on aggregations of jellyfish. Leatherbacks are unlikely to be found associated with ship channels and thus are unlikely to be impacted by hopper dredging activity. There has only been one reported instance of a take of a leatherback sea turtle by a relocation trawler in a shipping channel, approximately 1.5 miles offshore of Aransas Pass, Texas (April 28, 2003, pers. comm. T. Bargo to E. Hawk), and there has never been a reported take by a hopper dredge. The typical leatherback turtle would be as large or larger than the large, industry-standard California-type hopper dredge draghead. Leatherback sea turtles will not be considered further in this Opinion based on the unlikelihood of their presence nearshore and their non-benthic feeding habits which combine to produce a very low likelihood of hopper dredge entrainment.

Smalltooth sawfish (*Pristis pectinata*) are tropical marine and estuarine fish that have the northwestern terminus of their Atlantic range in the waters of the eastern U.S. Currently, their distribution has contracted to peninsular Florida and, within that area, they can only be found with any regularity off the extreme southern portion of the state. The current distribution is centered in the Everglades National Park, including Florida Bay. They have been historically caught as bycatch in commercial and recreational fisheries throughout their historic range; however, such bycatch is now rare due to population declines and population extirpations. Between 1990 and 1999, only four documented takes of smalltooth

[3]Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

sawfish occurred in shrimp trawls in Florida (Simpendorfer 2000). After consultation with individuals with many years in the business of providing qualified observers to the hopper dredge industry to monitor incoming dredged material for endangered species remains (C. Slay, Coastwise Consulting, pers. comm. August 18, 2003) and a review of the available scientific literature, NOAA Fisheries has determined that there has never been a reported take of a smalltooth sawfish by a hopper dredge, and such take is unlikely to occur because of smalltooth sawfishes' affinity for shallow, estuarine systems. Only hopper dredging of Key West channels would have the potential to impact smalltooth sawfish but those channels are not considered in this Opinion. Therefore, NOAA Fisheries believes that smalltooth sawfish are rare in the action area, the likelihood of their entrainment is very low, and that the chances of the proposed action affecting them are discountable. This species will not be discussed further in this Opinion.

Sperm whales (*Physeter macrocephalus*) occur in the Gulf of Mexico but are rare in inshore waters. Other endangered whales, including North Atlantic right whales (*Eubalaena glacialis)* and humpback whales (*Megaptera novaeangliae*), have been observed occasionally in the Gulf of Mexico. The individuals observed have likely been inexperienced juveniles straying from the normal range of these stocks. NOAA Fisheries believes there are no resident stocks of these species in the Gulf of Mexico, and these species are not likely to be adversely affected by projects in the Gulf. NOAA Fisheries believes that blue, fin, or sei whales will not be adversely affected by hopper dredging operations; the possibility of dredge collisions is remote since these are deepwater species unlikely to be found near hopper dredging sites. There has never been a report of a whale taken by a hopper dredge. Based on the unlikelihood of their presence, feeding habits, and very low likelihood of hopper dredge interaction, the above-mentioned cetaceans are not considered further in this Opinion.

Species and Critical Habitat Likely to Be Affected

Of the above-listed threatened and endangered species of sea turtles, whales, and sturgeon potentially present in the action area, NOAA Fisheries believes that only loggerhead, green, hawksbill, and Kemp's ridley sea turtles, and Gulf sturgeon, are vulnerable to being taken as a result of the use of hopper dredges to maintain, or deepen and widen navigation channels and harbors, or to dredge sand mining areas for beach nourishment in the U.S. Gulf of Mexico. Hopper dredging activities also have the potential to destroy or adversely effect Gulf sturgeon critical habitat. Descriptions follow for each of these five species and for the designated critical habitat.

A. Species/critical habitat description

<u>Loggerhead Sea Turtle</u>

The loggerhead sea turtle was listed as a threatened species on July 28, 1978. This species inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans, and within the continental United States it nests from Louisiana to Virginia. The major nesting areas include coastal islands of Georgia, South Carolina, and North Carolina, and the Atlantic and Gulf coasts of Florida, with the bulk of the nesting occurring on the Atlantic coast of Florida. Developmental habitat for small juveniles is the pelagic waters of the North Atlantic and the Mediterranean Sea (NMFS and USFWS 1991b).

Life history

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. There are five western Atlantic subpopulations, divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29° N; (2) a south Florida nesting subpopulation, occurring from 29° N on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez 1990 and TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS SEFSC 2001). The fidelity of nesting females to their nesting beach is the reason these subpopulations can be differentiated from one another. This nest beach fidelity will prevent recolonization of nesting beaches with turtles from other subpopulations.

Mating takes place in late March-early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern United States Individual females nest multiple times during a nesting season, with a mean of 4.1 nests/individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd 1988). Generally loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years or more. Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the United States Atlantic and Gulf of Mexico. Benthic immature loggerheads (turtles that have come back to inshore and near shore waters), the life stage following the pelagic immature stage, have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico.

Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985; Frazer et al. 1994) with the benthic immature stage lasting at least 10-25 years. However, based on new data from tag returns, strandings, and nesting surveys NMFS SEFSC (2001) estimates ages of maturity ranging from 20-38 years and benthic immature stage lasting from 14-32 years.

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads are primarily coastal and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

Population dynamics and status

A number of stock assessments (TEWG 1998, TEWG 2000, and NMFS SEFSC 2001) have examined the stock status of loggerheads in the waters of the United States, but have been unable to develop any reliable estimates of absolute population size. Based on nesting data, of the five western Atlantic subpopulations, the south Florida nesting subpopulation and the northern nesting subpopulation are the most abundant (TEWG 2000 and NMFS SEFSC 2001). The Turtle Expert Working Group (TEWG) (2000) was able to assess the status of these two better-studied populations and concluded that the south Florida subpopulation is increasing, while no trend is evident (at that time considered stable but possibly declining) for the northern subpopulation. Another consideration adding to the vulnerability of the northern subpopulation is that NOAA Fisheries' scientists estimate that the northern subpopulation produces 65% males (NMFS SEFSC 2001).

The latest and most extensive stock assessment (NMFS SEFSC 2001) was successful in assembling the best available information on loggerhead turtle life history and developing population models that can be used to predict the response of the loggerhead populations to changes in their mortality and survival. The new turtle excluder device rule (68 FR 8456, February 21, 2003) requiring larger openings is expected to reduce trawl related loggerhead mortality by 94% (Epperly et al. 2002). Based on the loggerhead population models in NMFS SEFSC (2001) this change in the mortality rate is expected to move the northern nesting population from stable to increasing.

The southeastern United States nesting aggregation is second in size only to the nesting aggregation on islands in the Arabian Sea off Oman (Ross 1979, Ehrhart 1989, NMFS and USFWS 1991b). The southeast United States nesting aggregation is especially important because the status of the Oman colony has not been evaluated recently. It is located in an area of the world where it is highly vulnerable to disruptive events such as political upheavals, wars, catastrophic oil spills, and lack of strong protections (Meylan et al. 1995).

Ongoing threats to the western Atlantic populations include incidental takes from dredging, commercial trawling, longline fisheries, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease.

Green Sea Turtle

Federal listing of the green sea turtle occurred on July 28, 1978, with all populations listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are endangered. The complete nesting range of the green turtle within the NOAA Fisheries' Southeast Region includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina and the Unite States Virgin Islands (U.S.V.I.) and Puerto Rico (NMFS and USFWS 1991a). Principal United States nesting areas for green turtles are in eastern Florida, predominantly Brevard through Broward Counties (Ehrhart and Witherington 1992). Green turtle nesting also occurs regularly on St. Croix, U.S.V.I., and on Vieques, Culebra, Mona, and the main island of Puerto Rico (Mackay and Rebholz 1996).

Life history

Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Females usually have 2-4 or more years between breeding seasons, while males may mate every year (Balazs 1983). After hatching, green sea turtles go through a post-hatchling pelagic stage where they are associated with drift lines of algae and other debris.

Green turtle foraging areas in the southeastern United States include any coastal shallow waters having macroalgae or sea grasses near mainland coastlines, islands, reefs, or shelves, and any open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997, NMFS and USFWS 1991a). Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984, Hildebrand 1982, Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957, Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon System, Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward counties (Wershoven and Wershoven 1992, Guseman and Ehrhart 1992). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs. Age at sexual maturity is estimated to be between 20-50 years (Balazs 1982, Frazer and Ehrhart 1985).

Green sea turtles are primarily herbivorous, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The post-hatchling, pelagic-stage individuals are assumed to be omnivorous, but few data are available.

Population dynamics and status

The vast majority of green turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995, Johnson and Ehrhart 1994). Marine turtle populations have been monitored on Florida nesting beaches for nearly four decades. Currently, the Florida Wildlife Commission (FWC) coordinates the collection of nesting survey data on 180 survey areas comprising 1,300 km of nesting beach. Thirty-three of these beaches, chosen to represent the state geographically, participate in FWC's Index Nesting Beach Survey Program by following a standardized methodology for data collection that allows for statistically valid trend evaluation. It is unclear how greatly green turtle nesting in the whole of Florida has been reduced from historical levels (Dodd 1981). However, based on 1989-2002 nesting information, green turtle nesting in Florida has been increasing (Florida Marine Research Institute Statewide Nesting 2002, Database). Total nest counts and trends at index[4] beach sites during the past decade suggest that green turtles that nest within the southeastern United States are increasing.

There are no reliable estimates of the number of immature green turtles that inhabit coastal areas (where they come to forage) of the southeastern United States. However, information on incidental captures of immature green turtles at the St. Lucie Power Plant (average 215 green turtle captures per year since 1977) in St. Lucie County, Florida (on the Atlantic coast) indicates that the annual number of immature green turtles captured has increase significantly in the past 26 years (FPL 2002). At the power plant, the annual number of immature green turtle captures has increased significantly in the past 26 years. It is not known whether or not this increase is indicative of local or Florida east coast populations.

It is likely that immature green turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero. Trends at Florida beaches are presented above. Trends in nesting at Yucatán beaches cannot be assessed because of a lack of consistent beach surveys over time. Trends at Tortuguero (ca. 20,000-50,000 nests/year) show a significant increase in nesting during the period 1971-1996 (Bjorndal et al. 1999). Therefore, it seems reasonable that there is an increase in immature green turtles inhabiting coastal areas of the southeastern United States; however, the magnitude of this increase is unknown.

The principal cause of past declines and extirpations of green turtle assemblages has been the over-exploitation of green turtles for food and other products. Although intentional take of green turtles and their eggs is not extensive within the southeastern United States, green turtles that nest and forage in the region may spend large portions of their life history outside the region and outside United States jurisdiction, where exploitation is still a threat. However, there are still significant and ongoing threats to green turtles from human-related causes in the United States. These threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, other human activities and fishing gear. There is also the increasing threat from occurrences of green turtle fibropapillomatosis disease. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, Jacobson 1990, Jacobson et al. 1991).

<u>Kemp's Ridley Sea Turtle</u>

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[4]Indexed beaches are those where survey effort to monitor annual nesting has been standardized and is constant from year to year and therefore nesting trends may be determined with statistical confidence; at non-indexed beaches, survey effort may, and often does, vary from year to year.

The Kemp's ridley was listed as endangered on December 2, 1970. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Zwinenberg 1977, Groombridge 1982, TEWG 2000). Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico, Tamaulipas State. The species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States.

Life history

Females return to their nesting beach about every two years (TEWG 1998). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico. The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season.

Benthic immature Kemp's ridleys have been found along the east coast Seaboard of the United States and in the Gulf of Mexico. In the Atlantic, benthic immature turtles travel northward as the water warms to feed in the productive, coastal offshore waters (Georgia through New England), migrating southward with the onset of winter (Lutcavage and Musick 1985, Henwood and Ogren 1987, Ogren 1989). In the Gulf, studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995). Little is known of the movements of the post-hatching stage (pelagic stage) within the Gulf. Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Schmid and Witzell 1997). The TEWG (1998) estimates age at maturity from 7-15 years.

Stomach contents of Kemp's ridleys taken from the lower Texas coast consisted of mainly nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). Pelagic stage Kemp's ridleys presumably feed on the available sargassum and associated infauna or other epipelagic species found in the Gulf of Mexico.

Population dynamics and status

Of the seven extant species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the Rancho Nuevo beaches (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s nesting numbers were below 1,000 (with a low of 702 nests in 1985). However, recent observations of increased nesting (with 6,277 nests recorded in 2000) suggest that the decline in the ridley population has stopped and the population is now increasing (USFWS 2000).

A period of steady increase in benthic immature Kemp's ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990. The increased survivorship of immature turtles is due in part to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets. As demonstrated by nesting increases at the main nesting sites in Mexico adult Kemp's ridley numbers have grown. The population model used by TEWG (2000) projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2015.

The largest contributor to the decline of the Kemp's ridley in the past was commercial and local exploitation, especially poaching of nests at the Rancho Nuevo site, as well as the Gulf of Mexico shrimp trawl fisheries. The advent of TED regulations for trawlers and protections for the nesting beaches have allowed the species to begin to rebound. Many threats to the future of the species remain, including interactions with fishery gear, marine pollution, foraging habitat destruction, illegal poaching of nests and potential threats to the nesting beaches from such sources as global climate change, development, and tourism pressures.

Hawksbill Sea Turtle

The hawksbill turtle was listed as endangered on June 2, 1970, and is considered Critically Endangered by the International Union for the Conservation of Nature (IUCN). The hawksbill is a medium-sized sea turtle with adults in the Caribbean ranging in size from approximately 62.5 to 94.0 cm straight carapace length. The species occurs in all ocean basins although it is relatively rare in the Eastern Atlantic and Eastern Pacific, and absent from the Mediterranean Sea. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30°N to 30°S. They are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons (NMFS and USFWS 1993).

Life History

There are five regional nesting populations with more than 1,000 females nesting annually. These populations are in the Seychelles, Mexico, Indonesia, and two in Australia (Meylan and Donnelly 1999). Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest. Movements of reproductive males are less well known, but are presumed to involve migrations to the nesting beach or to courtship stations along the migratory corridor (Meylan 1999b). Females nest an average of 3-5 times per season (Meylan and Donnelly 1999, Richardson et al. 1999). Clutch size is higher on average (up to 250 eggs) than that of other turtles (Hirth 1980). Reproductive females may exhibit a high degree of fidelity to their nest sites.

The life history of hawksbills consists of a pelagic stage that lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988, Meylan and Donnelly 1999), followed by residency in developmental habitats (foraging areas where immatures reside and grow) in coastal waters. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Hawksbills show fidelity to their foraging areas over periods of time as great as several years (van Dam and Díez 1998).

Their diet is highly specialized and consists primarily of sponges (Meylan 1988) although other food items, notably corallimorphs and zooanthids, have been documented to be important in some areas of the Caribbean (van Dam and Díez 1997, Mayor et al. 1998, Leon and Díez 2000).

Population Dynamics, Status, and Distribution

There has been a global population decline of over 80% during the last three generations (105 years) (Meylan and Donnelly 1999).

In the Western Atlantic, the largest hawksbill nesting population occurs in the Yucatán Península of Mexico, where several thousand nests are recorded annually in the states of Campeche, Yucatán, and Quintana Roo (Garduño-Andrade et al. 1999). Important but significantly smaller nesting aggregations are documented elsewhere in the region in Puerto Rico, the U.S. Virgin Islands, Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan 1999a). Estimates of the annual number of nests for each of these areas are of the order of hundreds to a few thousand. Nesting within the southeastern U.S. and U.S. Caribbean is restricted to Puerto Rico (>650 nests/yr), the U.S. Virgin Islands (~400 nests/yr), and, rarely, Florida (0-4 nests/yr)(Eckert 1995, Meylan 1999a, Florida Statewide Nesting Beach Survey database 2002). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan 1999a).

Gulf Sturgeon

NOAA Fisheries and the FWS listed the Gulf sturgeon, also known as the Gulf of Mexico sturgeon, as a threatened species on September 30, 1991 (56 CFR 49653). The present range of the Gulf sturgeon extends from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida. Sporadic occurrences have been recorded as far west as the Rio Grande River between Texas and Mexico, and as far east and south as Florida Bay (Wooley and Crateau 1985, Reynolds 1993).

Life history

The Gulf sturgeon is an anadromous fish; adults spawn in freshwater then migrate to feed and grow in estuarine/marine habitats. After spawning in the upper river reaches, both adult and subadult Gulf sturgeon migrate from the estuaries, bays, and the Gulf of Mexico to the coastal rivers in early spring (i.e., March through May) when river water temperatures range from 16 to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Fox and Hightower 1998, Sulak and Clugston, 1999, Fox et al. 2000). Fall downstream migration from the river into the estuary/Gulf of Mexico begins in September (at water temperatures around 23°C) and continues through November (Huff 1975, Wooley and Crateau 1985, Foster and Clugston 1997).

Most subadult and adult Gulf sturgeon spend cool months (October or November through March or April) in estuarine areas, bays, or in the Gulf of Mexico (Odenkirk 1989, Foster 1993, Clugston et al. 1995, and Fox et al. 2002). Research indicates that in the estuary/marine environment both subadult and adult Gulf sturgeon show a preference for sandy shoreline habitats with water depths less than 3.5 m and salinity less than 6.3 parts per thousand (Fox and Hightower 1998, Parauka et al. in press). The majority of tagged fish have been located in areas lacking seagrass (Fox et al. 2002, Parauka et al. in press), in shallow shoals 1.5 to 2.1 m and deep holes near passes (Craft et al. 2001), and in unvegetated, fine to medium-grain sand habitats, such as sandbars, and intertidal and subtidal energy zones (Menzel 1971, Abele and Kim 1986). These shifting, predominantly sandy, areas support a variety of potential prey items including estuarine crustaceans, small bivalve mollusks, ghost shrimp, small crabs, various polychaete worms, and lancelets (Menzel 1971, Abele and Kim 1986, AFS 1989, and M. Brim, USFWS pers. comm. 2002).

Once subadult and adult Gulf sturgeon migrate from the river to the estuarine/marine environment, having spent at least 6 months in the river fasting, it is presumed that they immediately begin foraging. Upon exiting the rivers, Gulf sturgeon are found in high concentrations near their natal river mouths; these lakes and bays at the mouth of the river are important because they offer the first opportunity for Gulf sturgeon to forage. Specifics regarding Gulf sturgeon diet items and foraging are discussed within Section IV (Effects of the Action) of this Opinion.

Gulf sturgeon are long-lived, with some individuals reaching at least 42 years in age (Huff 1975). Age at sexual maturity for females ranges from 8 to 17 years, and for males from 7 to 21 years (Huff 1975). Chapman et al. (1993) estimated that mature female Gulf sturgeon weighing between 29 and 51 kg produce an average of 400,000 eggs.

Based on the fact that male Gulf sturgeon are capable of annual spawning, and females require more than one year between spawning events (Huff 1975, Fox et al. 2000), we assume that the Gulf sturgeon are similar to Atlantic sturgeon (*A. o. oxyrhinchus*); that is, they exhibit a long inter-spawning period, with females spawning at intervals ranging from every 3 to 5 years, and males every 1 to 5 years (Smith 1985).

Spawning occurs in the upper river reaches in the spring when water temperature is around 15° to 20°C. While Sulak and Clugston (1999) suggested that sturgeon spawning activity is related to moon phase, other researchers have found little evidence of spawning associated with lunar cycles (Slack et al. 1999, Fox et al. 2000). Fertilization is external; females deposit their eggs on the river bottom and males fertilize them. Gulf sturgeon eggs are demersal, adhesive, and vary in color from gray to brown to black (Vladykov and Greeley 1963, Huff 1975, Parauka et al. 1991).

Genetic studies conclude that Gulf sturgeon exhibit river-specific fidelity. Stabile et al. (1996) analyzed tissue taken from Gulf sturgeon in eight drainages along the Gulf of Mexico for genetic diversity; they noted significant differences among Gulf sturgeon stocks, and suggested region-specific affinities and likely river-specific fidelity. Five regional or river-specific stocks (from west to east) have been identified: (1) Lake Pontchartrain and Pearl River, (2) Pascagoula River, (3) Escambia and Yellow Rivers, (4) Choctawhatchee River, and (5) Apalachicola, Ochlockonee, and Suwannee Rivers (Stabile et al. 1996).

Tagging studies also indicate that Gulf sturgeon exhibit a high degree of river fidelity (Carr 1983). Of 4,100 fish tagged, 21% (860/4100 fish) were later recaptured in the river of their initial collection, eight fish (0.009%) moved between river systems, and the remaining fish (78%) have not yet been recaptured (USFWS et al. 1995). There is no information documenting the presence of spawning adults in non-natal rivers. However, there is some evidence of inter-riverine (from natal rivers into non-natal) movements by both male and female Gulf sturgeon (n=22) (Wooley and Crateau 1985, Carr et al. 1996, Craft et al. 2001, Ross et al. 2001b, Fox et al. 2002). It is important to note that gene flow is low in Gulf sturgeon stocks, with each stock exchanging less than one mature female per generation (Waldman and Wirgin 1998).

A full discussion of the life history of this subspecies may be found in the September 30, 1991, final rule listing the Gulf sturgeon as a threatened species (56 FR 49653), the Recovery/Management Plan approved by NOAA Fisheries and the U.S. Fish and Wildlife Service in September 1995, and the final rule designating Gulf sturgeon critical habitat (68 FR 13370).

Population dynamics and status

Gulf sturgeon occur in most major tributaries of the northeastern Gulf of Mexico, from the Mississippi River east to Florida's Suwannee River, and in the central and eastern nearshore Gulf waters as far south as Charlotte Harbor (Wooley and Crateau 1985). In Florida, Gulf sturgeon are present in the Escambia, Yellow, Blackwater, Choctawhatchee, Apalachicola, Ochlockonee, and Suwannee Rivers (Reynolds 1993). While little is known about the abundance of Gulf sturgeon throughout most of its range, population estimates have been calculated for the Apalachicola, Choctawhatchee, and Suwannee Rivers. The USFWS calculated an average (from 1984-1993) of 115 individuals (> 45 cm TL) over-summering in the Apalachicola River below Jim Woodruff Lock and Dam (USFWS et al. 1995). Preliminary estimates of the Gulf sturgeon subpopulation in the Choctawhatchee River system are 2,000 to 3,000 fish over 61 cm TL. The Suwannee River Gulf sturgeon population (i.e., fish > 60 cm TL and older than age 2) has recently been calculated at approximately 7,650 individuals (Sulak and Clugston 1999). Although the size of the Suwannee River population is considered stable, the population structure is highly dynamic as indicated by length frequency histograms (Sulak and Clugston 1999). Strong and weak year classes coupled with the regular removal of larger fish (by natural mortality) limits the growth of the Suwannee River population but stabilizes the average population size (Sulak and Clugston 1999).

Gulf Sturgeon Critical Habitat

Gulf sturgeon critical habitat was jointly designated by the NOAA Fisheries and FWS in 2003 (68 FR 13370). Critical habitat is defined in section 3(5)(A) of the ESA as (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" is defined in section 3(3) of the ESA as the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary.

Gulf sturgeon critical habitat includes areas within the major river systems that support the seven currently reproducing subpopulations (USFWS et al. 1995) and associated estuarine and marine habitats. Gulf sturgeon use the rivers for spawning, larval and juvenile feeding, adult resting, and staging, and to move between the areas that support these components. Gulf sturgeon use the lower riverine, estuarine, and marine environment during winter months primarily for feeding and, more rarely, for inter-river migrations. Estuaries and bays adjacent to the riverine units protect unobstructed passage of sturgeon from feeding areas to spawning grounds.

Fourteen areas (units) are designated as Gulf sturgeon critical habitat. Critical habitat units encompass approximately 2,783 river kilometers (rkm) and 6,042 km^2 of estuarine and marine habitats and include portions of the following Gulf of Mexico rivers, tributaries, estuarine and marine areas:

Unit 1 = Pearl and Bogue Chitto Rivers in Louisiana and Mississippi
Unit 2 = Pascagoula, Leaf, Bowie, Big Black Creek and Chickasawhay Rivers in Mississippi
Unit 3 = Escambia, Conecuh, and Sepulga Rivers in Alabama and Florida
Unit 4 = Yellow, Blackwater, and Shoal Rivers in Alabama and Florida
Unit 5 = Choctawhatchee and Pea Rivers in Florida and Alabama
Unit 6 = Apalachicola and Brothers Rivers in Florida
Unit 7 = Suwannee and Withlacoochee River in Florida
Unit 8 = Lake Pontchartrain (east of causeway), Lake Catherine, Little Lake, the Rigolets, Lake Borgne, Pascagoula Bay and Mississippi Sound systems in Louisiana and Mississippi, and sections of the state waters within the Gulf of Mexico
Unit 9 = the Pensacola Bay system in Florida
Unit 10 = Santa Rosa Sound in Florida
Unit 11 = Nearshore Gulf of Mexico in Florida
Unit 12 = Choctawhatchee Bay system in Florida
Unit 13 = Apalachicola Bay system in Florida, and
Unit 14 = Suwannee Sound in Florida

Critical habitat determinations focus on those physical and biological features (primary constituent elements = PCEs) that are essential to the conservation of the species (50 CFR 424.12). Federal agencies must insure that their activities are not likely to result in the destruction or adverse modification of the PCEs within defined critical habitats. Therefore, proposed actions that may impact designated critical habitat require an analysis of potential impacts to each PCE.

PCEs identified as essential for the conservation of the Gulf sturgeon consist of:

(1) Abundant food items, such as detritus, aquatic insects, worms, and/or molluscs, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods,

molluscs and/or crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages;

(2) Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;

(3) Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;

(4) A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging;

(5) Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;

(6) Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and

(7) Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unobstructed river or a dammed river that still allows for passage).

As stated in the final rule designating Gulf sturgeon critical habitat, the following activities, among others, when authorized, funded or carried out by a Federal agency, may destroy or adversely modify critical habitat:

(1) Actions that would appreciably reduce the abundance of riverine prey for larval and juvenile sturgeon, or of estuarine and marine prey for juvenile and adult Gulf sturgeon, within a designated critical habitat unit, such as dredging; dredged material disposal; channelization; in-stream mining; and land uses that cause excessive turbidity or sedimentation;

(2) Actions that would appreciably reduce the suitability of Gulf sturgeon spawning sites for egg deposition and development within a designated critical habitat unit, such as impoundment; hard-bottom removal for navigation channel deepening; dredged material disposal; in-stream mining; and land uses that cause excessive sedimentation;

(3) Actions that would appreciably reduce the suitability of Gulf sturgeon riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, believed necessary for minimizing energy expenditures and possibly for osmoregulatory functions, such as dredged material disposal upstream or directly within such areas; and other land uses that cause excessive sedimentation;

(4) Actions that would alter the flow regime (the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) of a riverine critical habitat unit such that it is appreciably impaired for the purposes of Gulf sturgeon migration, resting, staging, breeding site selection, courtship, egg fertilization, egg deposition, and egg development, such as impoundment; water diversion; and dam operations;

(5) Actions that would alter water quality within a designated critical habitat unit, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, such that it is appreciably impaired for normal Gulf sturgeon

behavior, reproduction, growth, or viability, such as dredging; dredged material disposal; channelization; impoundment; in-stream mining; water diversion; dam operations; land uses that cause excessive turbidity; and release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater via point sources or dispersed non-point sources;

(6) Actions that would alter sediment quality within a designated critical habitat unit such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredged material disposal; channelization; impoundment; in-stream mining; land uses that cause excessive sedimentation; and release of chemical or biological pollutants that accumulate in sediments;

(7) Actions that would obstruct migratory pathways within and between adjacent riverine, estuarine, and marine critical habitat units, such as dams, dredging, point-source-pollutant discharges, and other physical or chemical alterations of channels and passes that restrict Gulf sturgeon movement (68 FR 13399).

4.0 Environmental Baseline

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the action area. The environmental baseline is a "snapshot" of a species' health at a specified point in time and includes state, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation in progress. Unrelated Federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the action area that may benefit listed species or critical habitat.

Status of Species and Critical Habitat Within the Action Area

Sea Turtles

The species of sea turtles that occur in the action area and that might be affected by the proposed action are all highly migratory. The nearshore and inshore waters of the northern and eastern Gulf, including the upper Texas and Florida coast and estuaries such as Galveston Bay and Apalachee Bay, may be used by these species as post-hatchling developmental habitat or foraging habitat. NOAA Fisheries believes that no individual members of any of the species are likely to be permanent residents of the action area, although some individuals may be present at any given time, with minimum local abundance in winter and maximum local abundance in summer. These same individuals will migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean when water temperatures drop and thus be impacted by activities occurring there; therefore, the species status is considered to be range-wide and supported by the species accounts in Section 2.0. Because they travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, individuals in the action area are impacted by activities that occur in other areas within their geographic range.

Gulf Sturgeon

The Gulf sturgeon is found in the Gulf of Mexico primarily from Tampa Bay, Florida west to the mouth of the Mississippi River. The action area includes the entire geographic range of the species, all five genetically distinct Gulf sturgeon river-specific stocks, and winter habitat for all known (seven) reproducing riverine populations.

Gulf sturgeon will be present in the project area from about September through May; they are not likely to be present in the project area in the summer (approximately May to September) when they are upstream at spawning areas. Upstream migration from the estuarine/marine area to riverine spawning areas occurs in early spring (i.e., March through May) when river water temperatures range from 16° to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Fox and Hightower 1998, Sulak and Clugston 1999, Fox et al. 2000). Fall downstream migration from the river into the estuary/marine environment is cued by water temperature (around 23°C), generally beginning in September and continuing through November (Huff 1975, Wooley and Crateau 1985, Foster and Clugston 1997).

Gulf sturgeon use the lower riverine, estuarine, and marine environment from about September through May for feeding and migration. Following a period of fasting in the river, the Gulf sturgeon are presumed to begin foraging as soon as they enter suitable brackish and marine habitat; they have been located in seagrass and sand in depths of 1.5 to 5. 9 m (Fox and Hightower 1998, Craft et al. 2001, Parauka et al. in press) which supports a variety of potential prey items including estuarine crustaceans, small bivalve mollusks, and lancelets (Menzel 1971, Abele 1986, AFS 1989). In the estuarine/marine environment, Gulf sturgeon must consume sufficient prey to not only regain the body weight lost during the summer in the riverine environment, they must also obtain enough energy necessary for growth and reproduction (Fox et al. 2002, Murie and Parkyn pers. comm.). In addition to foraging, the Gulf sturgeon are migrating within the project area between habitats and, more rarely, between rivers.

Gulf Sturgeon Critical Habitat

NOAA Fisheries and FWS have designated 14 units as Gulf sturgeon critical habitat. Discussion in this Opinion will be limited to the marine/estuarine habitats (units #8-14) that are under the purview of NOAA Fisheries. The defining boundary between the riverine (FWS) and estuarine (NOAA Fisheries) units is rkm 0 (68 FR 13454). Regulatory jurisdiction in coastal areas extends to the line on the shore reached by the plane of the mean (average) high water (MHW) (33 CFR 329.12(a)(2)). All bays and estuaries within units #8-14, therefore, lie below the MHW lines. The term "72 COLREGS" delineates those waters where mariners shall comply with the International Regulations for Preventing Collisions at Sea, 1972 and those waters where mariners shall comply with the Inland Navigation Rules (33 CFR 80.01). The waters inside (landward) of these lines are Inland Rules waters and the waters outside (seaward) of the lines are COLREGS (International Rules) waters. These lines are defined in 33 CFR 80, and have been used for identification purposes to delineate boundary lines of the estuarine and marine habitat unit's 8, 9, 11, and 12. The following table, taken from the Gulf sturgeon critical habitat final rule (68 FR 13390), details areal coverage within each unit under NOAA purview.

Table 1. Approximate Area of the Estuarine and Marine Critical Habitat Units for the Gulf Sturgeon.

Critical Habitat Unit Estuarine and Marine Systems	State	Kilometers^2	Miles^2
# 8. Lake Borgne	Louisiana/	718	277
	Mississippi/	8	3
Little Lake	Alabama	763	295
Lake Pontchartrain		26	10
Lake St. Catherine		13	5
The Rigolets		1,879	725
Mississippi Sound		160	62
MS near shore Gulf			
#9. Pensacola Bay	Florida	381	147

Critical Habitat Unit Estuarine and Marine Systems	State	Kilometers^2	Miles^2
#10. Santa Rosa Sound	Florida	102	39
#11. Near shore Gulf of Mexico	Florida	442	171
#12. Choctawhatchee Bay	Florida	321	124
#13. Apalachicola Bay	Florida	683	264
#14. Suwannee Sound	Florida	546	211
Total		6,042	2,333

Individual critical habitat unit (#8-14 only) boundaries are summarized below and a functional description is provided.

Unit #8 (Lake Pontchartrain, Lake St. Catherine, The Rigolets, Little Lake, Lake Borgne, and Mississippi Sound) encompasses Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne, including Heron Bay, and the Mississippi Sound. Critical habitat follows the shorelines around the perimeters of each included lake. The Mississippi Sound includes adjacent open bays including Pascagoula Bay, Point aux Chenes Bay, Grand Bay, Sandy Bay, and barrier island passes, including Ship Island Pass, Dog Keys Pass, Horn Island Pass, and Petit Bois Pass. The northern boundary of the Mississippi Sound is the shoreline of the mainland between Heron Bay Point, Mississippi and Point aux Pins, Alabama. Critical habitat excludes St. Louis Bay, north of the railroad bridge across its mouth; Biloxi Bay, north of the U.S. Highway 90 bridge; and Back Bay of Biloxi. The southern boundary follows along the broken shoreline of Lake Borgne created by low swamp islands from Malheureux Point to Isle au Pitre. From the northeast point of Isle au Pitre, the boundary continues in a straight north-northeast line to the point one nautical mile (nmi) seaward of the western most extremity of Cat Island (30°13'N, 89°10'W). The southern boundary continues one nmi offshore of the barrier islands and offshore of the 72 COLREGS lines at barrier island passes (defined at 33 CFR 80.815 c)), (d) and (e)) to the eastern boundary. Between Cat Island and Ship Island there is no 72 COLREGS line. NOAA Fisheries has therefore defined that section of the unit southern boundary as one nmi offshore of a straight line drawn from the southern tip of Cat Island to the western tip of Ship Island. The eastern boundary is the line of longitude 88°18.8'W from its intersection with the shore (Point aux Pins) to its intersection with the southern boundary. The lateral extent of unit #8 is the MHW line on each shoreline of the included water bodies or the entrance to rivers, bayous, and creeks. Pascagoula Channel, a major shipping channel, as identified on standard navigation charts and marked by buoys, is excluded.

Unit #8 provides juvenile, subadult and adult feeding, resting, and passage habitat for Gulf sturgeon from the Pascagoula and the Pearl River subpopulations; fish are consistently located both inshore and around/between the barrier islands (i.e., Cat, Ship, Horn, and Petit Bois) within this unit (Reynolds 1993, Ross et al. 2001a, and Rogillio et al. 2002). Gulf sturgeon have also been documented within one nmi off the barrier islands of Mississippi Sound. Substrate in this unit range from sand to silt, all of which contain known Gulf sturgeon prey items, including lancelets (Menzel 1971, Abele and Kim 1986, American Fisheries Society 1989, Heise et al.1999b, Ross et al. 2001a, and Rogillio et al.2002). Four PCEs are present in critical habitat unit #8: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #9 (Pensacola Bay) includes Pensacola Bay and its adjacent main bays and coves. These include Big Lagoon, Escambia Bay, East Bay, Blackwater Bay, Bayou Grande, Macky Bay, Saultsmar Cove, Bass Hole Cove, and Catfish Basin. The western boundary is the Florida State Highway 292 Bridge crossing Big Lagoon to Perdido Key. The southern boundary is the 72 COLREGS line between Perdido Key and Santa Rosa Island (defined at 33 CFR 80.810 (g)). The eastern boundary is the Florida State Highway 399 Bridge at Gulf Breeze, Florida. The lateral extent of unit #9 is the MHW line on each shoreline of the included waterbodies.

Unit #9 includes five interconnected bays, including Escambia Bay, Pensacola Bay, Blackwater Bay, East Bay, and the Santa Rosa Sound. The Santa Rosa Sound is addressed separately in unit #10. The Escambia River and its distributaries (Little White River, Dead River, and Simpson River) empty into Escambia Bay, including Bass Hole Cove, Saultsmar Cove, and Macky Bay. The Yellow River empties into Blackwater Bay. The entire system discharges into the Gulf of Mexico, primarily through a narrow pass at the mouth of Pensacola Bay.

Unit #9 provides winter feeding and migration habitat for Gulf sturgeon from the Escambia River and Yellow River subpopulations. Migratory movement is generally along the shoreline area of Pensacola Bay. During midwinter, sturgeon are commonly found in deep holes located north of the barrier island at Ft. Pickens, south of the Pensacola Naval Air Station, and at the entrance of Pensacola Pass; the depth in these areas ranges from 6-12.1 m. Four PCEs are present in critical habitat unit #9: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #10 (Santa Rosa Sound) includes the Santa Rosa Sound, bounded on the west by the Florida State Highway 399 bridge in Gulf Breeze, Florida and the east by U.S. Highway 98 bridge in Fort Walton Beach, Florida. The northern and southern boundaries of unit #10 are formed by the shorelines to the MHW line or by the entrance to rivers, bayous, and creeks.

Unit #10 provides a continuous migratory pathway for Gulf sturgeon between Choctawhatchee Bay, Pensacola Bay and the Gulf of Mexico for feeding and genetic exchange (Wakeford 2001, Fox et al. 2002, and F. Parauka pers. comm. 2002). Gulf sturgeon from the Choctawhatchee, Escambia, and Yellow Rivers utilize unit #10 for migration and foraging. Four PCEs are present in critical habitat unit #10: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #11 (Nearshore Gulf of Mexico): The western boundary is the line of longitude 87°20.0'W (approximately one nmi west of Pensacola Pass) from its intersection with the shore to its intersection with the southern boundary. The northern boundary is the mean high water (MHW) line of the mainland shoreline and the 72 COLREGS lines at passes as defined at 30 CFR 80.810 (a-g). The southern boundary of the unit is one nmi offshore of the northern boundary; the eastern boundary is the line of longitude 85°17.0'W from its intersection with the shore (near Money Bayou between Cape San Blas and Indian Peninsula) to its intersection with the southern boundary. Pensacola Channel, a major shipping channel, as identified on standard navigation charts and marked by buoys, is excluded.

Unit #11 includes winter feeding and migration habitat for Gulf sturgeon from the Yellow, Escambia, Blackwater, Choctawhatchee, and Apalachicola River subpopulations; the unit includes nearshore (1.6 km) waters from just west of Pensacola Pass to Money Bayou, Florida. Four PCEs are present in critical habitat unit #11: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #12 (Choctawhatchee Bay): includes the main body of Choctawhatchee Bay, Hogtown Bayou, Jolly Bay, Bunker Cove, and Grassy Cove. The western unit boundary is the U.S. Highway 98 bridge at Fort

Walton Beach, Florida; the southern boundary is the 72 COLREGS line across East (Destin) Pass as defined at 33 CFR 80.810 (f). The lateral extent of unit #12 is the MHW line on each shoreline of the included water bodies.

Unit #12 provides important habitat for overwintering subadults and adults from the Yellow, Escambia, Blackwater and Choctawhatchee Rivers (USFWS 1997 and 1998, Fox et al. 2002, Parauka et al. in press). Four PCEs are present in critical habitat unit #12: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #13 (Apalachicola Bay): includes the main body of Apalachicola Bay and its adjacent sounds, bays, and the nearshore waters of the Gulf of Mexico. The southern unit boundary includes water extending into the Gulf of Mexico one nmi from the MHW line of the barrier islands and from 72 COLREGS lines between the barrier islands (defined at 33 CFR 80.805 (e-h)); the western boundary is the line of longitude 85°17.0'W from its intersection with the shore (near Money Bayou between Cape San Blas and Indian Peninsula) to its intersection with the southern boundary. The eastern boundary of the unit is formed by a straight line drawn from the shoreline of Lanark Village at 29°53.1'N, 84°35.0'W to a point that is one nmi offshore from the northeastern extremity of Dog Island at 29°49.6'N, 84°33.2'W. The lateral extent of unit #13 is the MHW line on each shoreline of the included water bodies or the entrance of excluded rivers, bayous, and creeks.

Unit #13 provides winter feeding migration habitat for the Apalachicola River Gulf sturgeon subpopulation. Gulf sturgeon are believed to migrate from Apalachicola Bay into the Gulf of Mexico following prevailing currents and exiting primarily through the two most western passes (Indian and West) (Odenkirk, 1989). Four PCEs are present in critical habitat unit #13: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

Unit #14 (Suwannee Sound): includes Suwannee Sound and a portion of adjacent Gulf of Mexico waters extending nine nmi from shore out to the State territorial water boundary. Its northern boundary is formed by a straight line from the northern tip of Big Pine Island (at approximately 29°23'N, 83°12'W) to the Federal-State boundary at 29°17'N, 83°21'W; the southern boundary is formed by a straight line from the southern tip of Richards Island (at approximately 29°11'N, 83°04'W) to the Federal-State boundary at 29°04'N, 83°15'W. The lateral extent of unit #14 is the MHW line along the shorelines and the mouths of the Suwannee River (East and West Pass), its tributaries and other rivers, creeks, or water bodies.

Unit #14 provides foraging habitat for Gulf sturgeon from the Suwannee River and a pathway for the fish to migrate from the river to the estuarine/marine environment. Four PCEs are present in critical habitat unit #14: abundant prey items for subadults and adults, water quality, sediment quality, and safe and unobstructed migratory pathways.

For the complete, legal description of Gulf sturgeon critical habitat unit boundaries, and a synopsis of biological information per unit, please refer to the final rule designating Gulf sturgeon critical habitat (68 FR 13370).

Factors Affecting the Species Environment Within the Action Area

As previously explained, sea turtles found in the action area are not year-round residents of the area, and may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea. Therefore, individuals found in the action area can potentially be affected by activities anywhere else within their wide range of distribution.

Gulf sturgeon are present seasonally in a large portion of the project area; they are anadromous and spend the summer upriver at spawning habitat and the winter (about September through May) in estuarine/marine areas foraging and migrating. The action area includes the entire geographic range of the Gulf sturgeon and all habitats utilized for winter foraging and migration.

Gulf sturgeon critical habitat is found within the project area (from the Mississippi River east through the Suwannee Sound): seven of the 14 critical habitat units are within the project area and four of the seven PCEs may be impacted by the action. Upland activities could impact water quality in the unit.

1. Federal Actions

Sea Turtles

In recent years, NOAA Fisheries has undertaken several ESA section 7 consultations to address the effects of federally-permitted fisheries and other Federal actions on threatened and endangered sea turtles. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles. Similarly, recovery actions NOAA Fisheries has undertaken under the ESA are addressing the problem of takes of sea turtles in both the fishing and oil and gas industries, and vessel operations. The following summary of anticipated sources of incidental takes of turtles includes only those Federal actions which have undergone formal section 7 consultation. The incidental takes authorized in the biological opinions completed on the following actions are described in Table 2.

Adverse effects on threatened and endangered species from several types of fishing gear occur in the action area. Efforts to reduce the adverse effects of commercial fisheries are addressed through the ESA section 7 process. Gillnet, longline, trawl gear, and pot fisheries have all been documented as interacting with sea turtles. For all of these fisheries for which there is a Federal fishery management plan (FMP) or for which any Federal action is taken to manage that fishery, impacts have been evaluated under section 7. Several formal consultations have been conducted on the following fisheries that NOAA Fisheries has determined are likely to adversely affect threatened and endangered species: American lobster, calico scallop trawl fishery, monkfish, dogfish, southeastern shrimp trawl fishery, northeast multispecies, Atlantic pelagic swordfish/tuna/shark, and summer flounder/scup/black sea bass fisheries.

The southeastern shrimp trawl fishery affects more turtles than all other activities combined (NRC 1990). On December 2, 2002, NOAA Fisheries completed the Opinion for shrimp trawling in the southeastern United States under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This Opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination is based, in part, on the Opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl-related mortality by 94% for loggerheads and 97% for leatherbacks compared to trawl-related mortality under previous TED regulations, and on the fact that nesting in the southeastern United States for all species of sea turtles (and Rancho Nuevo, Mexico in the case of Kemp's ridleys), with the exception of the northern nesting population of loggerhead turtles, has been increasing. However, NMFS (SEFSC 2001) population projection models indicate that a 30% decrease in benthic loggerhead mortality from an expanded TED rule will cause an increase in the northern nesting population. The shrimp trawling Opinion can be found at the following Web site:

http://www.nmfs.noaa.gov/prot_res/readingrm/ESAsec7/Biop_shrimp_trawling.PDF

On June 14, 2001, NOAA Fisheries issued a jeopardy opinion for the Highly Migratory Species (HMS) fisheries off the eastern United States. The HMS Opinion found that the continued prosecution of the pelagic longline fishery in the manner described in the HMS FMP was likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. This determination was made by analyzing the effects of the fishery on sea turtles in conjunction with the environmental baseline and cumulative effects (for loggerheads this determination was based on the effects on the northern nesting population). The environmental baseline section of the HMS Opinion is incorporated herein by reference and can be found at the following NOAA Fisheries Web site:

http://www.nmfs.noaa.gov/prot_res/readingrm/ESAsec7/HMS060801final.pdf

NOAA Fisheries has implemented a reasonable and prudent alternative (RPA) in the HMS fishery which would allow the continuation of the pelagic longline fishery without jeopardizing the continued existence of loggerhead and leatherback sea turtles. The provisions of this RPA include the closure of the Grand Banks region off the northeastern United States and gear restrictions that are expected to reduce the bycatch of loggerheads by as much as 76% and of leatherbacks by as much as 65% compared to previously existing conditions. Further, NOAA Fisheries has implemented a major research project to develop measures aimed at further reducing longline bycatch. The implementation of this RPA reduces the negative effects that the HMS fishery has on the environmental baseline. The conclusions of the June 14, 2001, HMS Opinion and the subsequent implementation of the RPA are hereby incorporated into the environmental baseline section of this Opinion.

The environmental baseline for the June 14, 2001, HMS Opinion also considered the impacts from the North Carolina offshore spring monkfish gillnet fishery and the inshore fall southern flounder gillnet fishery, both of which were responsible for large numbers of sea turtle mortalities in 1999 and 2000, especially loggerhead sea turtles. However, during the 2001 season NOAA Fisheries implemented an observer program that observed 100% of the effort in the monkfish fishery, and then in 2002 a rule was enacted creating a seasonal monkfish gillnet closure along the Atlantic coast, based upon sea surface temperature data and turtle migration patterns. In 2001, NOAA Fisheries also issued an ESA section 10 permit to North Carolina with mitigative measures for the southern flounder fishery. Subsequently, the sea turtle mortalities in these fisheries were drastically reduced. Reinitiation of consultation for the summer flounder fishery has also begun. The reduction of turtle mortalities in these fisheries reduces the negative effects these fisheries have on the environmental baseline.

Potential adverse effects from Federal vessel operations in the action area and throughout the range of sea turtles include operations of the Navy (USN) and Coast Guard (USCG), the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the COE. NOAA Fisheries has conducted formal consultations with the USCG, the USN, and NOAA on their vessel operations. Through the section 7 process, where applicable, NOAA Fisheries has, and will continue to, establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction.

In addition to vessel operations, other military activities including training exercises and ordnance detonation also affect sea turtles. Consultations on individual activities have been completed, but no formal consultation on overall USCG or USN activities in any region has been completed at this time.

Federally-funded and permitted projects to construct and maintain navigation channels have also been identified as a source of turtle mortality. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. Regional biological opinions (RBOs) for the COE have been completed for southeastern Atlantic waters (North Carolina through Florida), and Gulf of Mexico northern and western waters (Louisiana and Texas). The current Gulf-wide Opinion supersedes the latter RBO.

The COE and the Minerals Management Service of the Department of Interior (MMS) issue permits for oil and gas exploration, well development, production, and abandonment/rig removal activities that also may adversely affect turtles. Both these agencies have consulted with NOAA Fisheries on these activities which include the use of seismic arrays for oil and gas exploration in the Gulf of Mexico, the impacts of which have been addressed in Opinions for individual and multi-lease sales. Impacts are expected to result from vessel strikes, noise, marine debris, and the use of explosives to remove oil and gas structures.

Another action with Federal oversight (by the Federal Energy Regulatory Commission [FERC] or the Nuclear Regulatory Agency) which has impacts on sea turtles is the operation of electrical generating plants. Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. Biological opinions have already been written for a number of electrical generating plants, and others are currently undergoing section 7 consultation.

Below is a table summarizing formal ESA section 7 consultations completed for Federal actions taking place in the southeastern United States that affect sea turtles:

Table 2. Summary of annual incidental take levels anticipated under the incidental take statements associated with NMFS' existing biological opinions in the U.S. Atlantic and Gulf of Mexico.

Federal Action	Annual Anticipated Incidental Take Level (lethal)[1]				
	Loggerhead	Leatherback	Green	Kemp's	Hawksbill
Coast Guard Vessel Operation	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]
Navy-SE Ops Area[3]	91(91)	17(17)[2]	16(16)[2]	16(16)[2]	4(4)[2]
Navy-NE Ops Area	10(10)	0	1(1)[2]	1(1)[2]	0
Shipshock-Seawolf/Winston Churchill[4]	276(58)[2]	276(58)[2]	276(58)[2]	276(58)[2]	276(58)[2]
COE Dredging-NE Atlantic	27(27)	1(1)	6(6)[2]	5(5)[2]	0
COE Dredging-S. Atlantic	35(35)	0	7(7)	7(7)	2(2)
COE Dredging-N&W Gulf of Mexico	30(30)	0	8(8)	14(14)	2(2)
COE Dredging-E Gulf of Mexico	8 (8) [5]	5(5)[5]	5(5)[5]	5(5)[5]	5(5)[5]
COE Rig Removal, Gulf of Mexico	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]
MMS Destin Dome Lease Sales	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]

MMS 181 Lease Sales	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]	1(1)[2;6]
MMS Rig Removal, Gulf of Mexico	10(10)[7]	5(5)[2;7]	5(5)[2;7]	5(5)[2;7]	5(5)[2;7]
NE Multispecies Sink Gillnet Fishery	10(10)	4(4)	4(4)	2(2)	0
ASMFC Lobster Plan	10 (10)	4(4)	0	0	0
Bluefish	6(3)	0	0	6(6)	
Herring	6(3)	1(1)	1(1)	1(1)	0
Mackerel, Squid, Butterfish	6(3)	1(1)	2(2)	2(2)	0
Monkfish Fishery[7]	6(3)	1(1)	1(1)	1(1)	0
Dogfish Fishery	6(3)	1(1)	1(1)	1(1)	0
Sargassum	30(30)[8]	1(1)[2]	1(1)[2]	1(1)[2]	1(1)[2]
Summer Flounder, Scup & Black Sea Bass	15(5)	3(3)[2]	3(3)[2]	3(3)[2]	3(3)[2]
Shrimp Fishery[9]	163,160 (3,948)	3,090 (80)	18,757 (514)	155,503 (4,208)	NA(640)[13]
Weakfish	20(20)	0	0	2(2)	0
HMS - Pelagic Longline Fishery[10]	468(7)	358(6)	46(2)	23(1)	46(2)
HMS - Shark gillnet Fishery[11]	20(20)	2(2)	2(2)	2(2)	2(2)
HMS - Bottom Longline Fishery[11]	12(12)	2(2)	2(2)	2(2)	2(2)
NRC – St. Lucie, FL[12]	1000[2] (10)[2]	1000[2] (1)	1000[2] (10)[2]	1000[2] (1)	1000[2] (1)
NRC – Brunswick, NC	50[2] (6)[2]	50[2]	50[2] (3)[2]	50[2] (2)[2]	50[2]
NRC – Crystal River, FL	55[2] (1)[2]	55[2] (1)[2]	55[2] (1)[2]	55[2] (1)[2]	55[2] (1)[2]
Total	**165,370 (4,346)**	**4,880 (197)**	**20,252 (656)**	**156,986 (4,348)**	**1,456 (835)**

[1]Anticipated Take level represents '**observed**' unless otherwise noted. Number in parenthesis represents lethal take and is a subset of the total anticipated take; numbers less than whole are rounded up.
[2] The anticipated take level may represent any combination of species and thus is tallied under each column.
[3] Includes Navy Operations along the Atlantic Coasts and Gulf of Mexico, Mine warfare center, Eglin AFB, Moody AFB
[4] Total **estimated** take includes acoustic harassment
[5]Up to 8 turtles total, of which, no more than 5 may be leatherbacks, greens, Kemp's or hawksbill, in combination.
[6]Total anticipated take is 3 turtles of any combination over a 30-year period
[7] Not to exceed 25 turtles, in total.
[8] Anticipated take for post-hatchlings for total period June 21, 1999 through January 2001
[9]Represents **estimated** take (interactions between turtles and trawls). Lethal take in parentheses.
[10] Represents **estimated** total take and **observed** lethal take in parentheses
[11] Represents **estimated** total and lethal take
[12] Annual incidental capture of up to 1,000 turtles, in any combination of the five species found in the action area. NMFS anticipates 1% of the total number of green and loggerhead turtles (combined) captured (i.e., if there are 900 total green and loggerhead turtles captured in one year, then 9 turtles in any combination of greens and loggerheads are expected to be injured or killed as a result. In cases where 1% of the total is not a whole number, then the total allowable incidental take due to injury or death will be rounded to the next higher whole number) will be injured or killed each year over the next 10 years as a result of this incidental capture. NMFS also anticipates two Kemp's ridley turtles will be killed each year and one hawksbill or leatherback turtle will be injured or killed every 2 years for the next 10 years.
[13] Actual mortalities of hawksbills, as a result of turtle/trawl interactions, is expected to be much lower than this number. This number represents the estimated total number of mortalities of hawksbill turtles from all sources in areas where shrimp fishing takes place.

Gulf Sturgeon and Gulf Sturgeon Critical Habitat

Incidental catch of Gulf sturgeon in both federally- and state-regulated fisheries has been documented. There have been incidental captures of Gulf sturgeon in the shrimp and gillnet fisheries in Apalachicola Bay (Swift et al. 1977, Wooley and Crateau 1985). Similar incidental catches have been reported in Mobile Bay, Tampa Bay, and Charlotte Harbor. Louisiana Department of Wildlife and Fisheries (LDWF) reported 177 Gulf sturgeon were incidentally captured by commercial fishermen in southeast Louisiana during 1992. Rogillio (September 20, 2002, pers. comm. to Eric Hawk, Gulf Sturgeon Workshop, University of Southern Mississippi, Hattiesburg, September 19-20, 2002) noted several recent instances of Gulf sturgeon takes by shrimpers operating off barrier island passes in Mississippi.

The operation of hydropower plants is a Federal action by FERC that has impacts on Gulf sturgeon. Sturgeon migrating up or down rivers and entering coastal and inshore areas can be affected by entrainment in the cooling-water systems; larvae may be adversely affected by heated water discharges. Dredging impacts associated with maintenance of hydropower and nuclear plants may affect both the Gulf sturgeon and its critical habitat.

The recent joint designation of Gulf sturgeon critical habitat by NOAA Fisheries and USFWS will benefit the species, primarily through the ESA section 7 consultation process. When critical habitat is designated, other Federal agencies are required to consult with NOAA Fisheries on actions they carry out, fund, or authorize, to ensure that their actions will not destroy or adversely modify critical habitat. In this way, a critical habitat designation will protect areas that are necessary for the conservation of the species. Designation of critical habitat may also enhance awareness within Federal agencies and the general public of the importance of Gulf sturgeon habitat and the need for special management considerations.

A designation of critical habitat also clarifies the section 7 consultation responsibilities for the Federal action agencies, particularly for projects where the action would not result in direct mortality, injury, or harm to individuals of the species. When critical habitat is designated, the action agency must consult - regardless of the seasonal presence or absence of the species - on actions that may affect critical habitat. Furthermore, the critical habitat designation describes the essential features of the habitat. Identifying the physical and biological features of each particular critical habitat area that are essential for species conservation assists agencies in identifying particular activities conducted outside the designated area that require section 7 consultation. For example, disposal of waste material in water adjacent to a critical habitat area may affect an essential feature (water quality) of the designated habitat and is therefore subject to the provisions of section 7.

Critical habitat designation also assists Federal agencies in planning future actions because it identifies, in advance, those habitats that will be given an additional review in section 7 consultations. This is particularly true in cases where two project areas exist and only one provides for the conservation of the species. With a designation of critical habitat, potential conflicts between Federal actions and listed species can be identified and possibly avoided early in the agency's process.

Federal agencies that consult on potential impacts to both Gulf sturgeon and its critical habitat include the Department of Defense (DOD), the COE, and the EPA. Dredging and dredged material disposal, and military activities including training exercises and ordnance detonation, have the potential to impact both the species and designated critical habitat. Numerous formal opinions have investigated project impacts to Gulf sturgeon; there has been a single formal opinion investigating impacts of dredge disposal on Gulf sturgeon critical habitat (NAS Pensacola). Numerous informal consultations with the DOD, COE, and EPA analyzing potential impacts to both Gulf sturgeon and its designated critical habitat have been conducted.

Federally-regulated stormwater and industrial discharges, and chemically treated discharges from sewage treatment systems, may impact Gulf sturgeon critical habitat. NOAA Fisheries and FWS continue to consult with EPA to minimize the effects of these activities on both listed species and designated critical habitat. In addition, other federally-permitted construction activities, such as beach restoration, have the potential to impact Gulf sturgeon critical habitat.

2. State or private actions

<u>Sea Turtles</u>

Commercial vessel traffic and recreational vessel pursuits can have an adverse effect on sea turtles through propeller and boat strike damage. Private vessels participate in high speed marine events concentrated in the southeastern United States and are a threat to sea turtles and marine mammals. The magnitude of these marine events is not currently known. NOAA Fisheries and the USCG (which permits these events) are in early consultation on these events, but a thorough analysis of impacts has not been completed.

Various fishing methods used in state fisheries, including trawling, pot fisheries, fly nets, and gillnets are known to cause interactions with sea turtles. Georgia and South Carolina prohibit gillnets for all but the shad fishery. Florida and Texas have banned all but very small nets in state waters. Louisiana, Mississippi, and Alabama have also placed restrictions on gillnet fisheries within state waters. Very little commercial gillnetting takes place in southeastern U.S. waters, with the exception of North Carolina. Most pot fisheries (turtles can get entangled in the lines in these fisheries) in the Southeast are prosecuted in areas frequented by sea turtles. Recreational angling, including bottom fishing for snapper, grouper, and other species in the Gulf of Mexico and southeastern waters, and fishing from private and public docks and piers, are known to occasionally take sea turtles by hooking and entanglement. NOAA Fisheries has consulted on potential sea turtle takes by fishermen on several federally-permitted public piers in Florida.

Gulf Sturgeon and Gulf Sturgeon Critical Habitat

A number of activities that may indirectly affect Gulf sturgeon and its critical habitat include discharges from wastewater systems, dredging, ocean dumping and disposal, and aquaculture. The impacts from these activities are difficult to measure. Where possible, however, conservation actions through the ESA section 7 process, ESA section 10 permitting, and state permitting programs, are being implemented to monitor or study impacts from these sources.

Increasing coastal development and ongoing beach erosion will result in increased demands by coastal communities, especially beach resort towns, for periodic privately-funded or federally-sponsored beach renourishment projects. These activities may affect Gulf sturgeon and its critical habitat by burying macroinvertebrates that occur in nearshore habitats that serve as foraging areas, in addition to the potential direct effect to the species by entrainment in dredge suction dragheads at the sand mining sites.

Increased groundwater withdrawal for irrigation in southwest Georgia may result in a 30% reduction of discharge to streams and thereby affect water quality and quantity. Reducing discharge decreases cool water habitats which are thought to offer sturgeon refugia from warm riverine water; recent droughts in the Apalachicola River basin have aggravated the loss of cool-water refugia; and spring-water intrusion into the Suwannee River during drought conditions changes ionic conductivity and water temperature unfavorably for embryonic development and larval success (Sulak and Clugston 1999).

3. Conservation and recovery actions shaping the environmental baseline

NOAA Fisheries has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NOAA Fisheries has required the use of TEDs in southeastern U.S. shrimp trawls since 1989 and in summer flounder trawls in the mid-Atlantic area (south of Cape Charles, Virginia) since 1992. It has been estimated that TEDs are 97% efficient at excluding (releasing alive) turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through proper placement and installation, configuration (e.g., width of bar spacing), floatation, and more widespread use. Recent analyses by Epperly and Teas (2002) indicate that the minimum requirements for the escape opening dimensions were too small, and that as many as 47% of the loggerheads stranding annually along the Atlantic Seaboard and Gulf of Mexico were too large to fit through existing openings. NOAA Fisheries recently published a final rule to require larger escape openings in TEDs used in the southeastern shrimp trawl fishery (68 FR 8456; February 21, 2003). Based upon the analyses in Epperly and Teas (2002), leatherback and loggerhead sea turtles will greatly benefit from the new regulations, with expected reductions of 97% and 94% (over the reduction expected with the old TEDs), respectively, in mortality from shrimp trawling.

In 1993 (with a final rule implemented in 1995), NOAA Fisheries established a Leatherback Conservation Zone to restrict shrimp trawl activities from the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border. This provided for short-term closures when high concentrations of normally pelagic leatherbacks are recorded in near coastal waters where the shrimp fleet operates. This measure was necessary because, due to their size, adult leatherbacks were larger than the escape openings of most NOAA Fisheries-approved TEDs. With the implementation of the new TED rule requiring larger opening sizes on all TEDs, the reactive emergency closures within the Leatherback Conservation Zone are no longer necessary.

NOAA Fisheries is also working to develop a TED which can be effectively used in a type of trawl known as a fly net, which is sometimes used in the mid-Atlantic and northeastern fisheries to target sciaenids and bluefish. Limited observer data indicate that takes can be quite high in this fishery. A prototype design has been developed, and testing has been underway since December 2002.

In addition, NOAA Fisheries has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. NOAA Fisheries recently conducted a number of workshops with longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines. NOAA Fisheries intends to continue these outreach efforts and hopes to reach all fishermen participating in the pelagic longline fishery over the next one to two years. An extensive network of Sea Turtle Stranding and Salvage Network participants along the Atlantic and Gulf of Mexico not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded turtles.

Commercial harvesting of Gulf sturgeon has been banned by all coastal states where the species is likely present (i.e., Florida, Mississippi, and Alabama). State actions eliminating or limiting gillnetting also benefit the Gulf sturgeon.

Federal Essential Fish Habitat consultation requirements pursuant to the Magnuson-Stevens Fishery Management and Conservation Act also minimize and mitigate for losses of wetlands, and preserve valuable foraging and developmental habitat for Gulf sturgeon.

5.0 Effects of the Action

A. <u>Hopper Dredging Effects on Sea Turtles</u>

It has been previously documented in NOAA Fisheries' biological opinions and the present Opinion that maintenance hopper dredging in three of the four COE Districts in the action area occasionally results in sea turtle entrainment and death, even with seasonal dredging windows, turtle deflector dragheads in place, and concurrent relocation trawling. For example, in the western Gulf of Mexico from February 1995 through September 2002, a total of 29 lethal takes was documented (six Kemp's ridleys, 15 loggerheads, and eight greens) by Galveston District hopper maintenance dredging activities (Appendix I).

In the northern Gulf of Mexico from May 1995 to mid-July 2003, a total of 39 lethal sea turtles takes (including 27 loggerheads, eight Kemp's ridleys, and four unidentified) was reported by the New Orleans District as taken by hopper dredges during maintenance dredging. Thirty-six of the takes (22 loggerheads) occurred in the MR-GO dredging area; three takes (two Kemp's ridleys) occurred in the Calcasieu Channel. 2001 was a year of unusually high loggerhead sea turtle abundance in the MR-GO based on take records since 1995; ten of the 11 turtle takes that occurred between April 24 and June 10, 2001 were loggerheads. Since October 2002, hopper dredging in the MR-GO has resulted in ten lethal loggerhead entrainments.

In the Jacksonville District (Florida west coast) since 1995, six turtles have been documented as entrained: three lethal Kemp's ridley takes, and three loggerhead takes (one non-lethal) during Tampa Bay and Charlotte Harbor dredging.

No sea turtle takes have yet been documented by the Mobile District in its hopper dredging projects; however, until late-summer of 2002, the District did not require observers or screening on its hopper dredges.

It can be expected that future hopper dredging in the Gulf of Mexico action area will occasionally take sea turtles, principally loggerheads, Kemp's ridleys, and greens, and may rarely take a hawksbill turtle, based upon this data on hopper dredging takes and on the information below regarding sea turtle distribution.

Satellite telemetry work funded by COE and conducted by NOAA Fisheries' Galveston Laboratory, demonstrates the nearshore occurrence of Kemp's ridleys near northern Gulf channels. Kemp's ridleys remained within ten nmi of shore for greater than 95% of the observed time, with 90% of the observed locations within five nmi (M. Renaud, NOAA Fisheries' Galveston Laboratory, pers. comm.). Movements out of northern Gulf waters in response to cooling temperatures occurred during December, and Kemp's ridleys returned with warming waters in March.

Seasonal abundance of sea turtles utilizing nearshore waters of the northwest Gulf of Mexico varies with species and location. Green turtles within subtropical habitats of the Laguna Madre are the regions's only year-round, inshore occupant. Other species, especially the Kemp's ridley, are transient users of the coastal zone that venture toward tidal passes and into bays during May-August when food sources and other environmental factors are favorable. The May-August period has yielded over 80% of the sea turtles captures (n=516) recorded by Texas A&M researchers (Landry et al. 1997). Based on strandings, reported incidental captures, observer data (Gulf and South Atlantic Foundation, and NMFS) aerial surveys (SETS, Pascagoula Oil Platform Association data, Gulf Of Mexico red drum surveys of 1987, 1995, and 1999, CETAP, SEAS92 and SECAS95, MATS95, GulfCet I, GulfCet II, and GoMex surveys), and telemetry tracks, loggerheads are distributed ubiquitously in the Gulf Area, generally occurring in all areas, inshore and offshore, and at all times when shrimp trawl activity is likely to occur. Shrimping occurs essentially year-round. (NOAA Fisheries' unpublished data, December 2002: Environmental Assessment/Regulatory Impact Review of Technical Changes to the Turtle Excluder Device (TED) Regulations to Enhance Turtle Protection in the Southeastern United States).

Anticipated Increase in Beach Restoration Activities

The COE has indicated that beach restoration activities, and consequent offshore sand mining often using hopper dredges, are likely to increase this decade in Gulf of Mexico coastal states. Sand mining sites are to some extent selected by the COE based on their absence of, or safe distance from, hardbottoms which in addition to attracting sea turtles may damage the dragheads, reduce production, and may also not provide sand with characteristics suitable for beach restoration efforts. NOAA Fisheries believes that sea turtles and Gulf sturgeon will occasionally be found at some sand mining sites (or dredged material disposal sites) in the Gulf of Mexico (e.g., Pinellas County, Lido Key, Lee County, and Sarasota County Shore Protection Projects), probably attracted to nearby nesting beaches, hardbottoms, artificial reefs, or other structures which contain foraging habitat for sea turtles, or passes between barrier islands where Gulf sturgeon are known to congregate and forage in winter (e.g., Horn Island Pass, Mississippi; Perdido Pass, Alabama; Pensacola Pass, Boca Grande Pass, and Stump Pass, Florida). NOAA Fisheries believes that dredging of sand at designated sites, proposed sites, or currently undiscovered mining sites near hardbottoms, or disposal of dredged materials near navigation channels and passes, may adversely affect listed species by hopper dredge entrainment and damage (by degradation or destruction) to foraging habitat in or in proximity to disposal or mining sites.

Disorientation Effects of Hopper Dredge and Pumpout Barge Deck Lighting

NOAA Fisheries believes that female sea turtles approaching nesting beaches and neonates (i.e., hatchlings) emerging from nests and exiting their natal beaches, may be adversely affected by bright offshore lights from hopper dredges or hopper dredge pumpout barges operating in the nearshore (0-3 nmi) environment. Females approaching the beach to nest could be deterred from nesting by bright lights in the nearshore environment. Hatchlings emerging from their nests could be attracted away from the shortest path to the water and instead crawl or swim toward the bright lights of a nearshore hopper dredge or anchored pumpout barge (instead of crawling or swimming seaward toward the open horizon), thus increasing their exposure time to predation. NOAA Fisheries recently received a report (M. Nicholas pers. comm. to E. Hawk, September 29, 2003) from a National Park Service biologist at Gulf Islands National Seashore) who relocated a clutch of 97 Perdido Key hatchlings on September 28, 2003. The biologist felt that the hatchlings were in danger of being attracted to a nearby operating, brightly lit hopper dredge which was dredging ½ to 1 mile offshore in Pensacola Entrance Channel. NOAA Fisheries considers it prudent that hopper dredges and hopper dredge pumpout barges operating within three nmi of sea turtle nesting beaches during sea turtle nesting and sea turtle hatchling emergence season (May 1-October 31, yearly), should shield essential deck lighting and reduce or extinguish non-essential deck lighting to the maximum extent possible consistent with vessel personnel safety and U.S. Coast Guard navigation requirements, to reduce potential disorientation effects, potential reduced or aborted nesting, and potential increased hatchling mortality from increased exposure to predators. This is consistent with U.S. Fish and Wildlife Service biological opinion requirements and Florida Wildlife Commission requirements for beach nourishment projects where nesting sea turtles may be present, and was jointly developed by these agencies, Florida Department of Environmental Protection, and the U.S. Army Corps of Engineers, Jacksonville District (Robbin Trindell, pers. comm. to Eric Hawk, September 30, 2003).

Sedimentation Effects

Efforts to reduce potential sedimentation damage to habitats adjacent to sand mining sites were incorporated into the 1995 SAD RBO, which recommended "water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities..." That measure will be carried forward in the Conservation Recommendations of the present Opinion. To reduce the possibility of listed species takes during sand mining activities, the terms and conditions of this Opinion will require that hopper dredges operating at offshore sand mining sites maintain a minimum distance of 400 feet from hardgrounds since these areas may attract sea turtles.

Notably, this Opinion includes only the hopper dredging of the aforementioned sand mining sites that do not occur within designated Gulf sturgeon critical habitat. This Opinion does not include any new sand mining site in designated critical habitat, nor the placement of sand in any littoral zone within designated critical habitat.

Sea Turtle Takes Associated with Sand Mining

Historically, sea turtle takes associated with sand mining activities for beach restoration, conducted using hopper dredges, have been few compared to channel dredging. In the South Atlantic, 11 loggerheads were taken from 1997-1999 at sand mining sites off Myrtle Beach, South Carolina (all of these takes occurred outside of the December 1-March 31 window). In North Carolina, two Kemp's ridleys and two loggerheads were taken in a single day at the Bogue Banks Restoration Project borrow site on December 21, 2001, apparently attracted to remains of an artificial, tire reef, and another Kemp's ridley was taken on April 11, 2002. In Florida's Brevard County, a loggerhead was taken at the Canaveral Shoals sand mining site on March 31, 2001, and another loggerhead was taken on February 19, 2002, at a nearby mining site. On March 19, 2003, a loggerhead sea turtle was taken during sand mining for the Bogue Banks Restoration Project (a relocation trawler moved five turtles out of the area between March 13-28). No other instances of hopper dredge takes at sand mining sites are known. There are no instances of takes yet recorded for sand mining activities in the Gulf of Mexico; these activities have been limited, sometimes have not been reported to NOAA Fisheries, and it is not known if observers have been present. However, NOAA Fisheries expects that future takes will occur in association with hopper dredge sand mining activities in the Gulf of Mexico.

Use of Bed-leveling Mechanical Dredging Devices

Bed-leveling is often associated with hopper dredging (and other types of dredging) operations. Bed-leveling "dredges" do not use suction and redistribute sediments, rather than removing them. Plows, I-beams, or other seabed-leveling mechanical dredging devices are often used to lower high spots left in channel bottoms and dredged material deposition areas by hopper dredges or other type dredges. Some evidence indicates that they may be responsible for occasional sea turtle mortalities (Mark Dodd, GADNR, unpublished data; July 2003 BA for Brunswick Harbor Deepening, Savannah District COE). Sea turtles may be crushed as the leveling device–which weighs about 30 to 50 tons and is typically fixed with cables to a derrick mounted on a barge pushed or pulled by a tugboat at about one to two knots–passes over and crushes a turtle which failed to move out of the way and is not pushed out of the way by the sediment wedge "wave" which generated by and moving ahead of the device. Sea turtles at Brunswick Harbor, Georgia may have been crushed and killed by recent bed-leveling "clean-up dredging" which commenced after the hopper dredge finished its work in a particular area. Brunswick Harbor is also one of the sites where sea turtles captured by relocation trawlers sometimes show evidence of brumating (over-wintering) in the muddy channel bottom, which could explain why, if they were crushed by bed-level type dredges, they failed to react quickly enough to avoid the bed-leveler. Use of bed-levelers for cleanup operations, however, is probably preferable to use of hopper dredges since turtles which are foraging/resting/brumating on irregular bottoms are probably more likely to be entrained by suction dragheads because sea turtle deflector dragheads are less effective on uneven bottoms, hopper dredges move considerably faster than bed-leveler "dredges," and bed-levelers do not use suction.

B. Hopper Dredging Effects on Gulf Sturgeon

Dredge entrainment of Gulf sturgeon by hopper dredging has previously been assessed by NOAA Fisheries in section 7 consultations for channel maintenance. NOAA Fisheries had determined that the hopper dredge projects were not likely to adversely affect the species given either the projects' limited scope and/or the unlikely seasonal presence of Gulf sturgeon. While no Gulf sturgeon take by hopper dredges have been reported to date, allopatric sturgeon species on the Atlantic Seaboard have been taken occasionally by hopper dredge. Similarly, the existing RBO to the COE's South Atlantic Division for hopper dredging between North Carolina through Florida limits the incidental take to five shortnose sturgeon (*A. brevirostrum*). While NOAA Fisheries is unaware of any instances to date of Gulf sturgeon take by a hopper dredge, Atlantic sturgeon and shortnose sturgeon are occasionally taken by hopper dredges operating on the Atlantic seaboard (C. Slay, Coastwise Consulting, pers. comm. to E. Hawk; J. Crocker, October 15, 2003, pers. comm. to S. Bolden). Therefore, NOAA Fisheries considers it prudent to address potential Gulf sturgeon takes by hopper dredges operating in the Gulf of Mexico as we presume the species can be taken given the evidence from two morphologically and ecologically similar Atlantic sturgeon species.

While the probability of sea turtle take by hopper dredge is lessened by winter-time dredging (particularly when water temperatures are below 11°C), Gulf sturgeon are more likely to be present in estuarine and coastal waters, and passes between the barrier islands, during that period. Nevertheless, Gulf sturgeon may be more sensitive to vibrations transmitted along the bottom (by a noisy, approaching hopper dredge draghead) than turtles and other fishes due to their physostomus (pneumatic duct connects gas bladder and gut to allow gas to be taken in and emitted vs. psysoclistous fishes that lose the connection in adults) swim bladder; are not known to bury themselves and "hibernate" in the soft bottom mud of ship channels (but they are known to remain for long periods in low areas) as are some turtles (e.g., in Kings Bay and Brunswick Harbor, Georgia); and are mobile and are not likely to be entrained, even by a rapidly (approximately 3-5 knots) approaching hopper dredge deflector draghead. Although no take of a Gulf sturgeon by hopper dredge (or any other type of dredge) operating in the Gulf of Mexico has ever been reported to NOAA Fisheries, Atlantic sturgeon have been documented as taken by hopper dredges. Shortnose sturgeon have also been lethally taken by hydraulic pipeline dredging in the Delaware River since 1996. A shortnose sturgeon was taken by a mechanical clam shell bucket dredge in the Northeast (J. Crocker, June 10, 2003, pers. comm. to S. Bolden) and recently five shortnose were taken by a hopper dredge in the Kennebec River, Maine during emergency dredging operations there (J. Crocker, October 15, 2003, pers. comm. to S. Bolden). NOAA Fisheries believes that Gulf sturgeon can be lethally taken by hopper dredges, and it is most likely to occur in the northern or eastern Gulf of Mexico during dredging of barrier island passes or nearby sand sources during winter months.

Gulf Sturgeon Takes Associated with Sand Mining

NOAA Fisheries knows of no Gulf sturgeon takes associated with mining of sand from nearshore or offshore mining sites by hopper dredge or any other type of dredge. Gulf sturgeon presence would be unlikely at these sites, unless mining sites were near barrier island pass foraging sites or along migratory pathways (which are primarily inshore).

C. Dredging Effects on Gulf Sturgeon Critical Habitat

This Opinion identifies specific projects that will impact Gulf sturgeon critical habitat units #8 and #11 and four (of the seven) PCEs (food availability, water quality, sediment quality and migratory pathways) within both of those units (Table 3).

Table 3. Summary of COE projects within this Opinion that occur within designated Gulf sturgeon critical habitat or may impact Gulf sturgeon.

District/Project	Genetic stock*	Critical Habitat Unit	Riverine Pop Impacted
GALVESTON			
None			
NEW ORLEANS			
Lower Mississippi R.	Lake Pontchartrain Pearl River	None	Mississippi
Mississippi River - New Orleans Harbor	Lake Pontchartrain Pearl River	None	Mississippi
Mississippi River - Gulf Outlet	Lake Pontchartrain Pearl River	None	Mississippi
Mississippi River - Southwest Pass	Lake Pontchartrain Pearl River	None	Mississippi
MOBILE			
Gulfport Harbor	Pascagoula River	#8	Pascagoula/Pearl
Pascagoula Harbor	Pascagoula River	#8	Pascagoula/Pearl
Mobile Harbor	Pascagoula River	None	Mobile
Pensacola Harbor	Escambia/Yellow Rivers	#11	Yellow, Choctawhatchee and Apalachicola

JACKSONVILLE			
Pensacola Beach	Escambia/Yellow Rivers	#11	Yellow, Choctawhatchee and Apalachicola
NAS Pensacola Channel	Escambia/Yellow Rivers	#11	Yellow, Choctawhatchee and Apalachicola
Tampa Harbor	?	None	?
Charlotte Harbor	?	None	?

*Five regional or river-specific stocks (from west to east) have been identified: (1) Lake Pontchartrain and Pearl River, (2) Pascagoula River, (3) Escambia and Yellow Rivers, (4) Choctawhatchee River, and (5) Apalachicola, Ochlockonee, and Suwannee Rivers (Stabile et al. 1996). Because of small sample size, genetic stocks could not be determined for fish in the southeast (i.e., Tampa Area) as indicated by the "?."

Maintenance dredging is a repetitive activity in coastal Gulf of Mexico; some channels are dredged continuously to keep them navigable, others require dredging cycles of 2-10 years. Maintenance dredging removes sediments from navigation channel beds that have been transported there naturally (e.g., longshore transport). Materials removed during maintenance dredging are usually variable in quantity and consist of soft, uncompacted soil. For the purpose of this Opinion, NOAA Fisheries assumes that the sediments removed from the channel beds during maintenance dredging are similar to those that will remain in the channel beds after dredging (e.g., removal of sand and sand remaining) and therefore no alteration in habitat composition is occurring. Therefore, NOAA Fisheries assumes that channel beds provide similar habitat pre- and post-dredging.

NOAA Fisheries considered and analyzed the following factors to determine direct and indirect effects of dredging to current depth, width and length (no improvements regardless of prior authorization) within critical habitat on the four PCEs in units #8 and #11:

1. Food availability
2. Water quality
3. Sediment quality, and
4. Migratory pathways

1. Food Availability

Numerous reports have been published in the scientific literature describing the in situ effects of dredging and dredged material placement on birds, lobsters, fish, aquatic plants, benthic communities, turbidity, primary productivity, bioavailability of sediment trace metals, etc. (Lewis et al. 2001). Environmental impacts observed in these studies included reduction in number of benthic species (both species diversity and species abundance), increased turbidity, reduction of primary productivity and mobilization, and increased bioavailability of sediment trace metals.

Of particular concern is the potential impacts of dredging on Gulf sturgeon prey availability. Ontogenetic changes in Gulf sturgeon diet and foraging area have been documented. Young-of-year forage in freshwater on aquatic invertebrates and detritus (Mason and Clugston 1993, Sulak and Clugston 1999); juveniles forage throughout the river on aquatic insects (e.g., mayflies and caddisflies), worms (oligochaete), and bivalves (Huff 1975, Mason and Clugston 1993); adults forage sparingly in freshwater and depend almost entirely on estuarine and marine prey for their growth (Gu et al. 2001). Both adult and subadult Gulf sturgeon are known to lose up to 30% of their total body weight while in fresh water, and subsequently compensate the loss during winter feeding in marine areas (Carr 1983, Wooley and Crateau 1985, Clugston et al 1995, Morrow et al. 1998, Heise et al. 1999, Sulak and Clugston 1999, Ross et al. 2000). Therefore, once Gulf sturgeon leave the river having spent at least six months in the river fasting, it is presumed that they immediately begin feeding. Upon exiting the rivers, Gulf sturgeon initially concentrate around the mouths of their natal rivers in lakes and bays; they then disperse into nearshore areas (including Passes) and continue to forage. Therefore, the nearshore foraging and migratory areas are very important for the Gulf sturgeon as they offer not only the first foraging opportunity for the Gulf sturgeon exiting the rivers, but also migratory pathways to winter habitat and, more rarely, to other rivers.

Few data have been collected on the food habits of Gulf sturgeon; their threatened status limits sampling efforts and gastric lavaging has only recently become successful (anal lavaging is being investigated). Gulf sturgeon have been described as opportunistic and indiscriminate benthivores; their guts generally contain benthic marine invertebrates including amphiopods, lancelets, polychaetes, gastropods, shrimp, isopods, molluscs, and crustaceans (Huff 1975, Mason and Clugston 1993, Carr et al. 1996, Fox et al. 2000, Fox et al. 2002). During the early fall and winter, immediately following downstream migration, Gulf sturgeon are most often located in nearshore (depth less than 20 feet) sandy areas that support burrowing macroinvertebrates, presumably foraging (Craft et al. 2001, Ross et al. 2001a, Fox et al. 2002, Parauka et al. in press).

Short-term (one month) impacts on benthic macroinvertebrates following dredging were investigated by comparing community structure in a Florida bayou pre- and post-dredging: a significant reduction in both density (of species and individuals) and diversity was recorded (Lewis et al. 2001); of particular interest was the predominance of polychaetes (relative abundance of 68% pre- to 23% post-disposal) prior to dredging being replaced by harpacticoid copepods (from 6% to 69%) (Lewis et al. 2001). Comparison of mollusks from dredged and non-dredged areas in Boga Ciega Bay, Florida indicated a much smaller number and diversity of species in the dredged canals that in non-dredged areas (Sykes and Hall 1970).

2. Water Quality

Water quality impacts as a result of dredging are expected to be temporary, with suspended particles settling out within a short time frame. These sediment disturbance impacts will be minimal in nature and will not have a measurable effect on water quality (or on sea turtles or Gulf sturgeon directly). Additionally, past sampling of water column and elutriate chemistry in various locations within the project area demonstrated that dredging is not likely to significantly impact water quality. Potential changes in salinity and tidal amplitude are expected to be minimal. NOAA Fisheries does not expect measurable impacts to Gulf sturgeon critical habitat as a result of water quality impacts related to this project.

3. Sediment Quality

Potential impacts to sediment quality as a direct result of dredging channel beds were considered in this Opinion. The composition of dredged material removed from the channel beds is expected to be the same as that remaining. Because this Opinion is only authorizing dredging to maintain channels at depths existing at the time of this consultation, regardless of depth previously authorized, the sediments removed from the channel beds should be similar to those in the surrounding area given that shoaling is a result of transport from nearby areas (consisting of soft materials). Therefore, it is unlikely that the materials removed from the channels considered in this Opinion are different in composition from those that would remain in the channel beds following dredging. The COE shall contact NOAA Fisheries if they believe or have evidence indicating, for any of the projects considered within this Opinion, that dredged material is not compatible to that remaining in the channel beds in terms of grain size, color and composition. Therefore, NOAA Fisheries does not expect measurable impacts to Gulf sturgeon critical habitat as a result of sediment quality impacts related to these projects.

4. Migratory Pathways
Effects on migratory pathways as a PCE for units #8 and #11 were considered in this Opinion. These two units are known to support migratory pathways for Gulf sturgeon from at least three genetic subpopulations (Lake Pontchartain/Pearl River, Pascagoula River and Escambia/Yellow Rivers) and at least seven riverine subpopulations (Mississippi, Pascagoula, Pearl, Mobile, Choctawhatchee, Yellow, and Apalachicola Rivers) as groups of individuals from these subpopulations have been located by telemetry on numerous occasions within units #8 and #11 (Rogillio 1993, Ross et al. 2000, Ross et al. 2001b, Parauka et al. in press, F. Parauka USFWS pers. comm. 2002, Rogillio et al. in prep). Gulf sturgeon move through these two units for two main reasons: migration between winter and summer habitats (foraging along the way), and, more rarely, for inter-riverine movements. Because the hopper dredging associated with the project located in Gulf sturgeon critical habitat (Table 3) will be localized and not span the length/width of a unit, NOAA Fisheries concluded that the dredging events will not preclude passage through the migratory pathways by the Gulf sturgeon and therefore adequate area for migration will be available.

D. <u>Effects of Relocation Trawling (Capture, Tag, and Release) in Association with Hopper Dredging</u>

Relocation trawling has been successful at temporarily displacing Kemp's ridley, loggerhead, leatherback, and green sea turtles from channels and nearshore mining areas in the Atlantic and Gulf of Mexico (e.g., Thimble Shoals Channel, Virginia Beach, Virginia; Morehead City, Wilmington, and Bogue Banks, North Carolina; Charleston, South Carolina; Kings Bay, Georgia; Canaveral Entrance Channel, Tampa Bay, Charlotte Harbor, and St. Petersburg Harbor, Florida; MR-GO, Louisiana; Freeport Harbor, Aransas Pass, and Sabine-Neches Waterway, Texas) during periods when hopper dredging was imminent or ongoing. Some turtles captured during relocation trawling operations return to the dredge site and are subsequently recaptured. Sea turtle relocation studies by Standora et al. (1993) at Canaveral Channel relocated 34 turtles to six release sites of varying distances north and south of the channel. Ten turtles returned from southern release sites, and seven from northern sites, suggesting that there was no significant difference between directions. Return times observed suggested that there was a direct correlation between relocation distance and likelihood of return or length of return time to the channel when sea turtles were relocated to the south. No correlation was observed between the northern release sites and the time or likelihood of return. The study found that relocation of turtles to the site 70 km (43 miles) south of the channel would result in a return time of over 30 days.

REMSA, a private company contracted to conduct relocation trawling captured, tagged, and relocated 69 turtles in a 7-day period at Canaveral Channel in October 2002, with no recaptures; turtles were relocated a minimum of 3-4 miles away (Trish Bargo, REMSA, June 2, 2003 pers. comm. to Eric Hawk). Twenty-four hour per day relocation trawling conducted by REMSA at Aransas Pass Entrance Channel (Corpus Christi Ship Channel) from April 15, 2003, to July 7, 2003, relocated 71 turtles from ca 1.5-5 miles from the dredge site, with three recaptures (Trish Bargo, July 24, 2003 pers. comm. to Eric Hawk). One turtle released on June 14, 2003, around 1.5 miles from the dredge site, was recaptured four days later; another turtle released captured June 9, 2003, released about three miles from the dredge site was recaptured nine days later. Subsequent releases occurred five miles away. Of these 68 subsequent capture/releases, one turtle released on June 22, 2003 was recaptured 13 days later (REMSA Final Report, Sea Turtle Relocation Trawling, Aransas Pass, Texas, April-July 2003).

Prior to 1997, most relocation trawling in association with hopper dredging was performed by the Corps of Engineers under a NOAA Fisheries ESA section 10 incidental take/research permit. Since then, however, relocation trawling has primarily been conducted by private companies. In the last three years, Coastwise Consulting, Inc., has conducted over 132 days of relocation trawling at Morehead City, North Carolina; Charleston, South Carolina; and Kings Bay, Georgia (e-mail, C. Slay to E. Hawk, October 25, 2002). During the course of this work, at least 43 loggerheads, ten Kemp's ridleys, and one green turtle were successfully captured, tagged, and released. No dead or injured turtles were encountered and no captured turtles were recaptured during this work. Since around 1998, Coastwise Consulting has captured, tagged, and released approximately 80-90 turtles, with no evidence of injury or mortality (Pers. comm., C. Slay to E. Hawk, December 6, 2002). On the Atlantic coast, REMSA has also successfully tagged and relocated over 140 turtles in the last several years, most notably, 69 turtles (55 loggerheads and 14 greens) in a 7-day period at Canaveral Channel in October 2002, with no significant injuries. Other sea turtle relocation contractors (R. Metzger in 2001; C. Oravetz in 2002) have also successfully and non-injuriously trawl-captured and released sea turtles out of the path of oncoming hopper dredges. More recently in the Gulf of Mexico, REMSA captured, tagged, and relocated 71 turtles at Aransas Pass with no apparent long-term ill effects to the turtles. Three injured turtles captured were subsequently transported to University of Texas Marine Science Institute rehabilitation facilities for treatment (two had old, non-trawl related injuries or wounds; the third turtle may have sustained an injury to its flipper, apparently from the door chain of the trawl, during capture). Three of the 71 captures were recaptures–released around 1.5, three, and five miles, respectively, from the dredge site–and exhibited no evidence that their capture, tag, release, and subsequent recapture, was in any way detrimental.

The effects of this harassment of the turtles during capture and handling can result in raised levels of stressor hormones, and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research-trawling for turtles, these effects are expected to dissipate within a day (Stabenau and Vietti 1991). Since turtle recaptures are rare, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected.

Rarely, even properly conducted relocation trawling can result in accidental sea turtle deaths. Henwood (pers. comm. to E. Hawk, December 6, 2002) noted that trawl-captured loggerhead sea turtles died on several occasions during handling on deck during winter trawling in Canaveral Channel in the early 1980s, after short (approximately 30-minute) tow times. However, Henwood also noted that a significant number of the loggerheads captured at Canaveral during winter months appeared to be physically stressed and in "bad shape" compared to loggerheads captured in the summer months from the same site, which appeared much healthier and robust. Stressed turtles or unhealthy turtles or turtles exposed to repeated forced submergences are more likely to be injured or killed during relocation trawling than healthy turtles.

In November 2002, during relocation trawling conducted in York Spit, Virginia, a Kemp's ridley sea turtle was likely struck by one of the heavy trawl doors or it may have been struck and killed by another vessel shortly before trawl net capture. The hopper dredge was not working in the area at the time (pers. comms. and e-mails, P. Bargo to E. Hawk, December 6 and 9, 2002).

NOAA Fisheries typically limits tow times for relocation trawling to 42 minutes or less measured from the time the trawl doors enter the water when setting the net to the time the trawl doors exit the water during haulback ("doors in - doors out"). The National Research Council report "Decline of the Sea Turtles: Causes and Prevention" (NRC 1990) suggested that limiting tow durations to 40 minutes in summer and 60 minutes in winter would yield sea turtle survival rates that approximate those required for the approval of new TED designs, i.e., 97%. The NRC report also concluded that mortality of turtles caught in shrimp trawls increases markedly for tow times greater than 60 minutes. Current NOAA Fisheries' TED regulations allow, under very specific circumstances, for shrimpers with no mechanical-advantage trawl retrieval devices on board, to be exempt from Federal TED requirements if they limit tow times to 55 minutes during April through October and 75 minutes from November through March. The presumption is that these tow time limits will result in turtle survivability comparable to having TEDs installed.

The Gulf and South Atlantic Fisheries Development Foundation's August 31, 1998, "Alternatives to TEDs: Final Report," presents data on 641 South Atlantic shallow tows (only one tow was in water over 15 fathoms [27.4 m]), all conducted under restricted tow times (55 minutes during April through October and 75 minutes from November through March), and 584 Gulf of Mexico nearshore tows conducted under the same tow time restrictions. Offshore effort in the Gulf of Mexico consisted of 581 non-time restricted tows which averaged 7.8 hours per tow. All totaled, 323 turtle observations were documented: 293 in the nearshore South Atlantic efforts, and 30 in the Gulf efforts (24 nearshore and six offshore). Of the 293 South Atlantic turtles (219 loggerhead, 68 Kemp' ridley, five green, and one leatherback), only 274 were used in the analyses (201 loggerhead, 67 Kemp's ridley, five green, and one leatherback) because 12 escaped from the nets after being seen and seven were caught in try nets. Of the 274 South Atlantic turtles captured using restricted tow times, only five loggerheads and one Kemp's ridley died because of the interaction. For the Gulf efforts, 26 turtles (eight loggerhead, 16 Kemp's ridley, two green) were captured, resulting in three mortalities (one loggerhead inshore, one loggerhead and one green offshore). Excluding all six offshore tows and both offshore mortalities (because of the prolonged, non-restricted tow times), we are left with 1,225 time-restricted tows (584 + 641) resulting in 298 trawl-captured turtles (274 + 24) resulting in seven mortalities, i.e., 2.3% of the interactions resulted in death.

In summary, NOAA Fisheries believes that properly conducted and supervised relocation trawling (i.e., observing trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in adverse effects to sea turtles. NOAA Fisheries estimates that, overall, sea turtle trawling and relocation efforts will result in considerably less than 0.5% mortality of captured turtles, primarily due to their being previously stressed or diseased or if struck by trawl doors or accidents on deck. On the other hand, hopper dredge entrainments invariably result in injury, and are almost always fatal. In the present Opinion, NOAA Fisheries requires relocation trawling and tagging as methods of reducing sea turtle entrainment in hopper dredges and to document the effects of relocation trawling, according to criteria defined in the ITS.

<u>Effects and desirability of tagging relocated animals:</u>
Tagging prior to release will help us learn more about the habits and identity of these trawl-captured animals after they are released; and if they are recaptured will enable improvements in relocation trawling design to further reduce the effect of the take. External and internal flipper tagging (e.g., with Inconel and PIT tags) are not considered dangerous procedures by the sea turtle research community; are routinely done by thousands of volunteers in the United States and abroad; and can be safely accomplished with minimal training. NOAA Fisheries knows of no instance where flipper tagging has resulted in mortality or serious injury to a trawl-captured sea turtle. Such an occurrence would be extremely unlikely because the technique of applying a flipper tag is minimally traumatic and relatively non-invasive; in addition, these tags are attached using sterile techniques. Important growth, life history, and migratory behavior data may be obtained from turtles captured and subsequently relocated. Therefore, these turtles should not be released without tagging (and scanning for pre-existing tags).

Collection of tissue samples: Tissue sampling is performed to determine the genetic origins of captured sea turtles, and learn more about their nesting beach/population origins. This is important information because some populations, e.g., the northern subpopulation of loggerheads nesting in the Southeast Region, may be declining. For all tissue sample collections, a sterile 4- to 6-mm punch sampler is used. Researchers who examined turtles caught two to three weeks after sample collection noted that the sample collection site was almost completely healed (Witzell, pers. comm.). NOAA Fisheries does not expect that the collection of a tissue sample from each captured turtle will cause any additional stress or discomfort to the turtle beyond that experienced during capture, collection of measurements, and tagging. Tissue sampling procedures are specified in the terms and conditions of this Opinion.

E. Effects of Dredged Material Disposal on Sea Turtles, Gulf Sturgeon, and Critical Habitat

NOAA Fisheries has reviewed the maintenance dredging projects that occur in the Gulf of Mexico on a recurring basis (see Proposed Action section for by-District project descriptions) and the disposal sites and methods which the COE uses to dispose of dredged material. Typically, dredged materials from channel maintenance dredging activities are disposed of down current of the navigation channels being maintained (by agitation dredging and sidecasting), or in designated disposal areas which are adjacent to and run approximately parallel to the navigation channels, or in nearby designated offshore disposal areas (to minimize transit time of the hopper dredge to and from the dredging site). Alternatively, they are used beneficially for barrier island restoration and creation of island, wetland, marsh, and shallow-water habitats, or to renourish eroded mainland beaches. With the exception of disposal of dredged materials within designated Gulf sturgeon critical habitat (which is not considered in this Opinion and must be consulted on individually by each COE District for projects under their respective permitting authority), NOAA Fisheries believes that disposal activities currently being conducted, and proposed to be continued, by the Galveston District, New Orleans District, Mobile District, and Jacksonville District are unlikely to adversely affect sea turtles or Gulf sturgeon. These species are highly mobile and should be able to easily avoid a descending sediment plume discharged at the surface by a hopper dredge opening its hopper doors, or pumping its sediment load over the side. This Opinion does not allow disposal actions within foraging habitat areas designated as Gulf sturgeon critical habitat. NOAA Fisheries also believes that foraging habitat for sea turtles is not likely a limiting factor in the Gulf of Mexico COE Districts and thus the temporary removal of relatively small areas (compared to remaining foraging habitat) of potential foraging habitat by burial with dredged material sediment will not measurably adversely affect sea turtles. Furthermore, large portions of areas routinely dredged by the New Orleans District in the MR-SWP and associated disposal sites are not suitable foraging habitat for sea turtles because of high freshwater flows. As well, typical nearshore areas of the Gulf of Mexico that are routinely renourished (e.g., west Florida beaches of Pinellas, Sarasota, Lee Counties), or might be renourished, or are being considered for renourishment (e.g., Orange Beach/Gulf Shores, Alabama) are not considered by NOAA Fisheries to be of particularly significant or essential foraging value to sea turtles. Turtles will typically forage further offshore where non-ephemeral limestone ledges supporting algal/sponge growth are located. These ledges are not routinely covered by shifting sands, as they are prone to in the high wave-energy nearshore environment. Foraging habitat for Gulf sturgeon, recognized with the designation of critical habitat, will not be adversely affected by this action. Furthermore, beach renourishment projects typically affect yearly only a minute portion of the many hundreds of miles of Gulf of Mexico nearshore beach environment available for foraging sea turtles.

COE District disposal activities (principally, Jacksonville District COE) which involve renourishing beaches where sea turtles nest are consulted on by the U.S. Fish and Wildlife Service because sea turtles on land fall under the purview of that agency. NOAA Fisheries believes that deposition of dredged materials on the beach or in the littoral nearshore environment for beach renourishment and creation of island, wetland, marsh, and shallow-water habitats in the Gulf of Mexico by any of the COE Districts during beach restoration or habitat restoration projects (excepting disposal in designated Gulf sturgeon critical habitat) described in the Proposed Action section of this Opinion, and similar actions, will not adversely affect sea turtles or Gulf sturgeon and may ultimately be of benefit to them if restoration efforts are successful. Nearshore habitats for foraging sea turtles and Gulf sturgeon are present in sufficient quantities such that removal of relatively small portions of potential foraging habitat will not cause measurable adverse effects on sea turtles or Gulf sturgeon.

Disposal Effects on Benthos

Sediment composition is a cardinal factor in controlling the settlement and viability of many marine invertebrates (Thorson 1956). In addition, benthic recovery is dependent on time of year. Placement of materials similar to ambient sediments (e.g., sand on sand or mud on mud) has been shown to produce less severe impacts in contrast to placement of dissimilar sediments, which generally results in more severe, long-term impact (Maurer et al. 1978, 1986). Deposition of relatively thin layers of dredged material (<10 cm; 4 in) can minimize impacts by allowing many populations of small, shallow-burrowing infauna with characteristically high reproductive rates and wide dispersal capabilities to recover quickly. Deposits greater than 20-30 cm (8-12 in) generally eliminate all but the largest and most vigorous burrowers (Maurer et al. 1978).

Observed rates of benthic community recovery after dredged material placement range from a few months to several years. The relatively species-poor benthic assemblages associated with low salinity estuarine sediments can recover in periods of time ranging from a few months to approximately one year (Leathem et al. 1973, McCauley et al. 1976, 1977, Van Dolah et al. 1979, 1984, Clarke and Miller-Way 1992), while the more diverse communities of high salinity estuarine sediments may require a year or longer (e.g., Jones 1986, Ray and Clarke 1999). Recovery rates for sandy inshore marine sites, should be similar to those reported for high salinity estuarine sites (Oliver et al. 1977, Richardson et al. 1977, Haskin et al. 1978, Van Dolah et al. 1984) if the overburden is comprised of similar sediments.

Most of what is known about the species specific recovery/recolonization of benthic communities following dredge material placement in the Gulf of Mexico is the result of work by Rakocinski et al. (1991, 1993, 1996); others (e.g., Dixon and Pilkey 1991, Nelson 1993) have focused on benthic recovery following beach restoration. Generally recovery/recolonization is dependent upon sediment-type, time, depth of overburden, depth, proximity to beach. One long-term (two year) study monitored recovery and concluded that while recolonization occurred, the macrobenthic community structure was different and wide fluctuations between stations was present two years post-event (Rakocinski et al. 1996).

NOAA Fisheries concludes that the effects of dredged material disposal on benthic communities is unlikely to adversely affect sea turtles or Gulf sturgeon.

Disposal Effects on Gulf Sturgeon Critical Habitat

No disposal within Gulf sturgeon critical habitat is authorized in this Opinion (see section entitled "Description of the Action Area and Proposed Action"). Therefore, NOAA Fisheries concludes that there are no disposal effects on Gulf sturgeon critical habitat.

F. Anticipated Incidental Take Levels Predicted for Each COE District:

While it is impossible to ascertain the exact number of future take of sea turtles and Gulf sturgeon, NOAA Fisheries bases the estimated anticipated take levels on the following data:

1. Previous sea turtle takes associated with hopper dredging during Gulf of Mexico maintenance dredging and sand mining operations by the COE's New Orleans, Galveston, and Jacksonville Districts (Mobile District has previously not had observers on hopper dredges so the historic level of incidental take, if any, is unknown);

2. The level of take anticipated in previous Opinions;

3. The distribution and abundance of sea turtles and Gulf sturgeon in the Gulf of Mexico;

4. COE adherence to dredging windows;

5. The magnitude of, and operational measures (including relocation trawling) employed by, individual dredging projects;

6. Documented sturgeon take by dredges on the Atlantic coast;

7. The number and description of the hopper dredging projects provided by each District; and

8. The proportion of known reproducing populations of Gulf sturgeon (total = 7) geographically located within each District.

Fresh Takes vs. Decomposed Takes

The incidental level of both sea turtle and Gulf sturgeon take is anticipated to consist of "fresh dead" animals. However, NOAA Fisheries realizes that dredging may produce an additional unquantifiable number of "previously dead" sea turtles or turtle parts. While decomposed animals taken in Federal operations are considered to be takes (the possession of a listed species is considered a take), NOAA Fisheries recognizes that decomposed sea turtles whose deaths were not necessarily related to the present activity may be entrained by the dredge. Theoretically, if dredging operations are conducted properly, no takes of sea turtles should occur since the turtle draghead defector should push the turtles to the side and the suction pumps should be turned off whenever the dredge draghead is away from the substrate. However, due to certain environmental and other conditions (e.g., rocky bottom, uneven substrate, sea swells, draghead operator error, clogged dragheads, etc.), the dredge dragheads may periodically lift off the bottom and draw in any other previously dead sea turtles or turtle parts it may encounter. Reviews of observer records reveal that entrainment of old turtle bones during hopper dredging operations occasionally occurs. Therefore, takes of decomposed listed species shall be evaluated on a case-by-case basis by NOAA Fisheries; these takes, depending upon the circumstances, may or may not be ascribed to the ongoing dredging operation and may or may not be counted towards the anticipated take level.

NOAA Fisheries relies heavily on the unbiased reports of the onboard endangered species observer and other sources of information (such as commercial fisheries operating in the area) when determining take of a listed species. Provided that NOAA Fisheries concurs with the COE's determination regarding the stage of decomposition, condition of the specimen, and ultimately the likely cause of mortality, the take may or may not be attributed to the incidental take level for a project. Similarly, sometimes parts of one dismembered turtle are taken in separate loads, sometimes several days apart; if the parts are a good "match" and appear to be from the same animal, NOAA Fisheries will likely determine that only a single turtle was taken. Also, turtles or sturgeon may strand near dredging operations, bearing marks or damage which could be construed as evidence of hopper dredge entrainment. NOAA Fisheries shall study these situations carefully in consultation with the affected COE Districts and Sea Turtle Stranding and Salvage Network (STSSN) personnel before reaching a determination on whether or not to count these as takes.

Take levels for the Galveston and New Orleans Districts are expected to remain identical to those established in the September 22, 1995, RBO, except that Gulf sturgeon takes will now be authorized for the New Orleans District. Since the RBO was issued, neither District has met or exceeded the established annual incidental take level (although the New Orleans District in July 2001 reinitiated consultation with

NOAA Fisheries when high turtle take levels in the MR-GO resulted in the District reaching 75% of its authorized take level of loggerhead sea turtles). NOAA Fisheries believes that the previously established anticipated take levels are still valid; however, one Gulf sturgeon will be added to the New Orleans District take limit where previously there was none, because NOAA Fisheries believes that there is a significant possibility that a Gulf sturgeon will be taken by a New Orleans District hopper dredge in the future. No Gulf sturgeon takes will be added to the Galveston District's take limit because Gulf sturgeon are not known to occur in the Galveston District.

Sea turtles and Gulf sturgeon may occur within the Mobile District's navigation channels and sand mining areas. Hopper dredge use by the Mobile District has occurred regularly in the past, but without observers to document potential sea turtle or Gulf sturgeon entrainment. Currently, a NOAA Fisheries' biological opinion does not exist to authorize potential takes during Mobile District hopper dredging activities. Although no take of listed turtles or sturgeon in the Mobile District have been reported to NOAA Fisheries, this is believed to be a reflection of the lack of observers present to monitor incoming dredged material for turtle and sturgeon parts. The present Opinion anticipates a limited amount of take for sea turtles and Gulf sturgeon by the Mobile District.

The Jacksonville District may incidentally take sea turtles and Gulf sturgeon in their hopper dredging operations west and north of Key West, Florida (takes in Key West channels are covered by the existing September 25, 1997, RBO to the COE's SAD); therefore, a take limit must be set for the Jacksonville District's Florida West Coast hopper dredging projects (Key West [excluding Key West navigation channels] to Aucilla River Basin [including the Aucilla River], Florida). The biennial incidental take level established for sea turtles and Gulf sturgeon in the October 1999 Charlotte Harbor Opinion will be subsumed into the Jacksonville District's Florida West Coast take level established in the present Opinion.

Anticipated Gulf-wide Take of Sea Turtles and Gulf Sturgeon by Hopper Dredges:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, forty (40) loggerhead turtles, and four (4) Gulf sturgeon. This take level represents a total take per fiscal year for all channel dredging and sand mining by hopper dredges in the Gulf of Mexico by the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts collectively.

Galveston District
For the Galveston District, the annual documented incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, five (5) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles per fiscal year for all channel dredging and sand mining by hopper dredge in the Galveston District. This level of take represents the same level of take authorized by the previous Opinion.

New Orleans District
For the New Orleans District, the documented annual incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the New Orleans District. As in the previous Opinion, a greater number of green turtles is included in the incidental take level predicted for the Galveston District due to the greater abundance of green turtles in south Texas waters.

Mobile District (Florida Panhandle west of Aucilla River Basin to, but not including, the Mississippi River)
For the Mobile District, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Mobile District. A greater number of Gulf sturgeon is included in the incidental take level predicted for the Mobile District than the New Orleans District due to the larger proportion of reproducing populations of of Gulf sturgeon in the former District.

Jacksonville District (Florida West Coast: Aucilla River Basin to, but not including, Key West)
For the Jacksonville District, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Jacksonville District west of Key West (hopper dredging of Key West navigation channels is covered under the existing regional hopper dredging RBO to the COE's SAD).

Anticipated Takes of Sea Turtles and Gulf Sturgeon through Relocation Trawling:

Though not included by the COE as an integral part of the proposed action, this Opinion will require the use of relocation trawling as a reasonable and prudent measure (RPM) to reduce the effect of take of turtles by hopper dredges. Even though relocation trawling involves directed take of turtles, it constitutes a legitimate RPM because it reduces the level of almost certain lethal and injurious take of sea turtles by hopper dredges, and allows the turtles captured non-injuriously by trawl to be relocated out of the path of the dredges. The Consultation Handbook (for Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act, U.S. Fish and Wildlife Service and National Marine Fisheries Service, March 1998) expressly authorizes such directed take as an RPM at page 4-54. Therefore, NOAA Fisheries will in this section evaluate the expected level of turtle take through required relocation trawling, so that these levels can be included in the evaluation of whether the proposed action will jeopardize the continued existence of the species.

Between October 1, 2002, and the present, approximately 80 sea turtles have been relocated in association with Gulf of Mexico hopper dredging projects, including projects at Aransas Pass, Brownsville Entrance Channel, and the MR-GO, by contract trawlers. Although 2002 was the first year the Galveston District conducted relocation trawling in association with some of its hopper dredging projects, henceforth the District will require mandatory 24-hr/day relocation trawling in association with all dredging projects within the District (Rob. Hauch, pers. comm. to E. Hawk, July 22, 2003).

NOAA Fisheries estimates that yearly relocation trawling in all of the navigation channels and sand mining areas of the Gulf of Mexico will take no more than 300 loggerhead, green, hawksbill, and Kemp's ridley sea turtles, and eight (8) Gulf sturgeon. This number is based on past recent history of relocation trawler takes in the Gulf of Mexico, information on Gulf sturgeon takes by shrimp trawlers at Gulf of Mexico barrier island passes (H. Rogillio, pers. comm. to Eric Hawk), the possibility that the events at Aransas Pass (where 70+ turtles were captured in 10 weeks during 2003) will repeat in other places in the Gulf of Mexico (perhaps simultaneously), increased presence of sea turtles in coastal waters as turtle populations recover and new TED regulations take effect leading to increased trawl capture rates, increased relocation trawling efforts in the Gulf of Mexico spurred in part by this summer's trawling success at Aransas Pass and MR-GO, the Galveston District's stated intent to conduct relocation trawling during on all their future District dredging projects (Rob Hauch, pers. comm. to Eric Hawk), probable increases in Gulf of Mexico summertime dredging when water temperatures are warmer and sea turtles are more abundant, and predicted relocation trawling captures by COE Districts in the Gulf of Mexico that have never before done so (i.e., Mobile District). As stated in the Reasonable and Prudent Measures, and Terms and Conditions of this ITS, relocation trawling is required under specific circumstances. This relocation trawling may result in sea turtle and Gulf sturgeon takes, but these takes are not expected to be injurious or lethal due to the short duration of the tow times (15 to 30 minutes per tow; not more than 42 minutes, as per Term and Condition No. 15) and required safe-handling procedures.

Estimated turtle take is derived as follows: In FY03, Shoreline Consulting captured 1-2 turtles at Aransas Pass, REMSA captured 71 turtles at Aransas Pass, relocation trawling at Brownsville Entrance Channel captured at least five more, and relocation trawling at the MR-GO captured seven in 2 ½ weeks, for a FY03 total of 85 turtles. However, if Galveston District dredged two large projects simultaneously in the summer, they could conceivably more than double the numbers taken this year. The three remaining COE Districts in the Gulf of Mexico would also be likely to be simultaneously conducting relocation trawling on some of their projects. Also, some major navigation projects have not been dredged in years and are due (e.g., Tampa Bay), as are minor projects known to take sea turtles (e.g., St. Petersburg Harbor). NOAA Fisheries arrived at the estimate of 300 potential sea turtle trawl captures yearly by Gulf of Mexico relocation trawlers by doubling the amount taken this year at Aransas Pass on the assumption that two large projects in the summer would take twice as many as one (73 x 2 = 146), then doubling it again to account for all the other uncertainties including increasing turtle populations, increased effectiveness of the larger TED escape openings, increased acceptance and use of relocation trawling, increased summer time trawling, increasing number of beach renourishment projects in the Gulf of Mexico.(146 x 2= 294), then rounding to 300 to allow an extra margin for error.

Sturgeon takes are estimates based on reports of Gulf sturgeon take by trawlers operating near Gulf of Mexico barrier island passes (H. Rogillio, pers. comm. to E. Hawk, 2002) and reports of gillnet interactions with Gulf sturgeon near passes where Gulf sturgeon are known to congregate in winter.

G. Summary of Effects of the Proposed Action on Sea Turtles, Gulf Sturgeon, and Gulf Sturgeon Critical Habitat

Stranding information indicates that sea turtle aggregations are found in the vicinity of Gulf of Mexico navigation channels and that sea turtles are present in nearshore Gulf coastal waters year-round. The previous NOAA Fisheries Opinion governing hopper dredging in the northern and western Gulf of Mexico (NMFS 1995) noted that shallow, warm, nearshore waters in the northern Gulf of Mexico provide prime Kemp's ridley habitat until cooling waters force turtles offshore or south along the Florida and southwest Texas coast. Generally, Kemp's ridleys were observed in water depths of less than 18 m and surface water temperatures greater than 12°C. Based on the year-round presence of sea turtles, seasonal presence of Gulf sturgeon in navigation channels and barrier island passes, sea turtles' potential presence at sand mining sites in proximity to hardgrounds, and the documented takes of sea turtles at sand mining sites in North Carolina, South Carolina, and Florida, it can be expected that future maintenance dredging and dredging for beach renourishment purposes with hopper dredges in the action area will occasionally capture and entrain sea turtles and Gulf sturgeon incidental to the proposed dredging activities. Most of these entrainments can be expected to result in death of the individuals overtaken by the draghead.

In addition to hopper dredge takes, NOAA Fisheries anticipates that sea turtles may be taken by bed-leveler type dredges. The Brunswick Harbor report received in July 2003 is the first report that NOAA Fisheries received indicating a possible link between bed-leveling mechanical dredging and sea turtle takes. Although there are no confirmed reports to date which definitively implicate bed-levelers with sea turtle takes, NOAA Fisheries believes, based on the Brunswick Harbor report, that a significant possibility exists that bed-leveling mechanical dredging may kill sea turtles during leveling/cleanup operations associated with hopper dredging projects not only at Brunswick Harbor, but also in Gulf of Mexico channels and dredged-material deposition areas where bed-levelers are used. Following the Brunswick Harbor report, NOAA Fisheries issued a biological opinion on September 11, 2003, to the Savannah District COE to allow the use of bed-leveling mechanical dredging devices during the Brunswick Harbor deepening project. That Opinion anticipated and established an incidental take of sea turtles pursuant to the proposed action. In the Gulf of Mexico, NOAA Fisheries will use STSSN observer reports and evidence from strandings in proximity of dredging projects where bed-levelers are being used to determine if sufficient evidence exists to indicate that a turtle was killed by a bed-leveler. If compelling STSSN observer reports and evidence indicate that a turtle was killed by a bed-leveling type dredge, that take will be deducted from the ITS' anticipated take level for that COE District where the take occurred.

NOAA Fisheries anticipates that for the entire Gulf of Mexico from the U.S.-Mexico border to Key West, not including Key West, endangered species observers aboard COE hopper dredging operations, and STSSN personnel indirectly monitoring bed-leveler type dredging, will document the take yearly, by injury or mortality, of a maximum of approximately 40 loggerhead turtles, 20 Kemp's ridley turtles, 14 green turtles, four hawksbill turtles, and four Gulf sturgeon, and of a maximum of 300 turtles and eight Gulf sturgeon taken non-injuriously by relocation trawling. These estimates are based on factors such as documented average and maximum yearly takes during previous years, variability in sea turtle abundance and distribution, annual maintenance dredging schedules, anticipated increases in beach nourishment projects, and anticipated takes established in previous Opinions. To be conservative and account for listed species which may be taken but not documented, NOAA Fisheries assumes that an equal number of sturgeon and turtles are killed by being crushed by the deflector dragheads but are not entrained and thus are not documented, or are entrained in fragments and are not detected by hopper dredge endangered species observers, or takes occur during periods when hopper dredge endangered species observers are not required or are not present. Thus, a maximum estimate of 80 loggerhead turtles, 40 Kemp's ridleys, 28 green turtles, eight hawksbill turtles, and eight Gulf sturgeon may be killed or injured annually in COE Gulf of Mexico hopper dredging operations. NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico.

With the exception of the northern nesting population of loggerheads, nesting for loggerheads, Kemp's ridley, and green sea turtles has been increasing or remaining stable in the southeast United States and (in the case of Kemp's ridleys) Rancho Nuevo, Mexico, given all of the ongoing impacts to these species which includes takes through maintenance dredging and sand mining using hopper dredges. Based on information presented in the Environmental Baseline section of this Opinion, the increase in TED opening sizes associated with the final rule, published in the *Federal Register* on February 21, 2003, (68 FR 8456) is expected to allow the northern nesting population of loggerheads to increase, though all sea turtle species in the Gulf of Mexico, and Gulf sturgeon, will benefit from the enlarged openings which will enhance escapement. Similarly, the population of Gulf sturgeon appears to be stable or increasing, and recent designation of critical habitat should further aid its recovery. Except for the Mobile District which previously has not had an Opinion authorizing incidental take (though NOAA Fisheries suspects takes none-the-less occurred), the proposed action does not constitute a significant increase in the authorized take, particularly injurious or lethal take, of sea turtles or Gulf sturgeon above levels associated with past and ongoing authorized maintenance dredging and sand mining activities involving the use of hopper dredging. Further, these take levels are very small compared to other activities, such as shrimping, other commercial fisheries, and vessel collisions, which are much greater sources of sea turtle and Gulf sturgeon take and mortality. Therefore, NOAA Fisheries believes that this level of anticipated take is not likely to alter the positive population trajectories of any of these species.

Finally, the critical habitat analysis that NOAA Fisheries conducted to investigate potential project impacts to PCEs within units #8 and #11 concluded that impacts from the project would not have a measurable effects on water quality, sediment quality, migratory pathways or prey availability. This conclusion was dependent upon two important parameters: 1) channels would only be maintained, not improved, and 2) sediments removed from the channel bed would not be different from those remaining; therefore available habitat would not be modified.

6.0 Cumulative Effects

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area or within the range of sea turtles. Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Within the action area, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. The present, major human uses of the action area are expected to continue at the present levels of intensity in the near future. Listed species of turtles, however, migrate throughout the Atlantic Ocean and Gulf of Mexico and may be affected during their life cycles by non-Federal activities outside the action area.

Throughout the coastal Gulf of Mexico the loss of thousand of acres of wetlands is occurring due to natural subsidence and erosion, as well as reduced sediment input from the Mississippi River. Impacts caused by residential, commercial, and agricultural developments appear to be the primary causes of wetland loss in Texas.

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water, will continue to affect water quality in the Gulf of Mexico. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the Gulf of Mexico. Floating tar sampled during the 1970s, when bilge discharge was still legal, concluded that up to 60% of the pelagic tars sampled did not originate from northern Gulf of Mexico coast.

Marine debris will likely persist in the action area in spite of national and international treaty prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingested marine debris (Plotkin and Amos 1990, Bolten and Bjorndal 1991). Although few individuals are affected, entanglement in marine debris may contribute more frequently to the death of sea turtles.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities, and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States due to the large number of waste discharge point sources. The species of turtles analyzed in this Opinion may be exposed to and accumulate these contaminants during their life cycles. A few (n=12) Gulf sturgeon have been analyzed for pesticides and heavy metals (Bateman and Brim 1994). Each individual fish had concentrations of arsenic, mercury, DDT metabolites, toxaphene, polycyclic aromatic hydrocarbons and aliphatic hydrocarbons high enough to warrant concern (USFWS et al. 1995). Specific sources were not identified.

Beachfront development, lighting, and beach erosion control all are ongoing activities along the Atlantic and Gulf coasts. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, as conservation awareness spreads, more and more coastal cities and counties are adopting more stringent measures to protect hatchling sea turtles from the disorienting effects of beach lighting.

Because many activities that affect marine habitat involve some degree of Federal authorization (e.g., through MMS or COE), NOAA Fisheries expects that ESA section 7 will apply to most major, future actions that could affect designated Gulf sturgeon critical habitat.

State-regulated commercial and recreational fishing activities in Atlantic Ocean and Gulf of Mexico waters currently result in the incidental take of threatened and endangered species. It is expected that states will continue to license/permit large vessel and thrill-craft operations which do not fall under the purview of a Federal agency, and issue regulations that will affect fishery activities. Any increase in recreational vessel activity in inshore and offshore waters of the Gulf of Mexico and Atlantic Ocean will likely increase the number of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles. Future cooperation between NOAA Fisheries and the states on these issues should help decrease take of sea turtles caused by recreational activities. NOAA Fisheries will continue to work with coastal states to develop and refine ESA section 6 agreements and section 10 permits to enhance programs to quantify and mitigate these takes.

7.0 Conclusion

The current status of sea turtle and Gulf sturgeon populations is not likely to be appreciably affected by hopper dredging operations in the action area, as has been described in detail in Sections 3.0 and 5.0 of this Opinion. In summary, NOAA Fisheries believes that the current status of sea turtle and Gulf sturgeon populations is stable or increasing and that hopper dredge-related take levels anticipated in the Effects of the Action (Section 5) and ITS of this Opinion will not change that conclusion. NOAA Fisheries acknowledges that documented takes represent partial estimates of total takes and believes that some takes may pass undetected by observers through inflow screening devices, due to the force of the water pressure, or because the animals are killed but not entrained; NOAA Fisheries estimates that unseen (thus, undocumented) takes represent roughly 50% of total documented takes and has evaluated the effects of the action including the expected undocumented takes.

It is also NOAA Fisheries' biological opinion that following the maintenance dredging of the channels (to existing depths only without improvements) the benthic community structure will return to, or return nearly to, pre-dredging status (i.e., species diversity, species richness, species abundance) with some inherent natural variability. Those benthic prey species will then be available for the conservation of Gulf sturgeon. NOAA Fisheries also concludes that the project will not impact water quality, sediment quality, or migratory pathways essential to the conservation of Gulf sturgeon. Therefore, NOAA Fisheries concludes that, when channels within designated critical habitat are dredged to only their current depth, without improvements (i.e., deepening or widening), the project will not destroy or adversely modify designated Gulf sturgeon critical habitat.

After reviewing the current status of sea turtles and Gulf sturgeon in the Gulf of Mexico; the environmental baseline for the action area; the effects of the proposed hopper dredging activities; and the cumulative effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion, it is NOAA Fisheries' biological opinion that the COE's hopper dredging activities, as proposed and described in the Proposed Action section of this Opinion, are not likely to jeopardize the continued existence of any listed species or destroy or adversely modify designated Gulf sturgeon critical habitat.

8.0 Incidental Take Statement

Section 9 of the ESA and Federal regulations issued pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Galveston, New Orleans, Mobile, and Jacksonville COE Districts so that they become binding conditions of any grant or permit issued to Gulf of Mexico hopper dredge operators for the exemption in section 7(o)(2) to apply. The COE has a continuing duty to regulate the activity covered by this incidental take statement. If the COE (1) fails to assume and implement the terms and conditions, or (2) fails to require the hopper dredge operators to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) will lapse. In order to monitor the impact of incidental take, the COE must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR 402.14(i)(3)].

Only incidental take resulting from the agency action, including incidental take caused by activities approved by the agency, that are identified in this statement and that comply with the specified reasonable and prudent measures, and terms and conditions, are exempt from the take prohibition of section 9(a) of the ESA.

Based on results of previous hopper dredging activities including dredging of Gulf of Mexico and southeastern U.S. channels, NOAA Fisheries foresees that future hopper dredging activities in U.S. Gulf of Mexico navigation channels and sand mining areas may result in the injury or mortality of loggerhead, Kemp's ridley, hawksbill, and green turtles, and Gulf sturgeon. A level of incidental take is anticipated; therefore, terms and conditions necessary to minimize and monitor takes are established.

Anticipated Gulf-wide Take by Hopper Dredging Activities:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, forty (40) loggerhead turtles, and four (4) Gulf sturgeon. This take level represents a total take per fiscal year for all channel dredging and sand mining by hopper dredges in the Gulf of Mexico by the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts. Takes by bed-leveler type dredges will be more difficult to ascertain and determine responsibility for because bed-levelers do not entrain turtle parts, and no dredged materials come aboard for observers to monitor; furthermore, bed-leveler impacted turtles may not float ashore for several days, if at all. However, if compelling STSSN observer reports and evidence indicate that a turtle was killed by a bed-leveler associated with a hopper dredging project covered by this Opinion, that take will be deducted from the ITS' anticipated take level for that COE District where the take occurred.

In addition, the total anticipated annual non-injurious take by relocation trawling that is required under this ITS is expected to consist of 300 (three hundred) sea turtles, of any combination of the species, and of eight (8) Gulf sturgeon, across all the COE Districts and hopper dredging projects (the relocation trawling takes are not allocated by districts). NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico.

Galveston District

For the Galveston District, the annual documented incidental take by hopper dredges, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, five (5) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles per fiscal year for all channel dredging and sand mining by hopper dredge in the Galveston District. This level of take represents the same level of take authorized by the previous Opinion. Although the annual level of hopper dredging in Freeport Channel has doubled since the previous Opinion, all takes recorded from Freeport Channel have been loggerheads and the District has never come close to reaching its anticipated take level for loggerheads, so no increase in take numbers of loggerheads or other species is expected.

New Orleans District

For the New Orleans District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the New Orleans District. As in the previous Opinion, a greater number of green turtles is included in the incidental take level predicted for the Galveston District due to the greater abundance of green turtles in south Texas waters.

Mobile District (Florida Panhandle west of Aucilla River Basin to, but not including, the Mississippi River)

For the Mobile District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Mobile District. A greater number of Gulf sturgeon is included in the incidental take level predicted for the Mobile District than the New Orleans District due to the greater abundance of Gulf sturgeon, and larger areas of designated Gulf sturgeon critical habitat, in the former.

Jacksonville District (Florida West Coast: Aucilla River Basin to, but not including, Key West)

For the Jacksonville District, the documented annual incidental take by hopper dredges, by injury or mortality, is expected to consist of three (3) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and one (1) Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge in the Jacksonville District west of Key West (hopper dredging of Key West navigation channels is covered under the existing regional hopper dredging RBO to the COE's SAD).

Responsibility for Hopper Dredging Takes Where COE Jurisdiction is Blurred (Civil Works vs. Regulatory Projects):

As mentioned in Section 2.0, sometimes a hopper dredging activity is permitted by a COE District but the applicant/permittee is a different COE District. To ensure that the COE District ultimately responsible for authorizing a hopper dredge activity is held accountable for its permitting action which may result in a take, and to avoid confusion as to which COE District is to be charged with a take during a hopper dredging project authorized by a COE District but performed by another District or performed in another District, NOAA Fisheries has established the following guidelines for assigning take responsibility:

A protected species take shall normally be charged to the District which issues the regulatory permit for the hopper dredging. Civil works projects do not require regulatory permitting therefore civil works hopper dredging takes shall be charged to the COE District conducting or contracting the dredging project.

However, in Florida, the Mobile District will assume responsibility for (and be charged with) all takes of threatened or endangered species resulting from hopper dredging or relocation trawling activities contracted by the Mobile District even though regulatory permits for the activities may be issued by the Jacksonville District, based on a working agreement to this effect developed between the Mobile and Jacksonville Districts (Susan Rees, pers. comm. to Eric Hawk, October 30, 2003).

For example: The Jacksonville District authorizes (via regulatory permit action through a branch office of its Regulatory Division) the restoration of Pensacola Beach utilizing a hopper dredge. The Jacksonville District's Florida West Coast anticipated incidental take level ("quota") shall be charged with any takes ensuing from the hopper dredge activities even though Pensacola Beach geographically lies within the Mobile District's civil works boundaries, since the Jacksonville District has the authority to incorporate permit conditions to limit protected species take, and contracts the work.

For example: The Mobile District typically acts as construction agent for the U.S. Navy to hopper dredge the navigation channel at the Pensacola Naval Air Station ("Navy channel"), a non-civil works "regulatory" project subject to permitting by the Jacksonville District's Regulatory Division (which has regulatory permitting authority for projects in the Florida Panhandle). The Mobile District, acting for the Navy, applies for and obtains the required regulatory permit from Jacksonville District's Regulatory Division. However, the Mobile District, pursuant to the working agreement in place between the Mobile and Jacksonville Districts, shall be charged for any takes ensuing from that hopper dredging activity.

9.0 Reasonable and Prudent Measures

Regulations (50 CFR 402.02) implementing section 7 of the ESA define reasonable and prudent measures as actions the Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take. The reasonable and prudent measures that NOAA Fisheries believes are necessary to minimize the impacts of hopper dredging in the Gulf of Mexico have been discussed with the COE and include use of temporal dredging windows, intake and overflow screening, use of sea turtle deflector dragheads, observer and reporting requirements, and sea turtle relocation trawling. The following reasonable and prudent measures and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent section 7 consultation.

Seasonal Dredging Windows, Observer Requirements, Deflector Dragheads, and Relocation Trawling[5]

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[5]The COE Wilmington District's sidecast dredges FRY, MERRITT, and SCHWEIZER, and split-hull hopper dredge CURRITUCK, are exempt from the above hopper dredging requirements (operating windows, deflectors, screening, observers, reporting requirements, etc.). Their small size and operating characteristics including small draghead sizes [2-ft by 2-ft, to 2-ft by 3-ft], small draghead openings [5-in by 5-in to 5 in by 8 in], small suction intake pipe diameters [10-14 in], and limited draghead suction [350-

Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Current regional opinions for hopper dredging require seasonal dredging windows and observer monitoring requirements, deflector dragheads, and conditions and guidelines for relocation trawling, which NOAA Fisheries' believes are necessary to minimize effects of these removals on listed sea turtle species that occur in inshore and nearshore Gulf and South Atlantic waters.

Temperature- and date-based dredging windows:
Both the Mobile and Jacksonville Districts expressed comments opposing NOAA Fisheries' imposition of seasonal dredging windows in their respective Gulf of Mexico dredging areas. In their November 28, 2000, BA on their Florida west coast hopper dredging activities, the Jacksonville District indicated that sea turtles are present year-round in the Gulf, so windows would only be of limited effectiveness. In their October 30, 2002, comments to NOAA Fisheries, the Mobile District noted it did not want to be restricted to seasonal hopper dredging windows, indicating that these would potentially seriously and detrimentally impact its ability to complete its operations and maintain Federal navigation projects due to "no excess of large dredges of the type required to perform maintenance of most Federal projects" and other reasons related to dredging industry capacity, downsizing, "loss of production" associated with the deflector draghead, and safety concerns.

Sea turtles generally move inshore with warming waters and offshore with cooling waters. In East Coast channels, Dickerson et al. (1995) found reduced sea turtle abundance with water temperatures less than 16°C. They found that 1,008 trawls conducted at or below 16°C captured 22 turtles (4.4 per cent), while 1,791 trawls conducted above 16°C resulted in 473 (95.6 percent) captures. Dickerson et al. also found that sea turtles tend to avoid water temperatures less than 15°C; however, hopper dredging Kings Bay, Georgia between March 1-12, 1997 with surface water temperatures of 57-58°F (13.9-14.4°C) resulted in 11 turtle takes in nine days (NMFS 1997).

More recently, the Savannah District COE (COE 2003) reported that the average surface temperature at which recent hopper dredge turtle takes have occurred in Brunswick is 57.7°F (14.3°C) and that "there are scattered takes at lower temperatures than turtles would normally be expected to occur" but that "These lower temperatures may not have played a significant role in those takes." The lowest temperature at which multiple takes have occurred in Brunswick in 2003 is 57°F (13.9°C).

Recognizing the relationship between water temperature and sea turtle presence and based on work by the NOAA Fisheries' Galveston Laboratory (Renaud et al. 1994, 1995) funded by the COE, NOAA Fisheries wrote in its September 22, 1995 RBO to the Galveston and New Orleans Districts that sea turtles might be taken by hopper dredges "in all ship channels in the northern Gulf when temperatures exceed 12°C," and that "Lacking seasonal water temperature data, NMFS believes takes may occur from April through November northeast of Corpus Christi, Texas." Consequently, Term and Condition No. 3 of the 1995 RBO required that observers be aboard hopper dredges year-round from Corpus Christi southwest to the Mexican border, but "If no turtle take is observed in December, then observer coverage can be terminated during January and February or until water temperatures again reach 12°." It also required that "In channels

400 hp]) have been previously determined by NOAA Fisheries to not adversely affect listed species (March 9, 1999, ESA consultation with COE Wilmington District, incorporated herein by reference). The aforementioned vessels and commercial hopper and sidecast dredges of the same or lesser sizes and operating characteristics working in the Gulf of Mexico would be considered similarly exempt by NOAA Fisheries' SERO after consultation with SERO.

northeast of Corpus Christi (except for MR-SWP), observers shall be aboard whenever surface water temperatures are 12°C or greater, and/or between April 1 and November 30."

NOAA Fisheries published a final rule (67 FR 71895, December 3, 2002) effective January 2, 2003, to reduce the impact of large-mesh gillnet fisheries on the Atlantic Coast on sea turtles. This rule was directed primarily at the monkfish fishery, which uses large-mesh gillnet gear and operates in the area when sea turtles are present. The rule reduces impacts on endangered and threatened species of sea turtles by closing portions of the Mid-Atlantic Exclusive Economic Zone (EEZ) waters to fishing with gillnets with a mesh size larger than 8-inch (20.3-cm) stretched mesh. The timing of the restrictions was based upon an analysis of sea surface temperatures for the above areas. Sea turtles are known to migrate into and through these waters when the sea surface temperature is 11°C or greater (Epperly and Braun-McNeill 2002). The January 15 date for the re-opening of the areas north of Oregon Inlet, North Carolina to the large-mesh gillnet fisheries was also based upon the 11°C threshold and is consistent with the seasonal boundary established for the summer flounder fishery-sea turtle protection area (50 CFR 223.206(d)(2) (iii)(A)). In summary, NOAA Fisheries believes that the 11°C threshold established to protect East Coast sea turtles is reasonable and prudent to protect sea turtles in the Gulf of Mexico from hopper dredging operations.

Temperature- and date-based dredging windows appear to have been very effective in reducing sea turtle entrainments. Observer requirements and monitoring including assessment and relocation trawling have provided valuable real-time estimates of sea turtle abundance, takes, and distribution which have been helpful to COE project planning efforts. Evidence that the windows and observer requirements are effective and valuable is that neither the Galveston or New Orleans District's hopper dredging projects have exceeded their anticipated incidental takes since their combined RBO was issued in 1995; SAD has not exceeded its anticipated incidental take since its RBO was amended in 1997.

NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many projects; however, screening is only partially effective and observed, documented takes provide only partial estimates of total sea turtle and Gulf sturgeon mortality. NOAA Fisheries believes that some listed species taken by hopper dredges go undetected because body parts are forced through the sampling screens by the water pressure and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed. The only mortalities that are documented are those where body parts either float, are large enough to be caught in the screens, and can be identified as from sea turtle or sturgeon species. However, this Opinion estimates that with 4-inch inflow screening in place, the observers probably detect and record at least 50% of total mortality.

Relocation trawling has proved to be a useful conservation tool in most dredging projects where it has been implemented. The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries (Amendment No. 1, June 13, 2002) to change the Conservation Recommendation to a Term and Condition of the RBO. Overall, it is NOAA Fisheries' opinion that the COE Districts choosing to implement relocation trawling have benefitted from their decisions. For example, in the Galveston District, Freeport Harbor Project (July 13-September 24, 2002), assessment and relocation trawling resulted in one loggerhead capture. In Sabine Pass (Sabine-Neches Waterway), assessment and relocation trawling in July-August 2002 resulted in five loggerhead and three Kemp's ridley captures. One turtle was killed by the dredge; this occurred while the relocation trawler was in port repairing its trawl net (P. Bargo, pers. comm. 2002). In the Jacksonville District, sea turtles have been relocated out of the path of hoppers dredges operating in Tampa Bay and Charlotte Harbor or their entrance channels. During St. Petersburg Harbor and

Entrance Channel dredging in the fall of 2000, a pre-dredging risk assessment trawl survey resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. In February 2002 during the Jacksonville District's Canaveral Channel emergency hopper dredging project for the Navy, two trawlers working around the clock captured and relocated 69 loggerhead and green turtles in seven days, and no turtles were entrained by the hopper dredge. In the Wilmington District's Bogue Banks Project in North Carolina, two trawlers successfully relocated five turtles in 15 days between March 13 and 27, 2003; one turtle was taken by the dredge. Most recently, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released (with three recaptures) in three months of dredging and relocation trawling. Five turtles were killed by the dredge. No turtles were killed after relocation trawling was increased from 12 to 24 hours per day (Trish Bargo, October 27, 2003, pers. comm. to Eric Hawk).

This Opinion authorizes the per-fiscal-year non-lethal non-injurious take (minor skin abrasions resulting from trawl capture are considered non-injurious), external flipper-tagging, and taking of tissue samples of 300 sea turtles and eight Gulf sturgeon in association with all relocation trawling conducted by the COE throughout the Gulf of Mexico. This take shall not be broken down by District but rather is a Gulf-wide take limit. This take is limited to relocation trawling conducted during the 0-3 days immediately preceding the start of hopper dredging (as a means to determine/reduce the initial abundance of sea turtles in the area and determine if additional trawling efforts are needed), and during actual hopper dredging. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this Opinion.

NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico. Lethal or injurious takes which result from relocation trawling (including capturing, handling, weighing, measuring, tagging, holding, and releasing) are limited to one sea turtle and one Gulf sturgeon per District per fiscal year and will be subtracted from (counted against) the authorized, anticipated take levels discussed previously for hopper dredging. For example: a Kemp's ridley injury or lethal take during a COE District's relocation trawling effort shall be counted as a documented take against that District's fiscal year anticipated take level for that species. NOAA Fisheries shall be immediately notified of any mortalities or injuries sustained by protected species during relocation/assessment trawling.

Deflector Dragheads
V-shaped, sea turtle deflector dragheads prevent an unquantifiable yet significant number of sea turtles from being entrained and killed in hopper dredges each year. Without them, turtle takes during hopper dredging operations would unquestionably be higher. Draghead tests conducted in May-June 1993 by the COE's WES in clear water conditions on the sea floor off Fort Pierce, Florida, with 300 mock turtles placed in rows, showed convincingly that the newly-developed WES deflector draghead "performed exceedingly well at deflecting the mock turtles." Thirty-seven of 39 mock turtles encountered were deflected, two turtles were not deflected, and none were damaged. Also, "the deflector draghead provided better production rates than the unmodified California draghead, and the deflector draghead was easier to operate and maneuver than the unmodified California flat-front draghead." The V-shape reduced forces encountered by the draghead, and resulted in smoother operation (WES, Sea Turtle Project Progress Report, June 1993)." V-shaped deflecting dragheads are now a widely accepted conservation tool, the dredging industry is familiar with them and their operation, and they are used by all COE Districts conducting hopper dredge operations where turtles may be present, with the exception of the Mobile District.

In Gulf of Mexico coastal waters, evidence indicates that turtles are present year-round, further arguing for year-round deflector draghead use by all COE Districts of the Gulf of Mexico. Recent comprehensive NOAA Fisheries' Southeast Fishery Science Center (SEFSC) review and analyses (unpublished data, December 2002: Environmental Assessment/Regulatory Impact Review of Technical Changes to the Turtle Excluder Device (TED) Regulations to Enhance Turtle Protection in the Southeastern United States) of seasonal sea turtle distribution and strandings throughout the Gulf of Mexico (including coastal waters dredged by the Mobile District) noted that "Aerial surveys and observer data have indicated the presence of turtles in areas where strandings data are sparse" and "Turtles were in all areas at all times." (September 13, 2002, e-mail, Epperly to Hawk). NOAA Fisheries' SEFSC's sea turtle team leader Epperly also recommended against hopper dredges operating in those same areas "without monitoring, relocation, and specialized gear (i.e., deflectors) on the dragheads."

It wasn't until late-summer 2002 that the Mobile District started requiring observers and screening on its hopper dredges. REMSA recently completed ten days of 24-hr relocation trawling/dredged material monitoring for the Mobile District during ten days of emergency maintenance hopper dredging of the Mobile Bay ship channel (July 10-20, 2003). No sea turtle specimens or parts of specimens were observed during the ten days by either the relocation trawler observers or the shipboard dredge observers. Dredging is currently conducted in the Mobile District with onboard observers and 4-inch inflow screening but without deflector dragheads (Ladner, pers. comm. to Hawk, November 26, 2002). Mobile District, in written comments dated October 30, 2002, on a draft version of the present Opinion, noted that "The District recognizes the benefits of deflector dragheads to conservation of the species in areas where sea turtle takes occur. However, dragheads reduce dredging efficiency and result in dredges being onsite for a longer period of time. Consequently, the District finds no overriding need to utilize deflectors until it is proven, through use of screens and observers, that the Mobile District actually takes sea turtles during normal operations."

Habitat Protection Buffers

COE Jacksonville District biologists expressed concern (Yvonne Haberer, email to Eric Hawk, April 2003; Terri Jordan, pers. comm. August 11, 2003) over a NOAA Fisheries' draft version of the current Opinion proposed requirement of a 200-m buffer zone around hardgrounds in the vicinity of COE-proposed sand mining areas off Florida. In discussions over the Pinellas County Shore Protection Project, the COE noted that NOAA Fisheries has previously required only a 200-ft zone around hardgrounds adjacent to COE sand mining operations in the Gulf of Mexico. NOAA Fisheries' Protected Resources Division consulted with NOAA Fisheries Habitat Conservation Division, which stated that as a general rule, buffer zones should not be less than 400 feet to protect essential fish habitat. In its response to the COE, which included a request for additional information (Eric Hawk email to Yvonne Haberer, May 14, 2003) which was never received, NOAA Fisheries' Protected Resources Division concluded that a 200-ft buffer was inadequate and that a 200-meter buffer zone was appropriate to protect sea turtles which may be foraging on or around hardgrounds adjacent to mining sites from hopper dredge entrainment. NOAA Fisheries noted that hopper dredge vessels are large (typically 300-400 ft long); limited in their ability to maneuver; and given other variable factors such as wind, tide, weather, sea state, currents, operator fatigue, operator error, and instrument error, a 200-ft margin of safety around hardgrounds was inadequate to protect NOAA Fisheries trust resources and sea turtles which could be expected to frequent hardgrounds and their vicinity. Subsequently, however, conversations with hopper dredge industry officials and dredge operators have led NOAA Fisheries to conclude that based on advances in hopper dredge construction, including the use of highly maneuverable Z-drives (on some dredges), enhanced station-keeping ability, and industry-standard navigation practices and technologies including routine use of differential global positioning systems (DGPS), dredge operators will be able to routinely and safely maintain desired safe distances from hardgrounds that are marked on their charts (E. Hawk, August 14 and 18, 2003, pers. comms. with R. Richardson, Manson Dredging; Mark Sickles, Dredge Contractors of America; and W. Murcheson, NATCO Dredging). NOAA Fisheries has determined that 400 feet is an adequate, reasonable buffer zone that should be maintained around hardgrounds, to protect endangered living resources–i.e., sea turtles that may be foraging in their vicinity. Four hundred feet also provides the additional benefit of protecting hardgrounds from some of the probable adverse effects of sedimentation from the dredged material plume. For example, a generic test case numerical model simulation of a typical situation representative of hopper dredging of MMS shoals using the Trailing Suction Hopper Dredge Plume Model developed by Baird, Inc., for MMS, using inputted variables of a cross current of 20 cm/s, fine sand, two million cubic meter project, and a water depth of about 15 to 20 m, gave a sedimentation footprint of 200 m beyond the boundary of the dredge area (Rob Nairn, October 3, 2003, pers. comm. to Eric Hawk).

Summary

NOAA Fisheries has carefully reviewed and fully considered these and all other comments received from the affected COE Districts; however, in summary, after review of WES studies, SEFSC survey data, and based on past experience, NOAA Fisheries believes that seasonal dredging windows, deflector dragheads, observer and screening requirements, and relocation trawling have proved convincingly over the last decade to be an excellent combination of reasonable and prudent measures for minimizing the number and impact of sea turtle takes, enabling NOAA Fisheries to assess the quantity of turtles being taken, and allowing the affected COE Districts (Wilmington, Charleston, Savannah, Jacksonville, New Orleans, and Galveston) to meet their essential dredging requirements to keep Federal navigation channels open.

There are increased costs associated with observers and relocation trawling (current estimates are $3,500-$5,000/day for 24 hours of relocation trawling, $150-$200/day for a hopper dredge endangered species observer); delays sometimes occur, particularly when two turtles are taken in 24 hours, or when clay-like materials clog the inflow screening boxes; and dredging projects may take longer to complete. However, overall, NOAA Fisheries believes that loss of production associated with the deflector draghead is insignificant, while saving significant numbers of sea turtles from almost-certain death by dismemberment in suction dragheads; increased production costs, including costs of observers and relocation trawlers, pale in comparison to overall project costs; and NOAA Fisheries' experience over the past decade with the COE's SAD Districts and the Gulf of Mexico's Galveston and New Orleans Districts has shown that Federal hopper dredging projects get completed in a timely fashion. Also, allowable overdredging by the COE reduces to some degree the need for frequent maintenance dredging, and the conservation measures required by the biological opinions in place result in significantly reduced dredge interactions with sea turtles–interactions which usually prove fatal.

NOAA Fisheries considers that PIT tagging, external flipper tagging, and tissue sampling of turtles captured pursuant to relocation trawling, including genetic analysis of tissue samples taken from dredge- and trawl-captured turtles, will provide benefits to the species by providing data which will enable NOAA Fisheries to make determinations on what sea turtle stocks are being impacted, and how that may change over time as the population growth rates change among the different stocks (Sheryan Epperly, pers. comm. to Eric Hawk).

NOAA Fisheries estimates that 150-300 sea turtle tissue samples will be taken annually in the Gulf of Mexico during COE dredging and relocation trawling operations. Depending on the species, a few years of collection will provide sufficient sample size to assess stock composition (Peter Dutton, pers. comm. to Eric Hawk). Samples will continue to be collected and archived, until a follow-up analysis can be done two to three years after that if it is deemed necessary. NOAA Fisheries estimates that genetic analysis of tissue samples, including labor, costs about $100-150 per sample (Peter Dutton, pers. comm. to Eric Hawk); thus, the cost of analysis of 300 samples will be between $30,000 and $45,000. NOAA Fisheries believes that, minimally, the combined COE Gulf of Mexico Districts affected by this Opinion should provide $10,000 to help defray the cost of analysis of the first 300 samples taken. COE funds should be provided to NOAA

Fisheries' Southwest Fisheries Center's Dr. Peter Dutton, preferably in a lump-sum, one-time payment as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts (similar to the current MOU nearing completion between the COE's South Atlantic Division and the Southwest Fisheries Science Center for hopper dredging/relocation trawling conducted by the South Atlantic Divisions four Atlantic Districts). After the initial financial contribution by the COE, NOAA Fisheries would continue to archive and store samples gathered by the COE but the COE's responsibility would be limited to taking the samples and shipping them to NOAA Fisheries' Southwest Fisheries Science Center. Incorporation of this funding requirement as a reasonable and prudent measure of this Opinion will result in the gathering of knowledge that is expected to reduce the effect of the takes from Gulf of Mexico dredging projects.

The dredging windows set forth in the terms and conditions of the 1995 Gulf of Mexico hopper dredging RBO, while very strongly encouraged by NOAA Fisheries for previously stated reasons, were ultimately discretionary activities by the COE and could be deviated from by the SAD or the Galveston or New Orleans Districts when they deemed essential or necessary after consultation with NOAA Fisheries, though this was infrequent. This flexibility is also stipulated in the Proposed Action section of the present Opinion which applies to all four COE Districts. Terms and conditions of the present Opinion remain largely the same, with the following significant exceptions:

1) The allowable window for hopper dredging has been extended to include the Mobile and Jacksonville Districts so that the December-March window is now Gulf-wide, from the Texas-Mexico border to Key West channels;

2) Previous temperature requirements of Term and Condition No. 3 of the 1995 RBO (i.e., "If no turtle take is observed during December, observer coverage can be terminated during January and February or until water temperatures again reach 12°C; In channels northeast of Corpus Christi, Texas [except for Southwest Pass as discussed below], observers shall be aboard whenever surface water temperatures are 12° or greater, and/or between April 1 and November 30.") have been modified downward to 11°C based on new sea turtle distribution information which indicates that sea turtles are more tolerant of cold than was previously thought. The discussion of temperature/sea turtle distribution supporting this change is incorporated herein by reference to the Monkfish Biological Opinion (dated April 14, 2003, prepared by NOAA Fisheries Northeast Region).

3) The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries SER (Amendment No. 1, June 13, 2002), to change the Conservation Recommendation to a Term and Condition of the RBO. Term and Condition No. 10 of the amended RBO specified conditions under which relocation trawling "should be considered" and subject to what precautions it should be carried out, and authorized unlimited non-lethal, non-injurious take of sea turtles and Gulf sturgeon in association with relocation trawling deemed necessary the by COE. This amount of discretion has since been determined to be inappropriate for a non-discretionary term and condition of an ITS. Thus, the present Opinion's requirement for relocation trawling is more non-discretionary than as written in Amendment No. 1 in that it <u>requires</u> the use of relocation trawlers under specific conditions as a way to minimize turtle interactions, rather than only requiring that it be "considered" by the COE.

4) In the present Opinion, the COE Districts are authorized to request waivers from the relocation trawling requirement (which may be delivered and responded to by both agencies via electronic mail) for projects where the COE Districts do not feel relocation trawling is feasible, necessary or warranted.

5) The Districts are required to fund the cost of tissue sampling and genetic analyses of tissue samples from turtles taken during projects in their respective Districts.

The following terms and conditions implement the reasonable and prudent measures discussed above:

Terms and Conditions

Hopper Dredging: Hopper dredging activities in Gulf of Mexico waters from the Mexico-Texas border to Key West, Florida up to one mile into rivers shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters. Hopper dredging of Key West channels is covered by the existing August 25, 1995, RBO to the COE's SAD. The COE shall discuss with NOAA Fisheries why a particular project cannot be done within the December 1-March 31 "window."

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (#9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NOAA Fisheries-approved observers to be aboard the hopper dredges to monitor the hopper spoil, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

   a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

   b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

   c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NOAA Fisheries-approved observers are *not* required, (as delineated in #4 above), the appropriate COE District must:

a. Advise inspectors, operators and vessel captains about the prohibitions on taking, harming, or harassing sea turtles

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the COE if sea turtles or whales are seen in the vicinity.

c. Notify NOAA Fisheries if sea turtles are observed in the dredging area, to coordinate further precautions to avoid impacts to turtles.

d. Notify NOAA Fisheries immediately by phone (727/570-5312) or fax (727/570-5517) if a sea turtle or Gulf sturgeon is taken by the dredge.

6. *Screening*: When sea turtle observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100% overflow screening is then required. NOAA Fisheries must be consulted <u>prior</u> to the reductions in screening and an explanation must be included in the dredging report.

a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the COE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case <u>effective</u> 100% overflow screening is mandatory. The COE shall notify NOAA Fisheries <u>beforehand</u> if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

b. Need for Flexible, Graduated Screens: NOAA Fisheries believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7 *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed to NOAA Fisheries' Southeast Regional Office (727-570-5517) by onboard endangered species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

An annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle Strandings*: The COE Project Manager or designated representative shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle/sturgeon strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

Information on any such strandings shall be reported in writing within 30 days of project end to NOAA Fisheries' Southeast Regional Office. Because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not normally be counted against the COE's take limit; however, if compelling STSSN observer reports and evidence indicate that a turtle was killed by a hopper dredge or a bed-leveling type dredge, that take will be deducted from the ITS' anticipated take level for that COE District where the take occurred.

11 *Reporting - Strandings*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition # 9, above.

Conditions Requiring Relocation Trawling: Handling of sea turtles captured during relocation trawling in association with hopper dredging projects in Gulf of Mexico navigation channels and sand mining areas shall be conducted by NOAA Fisheries-approved endangered species observers. Relocation trawling shall be undertaken by the COE at all projects where <u>any</u> of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

a. Two or more turtles are taken in a 24-hour period in the project.

b. Four or more turtles are taken in the project.

c. 75% of a District's sea turtle species quota for a particular species has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to NOAA Fisheries a waiver of part or all of the relocation trawling requirements. NOAA Fisheries will consider these requests and decide favorably if the evidence is compelling.

15. *Relocation Trawling - Annual Take Limits*: This Opinion authorizes the annual (by fiscal year) take of 300 sea turtles (of one species or combination of species) and eight Gulf sturgeon by duly-permitted, NOAA Fisheries-approved observers in association with all relocation trawling conducted or contracted by the four Gulf of Mexico COE Districts to temporarily reduce or assess the abundance of these listed species during (and in the 0-3 days immediately preceding) a hopper dredging project in order to reduce the possibility of lethal hopper dredge interactions, subject to the following conditions:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *Handling During Trawling*: Sea turtles and sturgeon captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix IV).

c. *Captured Turtle Holding Conditions*: Captured turtles shall be kept moist, and shaded whenever possible, until they are released.

d. *Weight and Size Measurements*: All turtles shall be measured (standard carapace measurements including body depth) and tagged, and weighed when safely possible, prior to release; Gulf sturgeon shall be measured (fork length and total length) and–when safely possible–tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NOAA Fisheries-approved observers or observer candidates in training under the direct supervision of a NOAA Fisheries-approved observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

e. *Take and Release Time During Trawling - Turtles*: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than three nautical miles (nmi) from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than five nmi away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. *Take and Release Time During Trawling - Gulf Sturgeon*: Gulf sturgeon shall be released immediately after capture, away from the dredge site or into already dredged areas, unless the trawl vessel is equipped with a suitable (not less than: 2 ft high by 2 ft wide by 8 ft long), well-aerated seawater holding tank where a maximum of one sturgeon may be held for not longer than 30 minutes before it must be released or relocated away from the dredge site.

g. *Injuries and Incidental Take Quota*: Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the appropriate COE District's incidental take quota. Minor skin abrasions resulting from trawl capture are considered non-injurious. Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility.

h. *Flipper Tagging*: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

i. *Gulf Sturgeon Tagging*: Tagging of live-captured Gulf sturgeon may also be done under the permitting authority of this Opinion; however, it may be done only by personnel with prior fish tagging experience or training, and is limited to external tagging only, unless the observer holds a valid sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing sampling, either as the permit holder, or as designated agent of the permit holder.

j. *PIT-Tag Scanning*: All sea turtles captured by relocation trawling (or dredges) shall be thoroughly scanned for the presence of PIT tags prior to release using a scanner powerful enough to read dual frequencies (125 and 134 kHz) and read tags deeply embedded deep in muscle tissue (e.g., manufactured by Biomark or Avid). Turtles which scans show have been previously PIT tagged shall never-the-less be externally flipper tagged. The data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov.

k. *CMTTP:* External flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

l. *Tissue Sampling*: All live or dead sea turtles captured by relocation trawling or dredging shall be tissue-sampled prior to release, according to the protocols described in Appendix II or Appendix III of this Opinion. Tissue samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observers aboard relocation trawlers or hopper dredges to tissue-sample live- or dead-captured sea turtles, without the need for a section 10 permit.

m. *Cost Sharing of Genetic Analysis*: The COE's Gulf of Mexico Districts shall combine to provide a one-time payment of $10,000 to NOAA Fisheries to share the cost of NOAA-Fisheries analysis of 300 tissue samples taken during COE hopper dredging/trawling operations in the Gulf of Mexico. This cost is currently estimated by NOAA Fisheries to be about $100-150 per sample, or $30,000-$45,000. COE funds shall be provided to NOAA Fisheries' Southwest Fisheries Center's Dr. Peter Dutton as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts and Divisions within six months of the issuance of this Opinion.

n. *PIT Tagging:* PIT tagging is not required or authorized for, and shall not be conducted by, ESOs who do not have 1) section 10 permits authorizing said activity and 2) prior training or experience in said activity; however, if the ESO has received prior training in PIT tagging procedures and is also authorized to conduct said activity by a section 10 permit, then the ESO **must** PIT tag the animal prior to release (in addition to the standard external flipper tagging). PIT tagging must then be performed in accordance with the protocol detailed at NOAA Fisheries' Southeast Science Center's webpage: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEC's "Fisheries Observers" webpage). PIT tags used must be sterile, individually wrapped tags to prevent disease transmission. PIT tags should be 125 kHz, glass-encapsulated tags - the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then **do not** insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400 mHz tag), then insert one in the other shoulder.

o. *Other Sampling Procedures*: All other tagging and external or internal sampling procedures (e.g., PIT tagging, blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles or live sturgeon are **not permitted under this Opinion unless** the observer holds a valid sea turtle or sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing the activity, either as the permit holder, or as designated agent of the permit holder.

p. *Handling Fibropapillomatose Turtles*: Observers handling sea turtles infected with fibropapilloma tumors shall either: 1) clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with mild bleach solution, between the processing of each turtle or 2) maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions. Tissue/tumor samples shall be sent within 60 days of capture to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov. This Opinion serves as the permitting authority for all NOAA Fisheries-approved endangered species observers aboard a relocation trawler or hopper dredge to tissue-sample fibropapilloma-infected sea turtles without the need for a section 10 permit.

16. *Hardground Buffer Zones*: All dredging in sand mining areas will be designed to ensure that dredging will not occur within a minimum of 400 feet from any significant hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NOAA Fisheries considers (for the purposes of this Opinion only) a significant hardground in a project area to be one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet or greater, and has algae growing on it. The COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE is uncertain as to what constitutes significance, it shall consult with NOAA

Fisheries' Habitat Conservation Division and NOAA Fisheries' Protected Resources Division for clarification and guidance.

17. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of each hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, COE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

18. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within three nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

Channel Conditions and Seasonal Abundance Studies: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NOAA Fisheries) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and WES to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NOAA Fisheries should be consulted regarding the development of a protocol for draghead evaluation tests. NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

   Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NOAA Fisheries considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

   Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits and Relocation Trawling*: NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NOAA Fisheries for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process.

6. *Draghead Improvements - Water Ports*: NOAA Fisheries recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the

vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

NOAA Fisheries supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop 'turtle friendly' dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms, etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NOAA Fisheries recommends water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE's Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NOAA Fisheries recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance Channel, and shall report to NOAA Fisheries biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this Opinion, the COE's Gulf of Mexico Districts, in coordination with COE's SAD, shall develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NOAA Fisheries' Protected Resources Division.

    Sodium Vapor Lights on Offshore Equipment: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the amount or extent of taking specified in the incidental take statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or

12.0 Appendices

Appendix I.

Summary of Takes by Hopper Dredges in the COE Galveston District Since the 1995 RBO.

TABLE 1

MAINTENANCE DREDGING TURTLE TAKES BY FISCAL YEAR

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Fiscal Year 1995				
Feb 19, 1995			1	
Feb 22, 1995			1	
Feb 26, 1995	1			
Aug 5, 1995	1			
Aug 31, 1995	1			
Sep 4, 1995	1			
Sep 16, 1995		1		
TOTAL FY 95	4	1	2	0
Fiscal Year 1996				
Oct 9, 1995		1		
Jun 28, 1996		1		
Jul 11, 1996		1		
Jul 13, 1996		1		
Jul 22, 1996		1		
TOTAL FY 96	0	5	0	0
Fiscal Year 1997				
Oct 13, 1996		1		
Mar 26, 1997	1			
Apr 29, 1997	1			
Jun 13, 1997		1		
TOTAL FY 97	2	2	0	0
Fiscal Year 1998				
TOTAL FY 98	0	0	0	0

Fiscal Year 1999				
Oct 29, 1998		1		
Feb 18, 1999			1	
Mar 2, 1999			1	
Jun 18, 1999		1		
Jun 19, 1999		1		
Jun 30, 1999		1		
TOTAL FY 99	0	4	2	0
Fiscal Year 2000				
Aug 10, 2000		1		
Aug 15, 2000		1		
TOTAL FY 00	0	2	0	0
Fiscal Year 2001				
TOTAL FY 01	0	0	0	0
Fiscal Year 2002				
Mar 18, 2002			1	
Mar 19, 2002			2	
Mar 20, 2002			1	
Aug 11, 2002		1		
TOTAL FY 02	0	1	4	0
TOTAL	6	15	8	0

TABLE 2

NEW-WORK DREDGING TURTLE TAKES BY FISCAL YEAR

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Fiscal Year 1999				
Jan 4, 1999	1			

TABLE 2

NEW-WORK DREDGING TURTLE TAKES BY FISCAL YEAR

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Sep 29, 1999			1	
TOTAL FY 99	1	0	1	0
Fiscal Year 2000				
TOTAL FY 00	0	0	0	0
TOTAL	1	0	1	0

TABLE 3

TURTLE TAKES BY PROJECT

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Brazos Island Harbor				
Feb 19, 1995			1	
Feb 22, 1995			1	
Feb 26, 1995	1			
Apr 29, 1997	1			
Jun 13, 1997		1		
Feb 18, 1999			1	
Mar 2, 1999			1	
Mar 18, 2002			1	
Mar 19, 2002			1	
TOTAL	2	1	6	0
Corpus Christi Ship Channel				
Sep 16, 1995		1		
Jun 18, 1999		1		
Jun 19, 1999		1		
Jun 30, 1999		1		
TOTAL	0	4	0	0

TABLE 3

TURTLE TAKES BY PROJECT

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Freeport Harbor				
Oct 9, 1995		1		
Jun 28, 1996		1		
Jul 11, 1996		1		
Jul 13, 1996		1		
Jul 22, 1996		1		
Oct 29, 1998		1		
Aug 10, 2000		1		
Aug 15, 2000		1		
TOTAL	0	8	0	0
Galveston Harbor and Channel /Houston-Galveston Navigation Channels				
Aug 15, 1995	1			
Aug 31, 1995	1			
Sep 4, 1995	1			
Jan 4, 1999	1			
Sep 29, 1999			1	
TOTAL	4	0	1	0
Matagorda Ship Channel				
Oct 13, 1996		1		
TOTAL	0	1	0	0
Sabine – Neches Waterway				
Mar 26, 1997	1			
Aug 11, 2002		1		
TOTAL	1	1	0	0
Port Mansfield Channel				

TABLE 3

TURTLE TAKES BY PROJECT

Date Taken	Kemp's ridley	Loggerhead	Green	Hawksbill
Mar 19, 2002			1	
Mar 20, 2002			1	
TOTAL	0	0	2	0

Appendix II:

PROTOCOL FOR COLLECTING TISSUE FROM DEAD TURTLES FOR GENETIC ANALYSIS

Method for Dead Turtles

<<<IT IS CRITICAL TO USE A NEW SCALPEL BLADE AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES>>>

1. Put on a new pair of latex gloves.
2. Use a new disposable scalpel to cut out an approx. 1 cm (½ in) cube (bigger is NOT better) piece of muscle. Easy access to muscle tissue is in the neck region or on the ventral side where the front flippers "insert" near the plastron. It does not matter what stage of decomposition the carcass is in.
3. Place the muscle sample on a hard uncontaminated surface (plastron will do) and make slices through the sample so the buffer solution will penetrate the tissue.
4. Put the sample into the plastic vial containing saturated NaCl with 20% DMSO *(SEE BELOW)
5. Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read "JMD20010715-01, C. mydas, Georgia, CCL=35.8 cm". If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
6. Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
7. Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
8. Wrap parafilm around the cap of the vial by stretching it as you wrap.
9. Place vial within whirlpak and close.
10. Dispose of the scalpel.
11. Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
12. Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

*The 20% DMSO buffer in the plastic vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath odor. The protocol requires that you WEAR gloves each time you collect a sample and handle the buffer vials.

The vials (both before and after samples are taken) should be stored at room temperature or cooler. If you don't mind the vials in the refrigerator, this will prolong the life of the sample. DO NOT store the vials where they will experience extreme heat (like in your car!) as this could cause the buffer to break down and not preserve the sample properly.

Questions:

Sea Turtle Program
NOAA/NMFS/SEFSC
75 Virginia Beach Drive
Miami, FL 33149
305-361-4207

THANK YOU FOR COLLECTING SAMPLES FOR SEA TURTLE GENETIC RESEARCH!!

Genetic Sample Kit Materials – DEAD turtles

- latex gloves
- single-use scalpel blades (Fisher Scientific 1-800-766-7000, cat. # 08-927-5A)
- plastic screw-cap vial containing saturated NaCl with 20% DMSO, wrapped in parafilm
- waterproof paper label, ¼" x 4"
- pencil to write on waterproof paper label
- permanent marker to label the plastic vials
- scotch tape to protect writing on the vials
- piece of parafilm to wrap the cap of the vial
- whirl-pak to return/store sample vial

Appendix III:

PROTOCOL FOR COLLECTING TISSUE FROM LIVE TURTLES FOR GENETIC ANALYSIS

Method for Live Turtles

<<<IT IS CRITICAL TO USE A NEW BIOPSY PUNCH AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES>>>

1. Turn the turtle over on its back.
2. Put on a new pair of latex gloves.
3. Swab the entire cap of the sample vial with alcohol.
4. Wipe the ventral and dorsal surfaces of the rear flipper 5-10 cm from the posterior edge with the Betadine/iodine swab.
5. Place the vial under the flipper edge to use the cleaned cap as a hard surface for the punch.
6. Press a new biopsy punch firmly into the flesh as close to the posterior edge as possible and rotate one complete turn. Cut all the way through the flipper to the cap of the vial.
7. Wipe the punched area with Betadine/iodine swab; rarely you may need to apply pressure to stop bleeding.
8. Use a wooden skewer to transfer the sample from the biopsy punch into the plastic vial containing saturated NaCl with 20% DMSO *(SEE BELOW)
9. Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read "JMD20010715-01, C. mydas, Georgia, CCL=35.8 cm". If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
10. Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
11. Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
12. Wrap parafilm around the cap of the vial by stretching it as you wrap.
13. Place vial within whirlpak and close.
14. Dispose of the biopsy punch.
15. Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
16. Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

*The 20% DMSO buffer in the plastic vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath odor. The protocol requires that you WEAR gloves each time you collect a sample and handle the buffer vials.

The vials (both before and after samples are taken) should be stored at room temperature or cooler. If you don't mind the vials in the refrigerator, this will prolong the life of the sample. DO NOT store the vials where they will experience extreme heat (like in your car!) as this could cause the buffer to break down and not preserve the sample properly.

Questions:

Sea Turtle Program
NOAA/NMFS/SEFSC
75 Virginia Beach Drive
Miami, FL 33149
305-361-4207

THANK YOU FOR COLLECTING SAMPLES FOR SEA TURTLE GENETIC RESEARCH!!

Genetic Sample Kit Materials – LIVE turtles

- latex gloves
  alcohol swabs
  Betadine/iodine swabs
  4-6 mm biopsy punch – sterile, disposable (Moore Medical Supply 1-800-678-8678, part #0052442)
  plastic screw-cap vial containing saturated NaCl with 20% DMSO, wrapped in parafilm
  wooden skewer
  waterproof paper label, ¼" x 4"
- pencil to write on waterproof paper label
  permanent marker to label the plastic vials
  scotch tape to protect writing on the vials
  piece if parafilm to wrap the cap of the vial
  whirl-pak to return/store sample vial

Appendix IV: SEA TURTLE HANDLING AND RESUSCITATION GUIDELINES

Any sea turtles taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

A) Sea turtles that are actively moving or determined to be dead (as described in paragraph (B)(4) below) must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

B) Resuscitation must be attempted on sea turtles that are comatose or inactive by:

1. Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 to 24 hours. The amount of elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

2. Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

3. Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

4. A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise, the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

Any sea turtle so taken must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

These guidelines are adapted from 50 CFR § 223.206(d)(1). Failure to follow these procedures is therefore a punishable offense under the Endangered Species Act.

13. 0 BIBLIOGRAPHY

1. Literature Cited - Turtle Species Accounts
2. Literature Cited - Gulf Sturgeon Species Account
3. General References and Other Literature Cited

1. Literature Cited - Turtle Species Accounts

Audubon, J.J. 1926. The Turtlers. Pp. 194-202 In: Delineations of American Scenery and Character, G.A Baker and Co., N.Y.

Balazs, G.H. 1982. Growth rates of immature green turtles in the Hawaiian Archipelago, p. 117 - 125. *In* K.A. Bjorndal (ed.), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Balazs, G.H. 1983. Recovery records of adult green turtles observed or originally tagged at French Frigate Shoals, northwestern Hawaiian Islands. NOAA Tech. Memo. NMFS-SWFC-36.

Balazs, G.H. 1999. Factors to consider in the tagging of sea turtles. In: Research and Management Techniques for the Conservation of Sea Turtles, by K.L. Eckert, K.A. Bjorndal, F.A. Abreu-Grobois, and M. Donnelly (editors). IUCN/SSC Marine Turtle Specialist Group Publication No. 4, 1999.

Bass, A.L., S.P. Epperly, J. Braun, D.W. Owens, and R.M. Patterson. 1998. Natal origin and sex ratios of foraging sea turtles in the Pamlico-Albemarle Estuarine Complex. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415: 137-138.

Bjorndal, K.A., J.A. Wetherall, A.B. Bolten, and J.A. Mortimer. 1999. Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: an encouraging trend. Conservation Biology 13: 126-134.

Brongersma, L. 1972. European Atlantic Turtles. Zool. Verhand. Leiden, 121: 318 pp.

Caldwell, D.K. and A. Carr. 1957. Status of the sea turtle fishery in Florida. Transactions of the 22nd North American Wildlife Conference, 457-463.

Carr, A.F., M.H. Carr, and A.B. Meylan. 1978. The ecology and migrations of sea turtles, 7. The west Caribbean green turtle colony. Bulletin of the American Museum of Natural History 162: 1-46.

Carr, A. 1984. So Excellent a Fishe. Charles Scribner's Sons, N.Y

Díez, C.E. 2000. Personal communication to Blair Witherington, FMRI.

Dodd, C.K. 1981. Nesting of the green turtle, *Chelonia mydas* (L.), in Florida: historic review and present trends. Brimleyana 7: 39-54.

Dodd, C.K. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish and Wildlife Service, Biological Report 88 (14).

Doughty, R.W. 1984. Sea turtles in Texas: a forgotten commerce. Southwestern Historical Quarterly 88: 43-70.

Dutton, P.H., B.W. Bowen, D.W. Owens, A. Barragán, and S.K. Davis. 1999. Global phylogeography of the leatherback turtles (*Dermochelys coriacea*). J. Zool. Lond 248:397-409.

Eckert, S.A. and K.L. Eckert, P. Ponganis, and G.L. Kooyman. 1989. Diving and foraging behavior of leatherback sea turtles (*Dermochelys coriacea*). Can. J. Zool. 67:2834-2840.

Eckert, K. L. 1995. Hawksbill sea turtle (*Eretmochelys imbricata*). National Marine Fisheries Service and U.S. Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973. Silver Spring, Maryland: National Marine Fisheries Service, pp. 76-108.

Ehrhart, L.M. 1983. Marine turtles of the Indian River Lagoon System. Florida Sci. 46: 337-346.

Ehrhart, L.M. 1989. Status report of the loggerhead turtle. In Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (eds.). Proceedings of the 2nd Western Atlantic Turtle Symposium. NOAA Technical Memorandum NMFS-SEFC-226: 122-139.

Ehrhart, L.M. and B.E. Witherington. 1992. Green turtle. In P. E. Moler (ed.). Rare and Endangered Biota of Florida, Volume III. Amphibians and Reptiles. University Presses of Florida: 90-94.

Epperly, S.P., J. Braun, and A.J. Chester. 1995b. Aerial surveys for sea turtles in North Carolina inshore waters. Fishery Bulletin 93: 254-261.

Ernst, L.H. and R.W. Barbour. 1972. Turtles of the United States. Univ. Kentucky Press, Lexington, Ky.

Florida Marine Research Institute, Florida Dept. of Environmental Protection. 2001. Florida statewide nesting beach survey data. Florida Department of Environmental Protection. Unpublished data.

FPL (Florida Power & Light Co.) St. Lucie Plant. 2000. Annual environmental operating report 1999. Juno Beach, Fla.

Frazer, N.B. and L.M. Ehrhart. 1985. Preliminary growth models for green, *Chelonia mydas*, and loggerhead, *Caretta caretta*, turtles in the wild. Copeia 1985: 73-79.

Frazer, N.B., C.J. Limpus, and J.L. Greene. 1994. Growth and age at maturity of Queensland loggerheads. U.S. Dep. of Commer. NOAA Tech. Mem. NMFS-SEFSC-351:42-45.

Garduño-Andrade, M., Guzmán, V., Miranda, E., Briseno-Duenas, R., and Abreu, A. 1999. Increases in hawksbill turtle (*Eretmochelys imbricata)* nestings in the Yucatán Peninsula, Mexico (1977-1996): data in support of successful conservation? Chelonian Conservation and Biology 3(2):286-295.

Groombridge, B. 1982. The IUCN Amphibia - Reptilia Red Data Book. Part 1. Testudines, Crocodylia, Rhynchocephalia. Int. Union Conserv. Nature and Nat. Res., 426 pp.

Guseman, J.L. and L.M. Ehrhart. 1992. Ecological geography of Western Atlantic loggerheads and green turtles: evidence from remote tag recoveries. In M. Salmon and J. Wyneken (compilers). Proceedings of the 11th Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS. NMFS-SEFC-302: 50.

Henwood, T.A. and L.H. Ogren. 1987. Distribution and migrations of immature Kemp's ridley turtles (*Lepidochelys kempii*) and green turtles (*Chelonia mydas*) off Florida, Georgia, and South Carolina. Northeast Gulf Science, 9(2): 153-160.

Herbst, L.H. 1994. Fibropapillomatosis in marine turtles. Annual Review of Fish Diseases 4: 389-425.

Hildebrand, H. 1963. Hallazgo del area de anidación de la tortuga "lora" *Lepidochelys kempii* (Garman), en la costa occidental del Golfo de México (Rept., Chel.). Ciencia Mex., 22(a): 105-112

Hildebrand, H. 1982. A historical review of the status of sea turtle populations in the Western Gulf of Mexico. In K.A. Bjorndal (ed.). Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C. 447-453.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). Biological Report 97(1), Fish and Wildlife Service, U.S. Dept of the Interior. 120 pp.

Hirth, H. 1980. Some aspects of the nesting behavior and reproductive biology of sea turtles. American Zoologist 20:507-523.

Jacobson, E.R. 1990. An update on green turtle fibropapilloma. Marine Turtle Newsletter 49: 7-8.

Jacobson, E.R., S.B. Simpson, Jr., and J.P. Sundberg. 1991. Fibropapillomas in green turtles. In G.H. Balazs, and S.G. Pooley (eds.). Research Plan for Marine Turtle Fibropapilloma, NOAA-TM-NMFS-SWFSC-156: 99-100.

Johnson, S.A., and L.M. Ehrhart. 1994. Nest-site fidelity of the Florida green turtle. In B.A. Schroeder and B.E. Witherington (compilers). Proceedings of the 13th Annual Symposium on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS-SEFSC-341: 83.

Keinath, J.A. 1993. Movements and behavior of wild and head-started sea turtles. Ph.D. Dissertation. College of William and Mary, Gloucester Point, Va., 206 pp.

Lagueux, C.J. 1998. Demography of marine turtles harvested by Miskito Indians of Atlantic Nicaragua. In R. Byles and Y. Fernández (compilers). Proceedings of the 16th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-412: 90.

Leon, Y.M. and C.E. Diez, 2000. Ecology and population biology of hawksbill turtles at a Caribbean feeding ground. Pp. 32-33 *in* Proceedings of the 18th International Sea Turtle Symposium, Abreu-Grobois, F.A., Briseno-Duenas, R. ,Marquez, R., and Sarti, L., Compilers. NOAA Technical Memorandum NMFS-SEFSC-436.

Lutcavage, M. and J.A. Musick. 1985. Aspects of the biology of sea turtles in Virginia. Copeia 1985(2): 449-456.

MacKay, A.L. and J.L. Rebholz. 1996. Sea turtle activity survey on St. Croix, U.S. Virgin Islands (1992-1994). In J.A. Keinath, D.E. Barnard, J.A. Musick, and B.A. Bell (Compilers). Proceedings of the 15th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Tech. Memo. NMFS-SEFSC-387: 178-181.

Magnuson, J.J., K.A. Bjorndal, W.D. DuPaul, G.L. Graham, D.W. Owens, P.C.H. Pritchard, J.I. Richardson, G.E. Saul, and C.W. West. 1990. Decline of the sea turtles: causes and prevention National Academy Press, Washington, D.C. 274 pp.

Mayor, P., B. Phillips, and Z. Hillis-Starr. 1998. Results of stomach content analysis on the juvenile hawksbill turtles of Buck Island Reef National Monument, U.S.V.I. Pp. 230-232 *in* Proceedings of the 17th Annual Sea Turtle Symposium, S. Epperly and J. Braun, Compilers. NOAA Tech. Memo. NMFS-SEFSC-415.

Meylan, A.B. 1988. Spongivory in hawksbill turtles: a diet of glass. Science 239(393-395).

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea turtle nesting activity in the State of Florida 1979-1992. Florida Marine Research Publications 52: 1-51.

Meylan, A.B., and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata* as critically endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3(2): 200-204.

Meylan, A.B. 1999a. The status of the hawksbill turtle (*Eretmochelys imbricata*) in the Caribbean. Region. Chelonian Conservation and Biology 3(2): 177-184.

Meylan, A.B. 1999b. International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. Chelonian Conservation and Biology 3(2): 189-194.

Meylan, A.B., in prep. The hawksbill turtle (*Eretmochelys imbricata*). *In* Meylan, P. A,. and G. L. Heinrich, eds. The Biology and Conservation of Florida Turtles. Chelonian Research Monographs.

Morreale, S.J. and E.A. Standora. 1999. Vying for the same resources: potential conflict along migratory corridors. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-415: 69.

Murphy, T.M. and S.R. Hopkins. 1984. Aerial and ground surveys of marine turtle nesting beaches in the Southeast Region. Unpublished report prepared for the National Marine Fisheries Service.

Nietschmann, B. 1982. The cultural context of sea turtle subsistence hunting in the Caribbean and problems caused by commercial exploitation. In K.A. Bjorndal (ed.). Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C. 439-445.

NMFS Southeast Fisheries Science Center. 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, Fla., SEFSC Contribution PRD-00/01-08; Parts I-III and Appendices I-V1.

NMFS and USFWS. 1991a. Recovery Plan for U.S. Population of Atlantic Green Turtle. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1991b. Recovery Plan for U.S. Population of Loggerhead Turtle. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1992. Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

NMFS and USFWS. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Fla.

NMFS and USFWS. 1995. Status reviews for sea turtles listed under the Endangered Species Act of 1973. National Marine Fisheries Service, Silver Spring, Md.

Ogren, L.H. 1989. Distribution of juvenile and sub-adult Kemp's ridley sea turtle: Preliminary results from 1984-1987 surveys, pp. 116-123 in: Caillouet, C.W. and A.M. Landry (eds), First Intl. Symp. on Kemp's Ridley Sea Turtle Biol, Conserv. and Management. Texas A&M Univ.Galveston, Tex., Oct. 1-4, 1985, TAMU-SG-89-105.

Parsons, J.J. 1972. The hawksbill turtle and the tortoise shell trade. In: Études de géographie tropicale offertes a Pierre Gourou. Paris: Mouton, pp. 45-60.

Pritchard, P.C.H. 1969. Sea turtles of the Guianas. Bull. Fla. State Mus. 13(2): 1-139.

Renaud, M.L. 1995. Movements and submergence patterns of Kemp's ridley turtles (*Lepidochelys kempii*). Journal of Herpetology 29: 370-374.

Richardson, J.I., Bell, R. and Richardson, T.H. 1999. Population ecology and demographic implications drawn from an 11-year study of nesting hawksbill turtles, *Eretmochelys imbricata*, at Jumby Bay, Long Island, Antigua, West Indies. Chelonian Conservation and Biology 3(2): 244-250.

Ross, J.P. 1979. Historical decline of loggerhead, ridley, and leatherback sea turtles, pp. 189-195. In: Bjorndal, K.A. (editor), Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Schmid, J.R. and W.N. Witzell. 1997. Age and growth of wild Kemp's ridley turtles (*Lepidochelys kempii*): cumulative results of tagging studies in Florida. Chelonian Conserv. Biol. 2: 532 - 537.

Schroeder, B.A., and A.M. Foley. 1995. Population studies of marine turtles in Florida Bay. In J. I. Richardson and T.H. Richardson (compilers). Proceedings of the Twelfth Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS-SEFSC-361: 117.

Schroeder, B.A., A.M. Foley, B.E. Witherington, and A.E. Mosier. 1998. Ecology of marine turtles in Florida Bay: Population structure, distribution, and occurrence of fibropapilloma. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415: 265-267.

Schultz, J.P. 1975. Sea turtles nesting in Surinam. Zoologische Verhandelingen (Leiden), Number 143: 172 pp.

Shaver, D.J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology. Vol. 23. 1991.

Shaver, D.J. 1994. Relative abundance, temporal patterns, and growth of sea turtles at the Mansfield Channel, Texas. Journal of Herpetology 28: 491-497.

Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs. 6: 43-67.

Smith, G.M. and C.W. Coates. 1938. Fibro-epithelial growths of the skin in large marine turtles, *Chelonia mydas* (Linnaeus). Zoologica 24: 93-98.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: are leatherback turtles going extinct? Chel. Conserv. Biol. 2(2): 209-222.

Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature 405: 529-530.

TEWG. 1998. An assessment of the Kemp's ridley (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-409, 96 pp.

TEWG. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

USFWS and NMFS. 1992. Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). National Marine Fisheries Service, St. Petersburg, Fla.

van Dam, R. and C. Diez, 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. Pp. 1421-1426, Proc. 8th International Coral Reef Symposium, v. 2.

van Dam, R. and C. Diez. 1998. Home range of immature hawksbill turtles (*Eretmochelys imbricata*) at two Caribbean islands. Journal of Experimental Marine Biology and Ecology, 220(1):15-24.

Wershoven, J.L. and R.W. Wershoven. 1992. Juvenile green turtles in their nearshore habitat of Broward County, Florida: a five-year review. In M. Salmon and J. Wyneken (compilers). Proceedings of the 11th Annual Workshop on Sea Turtle Biology and Conservation, NOAA Technical Memorandum NMFS. NMFS-SEFC-302: 121-123.

Witherington, B.E., and L.M. Ehrhart. 1989. Status and reproductive characteristics of green turtles (*Chelonia mydas*) nesting in Florida. In L. Ogren, F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham (eds.). Proceedings of the 2nd Western Atlantic Turtle Symposium, NOAA Technical Memorandum NMFS-SEFC-226: 351-352.

Zug, G.R.. and J.F. Parham. 1996. Age and growth in leatherback turtles, *Dermochelys coriacea* (Testudines: Dermochelyidae): a skeletochronological analysis. Chel. Conserv. Biol. 2(2): 244-249.

Zwinenberg. A.J. 1977. Kemp's ridley, *Lepidochelys kempii* (Garman, 1880), undoubtedly the most endangered marine turtle today (with notes on the current status of *Lepidochelys olivacea*). Bulletin of the Maryland Herpetological Society, 13(3): 170-192.

2. Literature Cited - Gulf Sturgeon Species Account:

Barkuloo, J. 1988. Report on the conservation status of the Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi*. U.S. Fish and Wildlife Service, Panama City, Florida.

Bateman, D.H. and M.S. Brim. 1994. Environmental contaminants in Gulf sturgeon of northwest Florida, 1985-1991. U.S. Fish and Wildlife Service. Pub. No. PCFO-EC 94-09. Panama City, Florida. 23 pp. with appendices.

Carr, A. 1983. All the way down upon the Suwannee River. Audubon Magazine 85(2):78-101

Chapman, F.A., S.F. O'Keefe, and D.E. Campton. 1993. Establishment of parameters critical for the culture and commercialization of Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi*. Final Report, NOAA, St. Petersburg, Florida.

Dadswell, M.J. 1979. Biology and population characteristics of the shortnose sturgeon, *Acipenser brevirostrum* LeSeueur 1818 (Osteichthyes: Acipenseridae), in the St. John River estuary, New Brunswick, Canada. Canadian Journal of Zoology 57:2186-2210.

Fraser, T.H. 1984. New record of *Acipenser oxyrhynchus* in Charlotte Harbor, Florida. Florida Scientist 47(1):78-79.

1991. Endangered and threatened wildlife and plants; determination of threatened status for the Gulf sturgeon. Federal Register 56(189): 49653-49658.

1999. U.S. Fish and Wildlife Service. Draft biological opinion on the effects of the Mobile, Alabama, Harbor Navigation Project (Hurricane Recovery Plan) on the threatened Gulf sturgeon, *Acipenser oxyrinchus desotoi*. 28 pp. Feb. 26.

FWS & GSMFC. 1995. U.S. Fish and Wildlife Service and Gulf States Marine Fisheries Commission. Gulf sturgeon recovery plan. Atlanta, Georgia. 170 pp.

Gilbert, C. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic Bight)--Atlantic and shortnose sturgeons. U.S. Fish and Wildlife Service, Biological Report 82(11.12). U.S. Army Corps of Engineers TR EL-82-4. 28 pp.

Hollowell, J. 1980. Information report Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi* (Vladykov). U.S. Fish and Wildlife Service. Unpublished report.

Huff, J.A. 1975. Life history of the Gulf of Mexico sturgeon, *Acipenser oxyrhynchus desotoi*, in the Suwannee River, Florida. Marine Resources Pub. No. 16. 32 pp.

Mason, W.T., Jr., and J.P. Clugston. 1993. Foods of the Gulf sturgeon *Acipenser oxyrhynchus desotoi* in the Suwannee River, Florida. Transactions of the American Fisheries Society 122:378-385.

Odenkirk, J.S. 1989. Movements of Gulf of Mexico sturgeon in the Apalachicola River, Florida. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies. 43:230-238.

Reynolds, C.R. 1993. Gulf sturgeon sightings, historic and recent–a summary of public responses. U.S. Fish and Wildlife Service. Panama City, Fla. 40pp.

Sulak, K.J. and J.P. Clugston. 1999. Recent advances in life history of Gulf of Mexico sturgeon *Acipenser oxyrinchus desotoi* in the Suwannee River, Florida, U.S.A.: a synopsis. J. Appl. Ichth. 15: 116 - 128.

Swift, C., R.W. Yerger, and P.R. Parrish. 1977. Distribution and natural history of the fresh and brackish water fishes of the Ochlockonee River, Florida and Georgia. Bull. Tall Timbers Res. Sta. No. 20. October. Pp. 18-19. Tallahassee, Florida.

White, D.H., C.A. Mitchell, H.D. Kennedy, A.J. Krynitsky, and M.A. Ribick. 1983. Elevated DDE and toxaphene residues in fishes and birds refelct local contamination in the lower Rio Grande Valley, Texas. The Southwestern Naturalist 28(3):325-333.

Wooley, C.M., P.A. Moon, and E.J. Crateau. 1982. A larval Gulf of Mexico sturgeon (*Acipenser oxyrhynchus desotoi*) from the Apalachicola River, Florida. Northeast Gulf Science 5(2):57-58.

Wooley, C.M. and E.J. Crateau. 1985. Movement, microhabitat, exploitation, and management of Gulf of Mexico sturgeon, Apalachicola River, Florida. North American Journal of Fisheries Management 5:590-605.

Ziewitz, J.W. and G.A. Carmody. 1998. Anadromous fish habitat in the Alabama-Coosa-Tallapoosa and Apalachicola-Chattahoochee-Flint River basins. U.S. Fish and Wildlife Service. Panama City, Florida. December.

3. General References and Other Literature Cited

Aguilar, R., J. Mas, and X. Pastor. 1995. Impact of Spanish swordfish longline fisheries on the loggerhead sea turtle *Caretta caretta* population in the western Mediterranean. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-361:1-6.

Aguirre, A.A., Balazs, G., Zimmerman, B. and F.D. Galey. 1994. Organic contaminants and trace metals in the tissues of green turtles (*Chelonia mydas*) affected with fibropapillomas in the Hawaiian Islands. Marine Pollution Bulletin 28:109-114.

Anonymous. 1990. Sources of oil pollution in the oceans. Marine Conservation News 2(3):1-20, Autumn.

Applied Biology, Inc. 1993. Florida Power & Light Company, St. Lucie Unit 2 annual environmental operating report. AB-631. Prepared by Applied Biology, Inc. for Florida Power & Light Co. Juno Beach, Florida, pp. 71.

Babcock, H.L. 1937. The sea turtles of the Bermuda Islands, with a survey of the present state of the turtle fishing industry. Proc. Zool. Soc. Lond. 107: 595-601.

Bagley, D. and L. Ehrhart. 2000. Unpublished data.

Barlow, J. and P.J. Clapham. 1997. A new birth-interval approach to estimating demographic parameters of humpback whales. Ecology 78(2): 535-546.

Bass, A.L. 1999. Genetic analysis of juvenile loggerheads captured at the St. Lucie Power Plant.A report to National Marine Fisheries Service and Quantum Resources, Inc.

Bass, A.L., S-M. Chow, and B.W. Bowen. 1999. Final report for project titled: genetic identities of loggerhead turtles stranded in the Southeast United States. Unpublished report to NMFS, order number 40-AANF809090. Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, Fla., 11 pp.

Bass, A.L., S.P. Epperly, J. Braun, D.W. Owens, and R.M. Patterson. 1998. Natal origin and sex ratios of foraging sea turtles in the Pamlico-Albemarle Estuarine Complex. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415:137-138.

Bass, A. L., C. J. Lagueux, and B. W. Bowen. 1998. Mixed stock composition of the Miskitu Cays green turtle fishery based on mtDNA markers. In S. P. Epperly, and J. Braun (Compilers). Proceedings of the Seventeenth Annual Sea Turtle Symposium. NOAA Tech. Memo. NMFS-SEFSC-415:7.

Belardo E., R. Matos, and F. Ortiz. 2000. Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F. Ortiz. 1999. 1998 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico.. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F.J. Ortiz.. 1998.. 1997 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F.J. Sanez. 1997. 1996 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and F.J. Ortiz. 1996. 1995 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and J.F. Sanez. 1995. 1994 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and G. Roman. 1994. 1993 Annual Report, Sea Turtle Conservation Project on Vieques Island. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Belardo, E., R. Matos, and G. Roman. 1993. 1992 Annual Report, Sea Turtle Conservation Project on Vieques Island, Final Draft. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

Bellmund, S., M.T. Masnik, and G. Laroche. 1982. Assessment of the impacts of the St. Lucie Nuclear Plant on threatened or endangered species. U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation. Docket No. 50-398, pp 68.

Best, P.B. 1979. Social organization in sperm whales, *Physeter macrocephalus*. In: H.E. Winn and B.L. Olla (Eds.) Behavior of marine animals, volume 3: cetaceans, p.227-289. Plenum Press, N.Y.

Bishop, C.A., Brown, G.P., Brooks, R.J., Lean, D.R.S., and J.H. Carey. 1994. Organochlorine contaminant concentrations in eggs and their relationship to body size and clutch characteristics of the female common snapping turtle (*Chelydra serpentina*) in Lake Ontario, Canada. Archives of Environmental Contamination and Toxicology 27:82-87.

Bishop, C.A., Brooks, R.J., Carey, J.H., Ng, P., Norstrom, R.J. and D.R.S. Lean. 1991. The case for a cause-effect between environmental contamination and development in eggs of the common snapping turtle (*Chelydra serpentina*) from Ontario, Canada. Journal of Toxicology and Environmental Health 33:521-547.

Bjorndal, K.A., A.B. Bolten, and H.R. Martins. In press. Somatic growth model of juvenile loggerhead sea turtles: duration of the pelagic stage.

Bjorndal, K.A., Bolten, A.B., and C.J. Lagueux. 1994. Ingestion of marine debris by juvenile sea turtles in coastal Florida habitats. Marine Pollution Bulletin, Vol. 28, No. 3, 154-158.

Bjorndal, K.A., A.B. Bolten, J. Gordon, and J.A. Camiñas. 1994a. *Caretta caretta* (loggerhead) growth and pelagic movement. Herp. Rev. 25:23-24.

Bjorndal, K.A., A.B. Meylan, and B.J. Turner. 1983. Sea turtles nesting at Melbourne Beach, Florida. I. Size, growth and reproductive biology. Biological Conservation 26:65-77.

Blaylock, Robert A., J.W. Hain, L.J. Hansen, D.L. Palka, and G.T. Waring. 1995. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-SEFSC-363. July. 211 pp.

Bolten, A.B., K.A. Bjorndal, H.R. Martins, T. F Dellinger, M.J. Biscoito, S.E. Encalada, and B.W. Bowen. 1998. Trans-Atlantic developmental migrations of loggerhead sea turtles demonstrated by mtDNA sequence analysis. Ecological Applications 8:1-7.

Bolten, A.B., K.A. Bjorndal, and H.R. Martins. 1994. Life history model for the loggerhead sea turtle (*Caretta caretta*) populations in the Atlantic: Potential impacts of a longline fishery. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SWFC-201:48-55.

Bolten, A.B., H.R. Martins, K.A. Bjorndal, and J. Gordon. 1993. Size distribution of pelagic-stage loggerhead sea turtles (*Caretta caretta*) in the waters around the Azores and Madeira. Arquipelago 11A: 49-54.

Bolten, A.B. and K.A. Bjorndal. 1991. Effects of marine debris on juvenile, pelagic sea turtles. Interim Project Report to the National Marine Fisheries Service Marine Entanglement Research Program. 41 pp.

Bowen, B.W., J.C. Avise, J.I. Richardson, A.B. Meylan, D. Margaritoulis, and S.R. Hopkins-Murphy. 1993. Population structure of loggerhead turtles (*Caretta caretta*) in the northwestern Atlantic Ocean and Mediterranean. Sea. Conserv. Biol. 7:834-844.

Bowen, B.W. 1995. Tracking marine turtles with genetic markers. BioSci. 45:528-53.

Brown, C.A., J.A. Cramer, and A. Bertolino. 2000. Estimates of bycatch by the U.S. Atlantic pelagic longline fleet during 1993-1998. Proceedings of the Sixth National Stock Assessment Workshop, March 28-30, 2000. NOAA Tech. Memo. NMFS-NWFSC.

Brown, C. 2000. Fishery Biologist, NMFS-Pelagic Longline Observer Program. Personal communication to Terri Jordan, NMFS, Silver Spring, MD.

Burchfield, P. 1996a. Personal Communication. Gladys Porter Zoo, Brownsville, Texas.

Burchfield, P. 1996b. Report on the Mexico/United States of America Kemp's ridley sea turtle population restoration project at the Rancho Nuevo, Barra Del Tordo, Barra Ostionales, Tepehuajes, La Pesca and Altamira Camps, Tamaulipas, Mexico. U.S. Department of Commerce, National Marine Fisheries Service.

Byles, R.A. 1988. Behavior and ecology of sea turtles from Chesapeake Bay, Virginia. A dissertation presented to the faculty of the School of Marine Science, The College of William and Mary in Virginia, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Caldwell, D.K. and D.S. Erdman. 1969. Pacific ridley sea turtle, *Lepidochelys olivacea*, in Puerto Rico. Bull. So. Calif. Acad. Sci. 68: 112.

Cannon, A.C. and J.P. Flanagan. 1996. Trauma and treatment of Kemp's ridley sea turtlews caught on hook-and-line by recreational fishermen. Draft abstract submitted for the 18th Annual Sea Turtle Symposium, Hilton Head, SC. February.

Carocci, F. and J. Majkowski. 1998. Aatlas of tuna and billfish catches. CD-ROM version 1.0. FAO, Rome, Italy.

Carr, A. 1987. New perspectives on the pelagic stage of sea turtle development. Conserv. Biol. 1:103-121.

Carr, A.F. 1954. The passing of the fleet. A. I .B. S. Bull. 4(5):17-19.

Carr, A.F. 1952. Handbook of Turtles. Ithaca, New York: Cornell University Press.

Carr, A.F., M.H. Carr and A.B. Meylan. 1978. The ecology and migrations of sea turtles. 7. The western Caribbean green turtle colony. Bull. Amer. Mus. Nat. Hist. 162(1):1-46.

Carr, A.F. and L. Ogren. 1960. The ecology and migrations of sea turtles. 4. The green turtle in the Caribbean Sea. Bull. Amer. Mus. Nat. Hist. 131(1):1-48.

CeTAP. 1982. A characterization of marine mammals and turtles in the mid- and north-Atlantic areas of the U.S. outer continental shelf, Final Report. U.S. Dept. of Interior, Bureau of Land Management, Contract No. AA551-CT8-48, Washington, D.C. 538 pp.

Chevalier, J. and Girondot, M. 1998. Nesting dynamics of marine turtles in French Guiana during the 1997 nesting season. Bull. Soc. Herp. Fr., 85-86: 5-19.

Clapham, P.J. and J.G. Mead. 1999. *Megaptera novaeangliae*. Mammalian Species. No. 604. 9 pp.

Clark, C.W. 1995. Application of U.S. Navy underwater hydrophone arrays for scientific research on whales. Rep. IWC 45: 210-212.

Clarke, M.R. 1980. Cephalapoda in the diet of sperm whales of the Southern Hemisphere and their bearing on sperm whale biology. Discovery Rep. 37:1-324.

Clarke, M.R. 1962. Stomach contents of a sperm whale caught off Madeira in 1959. Norsk Hvalfangst-tidende 51(5):173-191.

Coe, J.M., Rogers, D.B., Alexander, D.E., Laist, D.W. 1996. Marine Debris Sources, Impacts, and Solutions. National Marine Fisheries Service, ISBN 0-387-94759-0.

Cox, B.A. and Mauermann, R. G. Incidental Catch and Disposition of Sea Turtles by the Brownsville-Port Isabel Gulf Shrimp Fleet. 5 pp.

Cramer, J. and H. Adams. 2000. Large pelagic logbook newsletter: 1998. NOAA Tech. Memo. NMFS-SEFSC-433. 25 pp.

Crouse, D.T. 1999. The consequences of delayed maturity in a human-dominated world. American Fisheries Society Symposium. 23:195-202.

Crouse, D.T., L.B. Crowder, and H. Caswell. 1987. A stage-based population model for loggerhead sea turtles and implications for conservation. Ecol. 68:1412-1423.

Crowder, L.B., D.T. Crouse, S.S. Heppell, and T.H. Martin. 1994. Predicting the impact of turtle excluder devices on loggerhead sea turtle populations. Ecol. Applic. 4:437-445.

Dahlen, M.K., R. Bell, J.I. Richardson, and T.H. Richardson. 2000. Beyond D-0004: Thirty-four years of loggerhead (*Caretta caretta*) research on Little Cumberland Island, Georgia, 1964-1997. Proceedings of the Eighteenth International Sea Turtle Symposium. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-SEFSC-436, pp. 60-62.

Dahlgren. 2000. Noise Blast Test Results Aboard USS Cole. Report from Dahlgren Division, Naval Surface Warfare Center to Commander-in Chief, U.S. Atlantic Fleet (N3). 18 July.

Davis, R. 2000. Personal Communication to Kathy Wang, NMFS St. Petersburg, Fla.

Davenport, J. and J. Wrench. 1990. Metal levels in a leatherback turtle. Marine Pollution

Bulletin 21:40-41

Dellinger, T. and H. Encarnacao. 2000. Accidental capture of sea turtles by the fishing fleet based at Madeira Island, Portugal. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SEFSC-443:218.

Department of Defense. 1999. The National Security Need for Vieques. July.

Department of the Navy. 1998. Shock Testing the SEAWOLF submarine. Final Environmental Impact Statement. Department of the Navy with cooperation from the National Marine Fisheries Service.

Dickerson, D.D. and D.A. Nelson. 1989. Recent results on hatchling orientation responses to light wavelengths and intensities. Pages 41-43 *in* Eckert, S.A., K.L. Eckert, and T.H. Richardson (compilers). Proceedings of the 9th Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFSC-232.

Dickerson, D.D. and J.E. Clausner. 2003. Draft: Summary of Sea Turtle/Dredging Issues and Recommended Action Tasks Generated by the Improved Draghead Design Meeting, September 4, 2003, Atlanta, Georgia. U.S. Army Corps of Engineers, Engineering Research and Development Center, Vicksburg, Mississippi. 13pp.

Díez, C.E. 2000. Personal communication to Blair Witherington, FMRI.

Díez, C.E. and R.P. van Dam. 2000. Research Report for 1999 with summary of findings 1995 - 1999. Mona and Monito Island Hawksbill Turtle Research Project. Puerto Rico Department of Natural Resources, San Juan, PR (Díez)/Scripps Institute of Oceanography, La Jolla, CA (van Dam)

Doughty, R.W. Sea turtles in Texas: A forgotten commerce. Southwestern Historical Quarterly:43-70.

Eckert, K.L. 1993. Draft Status Review of Sea Turtles Listed Under the Endangered Species Act of 1973. Leatherback Sea Turtle *Dermochelys coriacea*. Prepared for NMFS, Silver Spring, MD.

Ecology and Environment. 1980. Environmental impact statement for the continued use of the Atlantic Fleet Weapons Training Facility, Inner Range (Vieques),Puerto Rico.

Ehrhart, L.M. 1983. Marine turtles of the Indian River lagoon system. Florida Sci. 46(3/4):337-346.

Ehrhart, L.M. 1979. A survey of marine turtle nesting at Kennedy Space Center, Cape Canaveral Air Force Station, North Brevard County, Florida, 1-122. Unpublished report to Division of Marine Resources, St. Petersburg, Florida, Fla. Dept. Nat. Res.

Epperly, S.P. and Braun-McNeill. 2002. The Use of AVHRR Imagery and the Management of Sea Turtle Interactions in the Mid Atlantic Bight. NMFS Southeast Fisheries Science Center. Unpublished.

Ernst, L.H. and R.W. Barbour. 1972. Turtles of the United States. Univ. Kentucky Press, Lexington Kentucky.

Epperly, S.A. 1996. Personal Communication. NMFS Beaufort Laboratory, North Carolina.

Epperly, S.P., J. Braun, and A. Veishlow. 1995. Sea turtles in North Carolina waters. Conserv. Biol. 9:384-394.

Epperly, S.P., J. Braun, A. J. Chester, F.A. Cross, J. . Merriner, and P.A. Tester. 1995. Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. Bull. Mar. Sci. 56(2):519-540.

Epperly, S.A., Braun, J., Chester, A.J., Cross, F.A., Merriner, J.V., and P.A. Tester. 1994. Beach strandings as an indicator of at-sea mortality of sea turtles. Submitted to Fishery Bulletin. January 10, 1994.

Erdman, D.S., J. Harms, and M.M. Flores. 1973. Cetacean records from the northeastern Caribbean region. Cetology 17. 14 pp.

Expert Working Group (Byles, R, C. Caillouet, D. Crouse, L. Crowder, S. Epperly, W. Gabriel, B. Gallaway, M. Harris, T. Henwood, S. Heppell, R. Marquez-M, S. Murphy, W. Teas, N. Thompson, and B. Witherington) 1996. Kemp's ridley sea turtle (*Lepidochelys kempii*) status report. Submitted to NMFS June 28, 1996.

Expert Working Group (Byles, R, C. Caillouet, D. Crouse, L. Crowder, S. Epperly, W. Gabriel, B. Gallaway, M. Harris, T. Henwood, S. Heppell, R. Marquez-M, S. Murphy, W. Teas, N. Thompson, and B. Witherington) 1996. Status of the loggerhead turtle population (*Caretta caretta*) in the Western North Atlantic. Submitted to NMFS July 1, 1996.

Florida Marine Research Institute. Unpublished Data. Index Nesting Beach Survey Database. St. Petersburg, Fla.

Florida Power & Light Co. 1985. Sea turtle intake entrapment studies. Special Document 4/9/85.

Florida Power & Light Co. 2000. Physical and ecological factors influencing sea turtle entrainment at the St. Lucie Nuclear Plant: 1976-1998.

Florida Power & Light Co. 2000. M. Bressette. Unpublished data.

Foley, A. 2000. Florida Marine Research Institute, St. Petersburg, Fla. Personal communication.

Francisco, A.M., A.L. Bass, K.A. Bjorndal, A.B. Bolten, R. Reardon, M. Lamont, Y. Anderson, J. Foote, and B.W. Bowen. 2000. Stock structure and nesting site fidelity in Florida loggerhead turtles (*Caretta caretta*) resolved with mtDNA sequences. Unpublished Manuscript. Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, 23pp.

Frazer, N.B. 1992. Sea turtle conservation and halfway technology. Cons. Biol. 6:179-184.

Frazer, N.B., C.J. Limpus, and J.L. Greene. 1994. Gorwth and age at maturity of Queensland loggerheads. U.S. Dep. of Commer. NOAA Tech. Mem. NMFS-SEFSC-351: 42-45.

Frazer, N.B. and L.M. Ehrhart. 1985. Preliminary growth models for green, *Chelonia mydas*, and loggerhead, *Caretta caretta*, turtles in the wild. Copeia 1985:73-79.

Fuller, D.A. and Tappan, A.M. The Occurrence of Sea Turtles in Louisiana Coastal Waters. Coastal Fisheries Institute, Center for Wetland Resources, Louisiana State University. 1986 Sep. 46 pages.

Fulton, J. 1998. Personal Communication. U.S. Department of the Interior, Fish and Wildlife Service, Bon Secour National Wildlife Refuge, AL.

Gambell, R. 1985. Sei whale -- *Balaenoptera borealis*. In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Vol. 3: The sirenians and baleen whales. London: Academic Press. Pp. 155-170.

Geo-Marine, Inc. 1996. Land Use Management Plan for U.S. Naval Facilities Vieques, Puerto Rico

Gitschlag, G. 2001. NMFS Laboratory, Galveston, TX. Personal communication (July 24 e-mail) to Eric Hawk, NMFS, St. Petersburg, Fla.

Gitschlag, G. 1998. NMFS Laboratory, Galveston, TX. Personal communication to Kathy Wang, NMFS, St. Petersburg, Fla.

Gitschlag, G., and B.A. Herczeg. 1994. Sea Turtle Observations at Explosive Removals of Energy Structures. Marine Fisheries Review 56(2) pp 1-8.

Hansen, L.J., D.D. Mullin, T.A. Jefferson, and G.P. Scott. 1996. Visual surveys aboard ships and aircraft. Pages 55-132 in R.W.

Hain, J.H.W., M.J. Ratnaswamy, R.D. Kenney, and H.E. Winn. 1992. The fin whale in waters of the northeastern U.S. continental shelf. Rep. IWC 42: 653-669.

Harmer, K.B.E. 1923. Cervical vertebrae of a gigantic blue whale from Panama. Proceed. Zool. Soc. London 1923: 1085-1089.

Hastings, M. 2000. Analyses of sound levels by Mark 45 ship-to-shore guns. Unpublished report, 8 pp. Provided by Richard Copaken, Esq., to NMFS SERO.

Henwood, T.A., W. Stuntz, and N. Thompson. 1992. Evaluation of U.S. Turtle Protective Measures under existing TED regulations, including estimates of shrimp trawler related mortality in the Wider Caribbean. NOAA Tech Memo NMFS-SEFSC-303.

Henwood, T.A. and W. Stuntz. 1987. Analysis of sea turtle captures and mortalities during commercial shrimp trawling. Fishery Bulletin 85(4): 813-817.

Heppell, S.S., D.T. Crouse, L.B. Crowder, S.P. Epperly, and N.B. Frazer. In preparation. Population models for Atlantic loggerheads: past, present and future. In A. Bolten and B. Witherington, eds. Ecology and Conservation of Loggerhead Sea Turtles, Univ. Florida Press (presented at special loggerhead symposium in Orlando, Florida, March 2000).

Hildebrand, H. 1982. A historical review of the status of sea turtle populations in the western Gulf of Mexico, pp. 447-453 in Bjorndal, K., (ed.), Biology and Conservation of Sea Turtles. Proc. World Conf. of Sea Turtle Conserv. Smithsonian Inst. Press. Washington, D.C.

Hildebrand, H.H. Random Notes on Sea Turtles in the Western Gulf of Mexico. Western Gulf of Mexico Sea Turtle Workshop Proceedings, January 13-14, 1983. 1983 Oct:34-41. Note: A copy of the entire Workshop Proceedings is at SP000480.

Hilborn, R. 1998. The economic performance of marine stock enhancement projects. Bulletin of Marine Science, 62(2):661-674.

Hirth, H.F. 1971. Synopsis of biological data on the green turtle *Chelonia mydas* (Linnaeus) 1758. FAO Fisheries Synopsis. 85:1-77.

Hopkins-Murphy, S.R., and T.M. Murphy, Jr. 1988. Status of the loggerhead turtle in South Carolina, p. 35-37. In: B.A. Schroeder (comp.), Proceedings of the Eighth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Tech. Memo. NMFS-SEFSC-214.

Iverson, S., D.M. Allen, and J.B. Higman. 1993. Shrimp capture and culture fisheries of the United States. Imprint of John Wiley & Sons, Inc. New York.

IWC. Committee for Whaling Statistics. 1959-1983. International whaling statistics, volumes 41-91 Comm. Whaling Stat., Oslo, Norway, var. paging.

Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. FAO species identification guide. Marine Mammals of the World. Rome: Food and Agriculture Organization.

Johnson, D.R., C. Yeung, and C.A. Brown. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1992-1997. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-418, 70 pp.

Katona, S.K. and J.A. Beard. 1990. Population size, migrations, and feeding aggregations of the humpback whale in the western North Atlantic ocean. Rep. IWC Special Issue 12: 295-306.

Keinath, J.A. 1993. Movements and behavior of wild and head-started sea turtles. Ph.D. Diss. College of William and Mary, Gloucester Point, Va., 206 pp.

Klima, E.F. 1986. Summary report on biological impacts of offshore petroleum platform severance using explosives. NMFS Galveston Laboratory.

Klima, E.F., G.R. Gitschlag, and M.L. Renaud. 1988. Impacts of the explosive removal of offshore petroleum platforms on sea turtles and dolphins. Marine Fisheries Review, 50(3) pp 33-42.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Mar. Mamm. Sci. 17: 35-7

Laist, D.W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J.M. and D.B. Rogers, eds. Marine debris: sources, impacts, and solutions. New York: Springer-Verlag. Pp. 99-139.

Laurent, L, P. Casale, M.N. Bradai, B.J. Godley, G. Gerosa, A.C. Broderick, W. Schroth, B. Schierwater, A.M. Levy, D. Freggii, E.M. Abd El-Mawla, D.A. Hadoud,H.E. Gomati, M. Domingo, M. Hadjichristophorou, L. Kornaraky, F. Demirayak, and Ch. Gautier. 1998. Molecular resolution of marine turtle stock composition in fishery bycatch: a case study in the Mediterranean. Molecular Ecol. 7:1529-1542.

Law, R.J., Fileman, C.F., Hopkins, A.D., Baker, J.R., Harwood, J., Jackson, D.B., Kennedy, S., Martin, A.R. and R.J. Morris. 1991. Concentrations of trace metals in the livers of marine mammals (seals, porpoises and dolphins) from waters around the British Isles. Marine Pollution Bulletin 22:183-191.

Lazell, J.D. 1980. New England waters: critical habitat for marine turtles. Copeia 1980 (2):290-295.

LeBuff, C.R., Jr. 1990. The loggerhead turtle in the eastern Gulf of Mexico. Caretta Research, Inc., Sanibel, Fla, 216 pp.

LeBuff, C.R., Jr. 1974. Unusual nesting relocation in the loggerhead turtle, *Caretta caretta*. Herpetologica 30:29-31.

Leary, T. R. 1957. A schooling of leatherback turtles, *Dermochelys coriacea*, on the Texas coast. Copeia 1957(3):232.

Leatherwood, S. and R.R Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco. 302 pp.

Limpus, C.J., V. Baker, and J.D. Miller. 1979. Movement induced mortality of loggerhead eggs. Herpetelogica 35(4): 335-338.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997. Human impacts on sea turtle survival. In: Lutz, P.L. and J.A. Musick, eds. The Biology of Sea Turtles. Boca Raton, Fla.: CRC Press. pp. 387-409.

Lutcavage, M.E., P.L. Lutz, G.D. Bossart, and D.M. Hudson. 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Arch. Environ. Contam. Toxicol. 28:417-422.

Lutz, P.L., 1987. Effects of ingestion of non-biodegradable debris in sea turtles. Final Report for the U.S. Department of Commerce; RFP No. FSN-5-0178.

Magnuson, J.J., K.A. Bjorndal, W.D. DuPaul, G.L. Graham, D.W. Owens, P.C.H. Pritchard, J.I. Richardson, G.E. Saul, and C.W. West. 1990. Decline of the sea turtles: causes and prevention. National Academy Press, Washington, D.C. 274 pp.

Mann, T.M. 1977. Impact of developed coastline on nesting and hatchling sea turtles in southeastern Florida. M.S. thesis. Florida Atlantic University, Boca Raton, Fla.

Márquez-M., R. 1990. FAO Species Catalogue, Vol. 11. Sea turtles of the world, an annotated and illustrated catalogue of sea turtle species known to date. FAO Fisheries Synopsis, 125, 81 pp.

Márquez, R., R. Byles, P. Burchfield, N. Thompson, M. Sanchez, J. Diaz, M.A. Carrasco, A.S. Leo, and C. Jimenez. 1995. The Recovery of the Kemp's ridley sea turtle population in the Mexican Beach of Rancho Nuevo, Tamaulipas. Draft submitted to the Marine Turtle Newsletter.

Matos, R., E. Belardo, and G. Roman. 1992. 1991 Annual Report, Vieques Island Sea Turtle Conservation Project With Management Recommendations. Department of Natural and Environmental Resources, San Juan, Puerto Rico. Report to U.S. Naval Station Roosevelt Roads.

McGehee, M.A. 1990. Effects of moisture on eggs and hatchlings of loggerhead sea turtles (*Caretta caretta*). Herpetologica 46(3):251-258.

McKenzie, C., Godley, B.J., Furness, R.W., and D.E. Wells. 1999. Concentrations and patterns of organochlorine contaminants in marine turtles from Mediterranean and Atlantic waters. Marine Environmental Research 47:117-135.

Mead, J.G. 1977. Records of sei and Bryde's whales from the Atlantic coast of the United States, the Gulf of Mexico, and the Caribbean. Rep. Int. Whal. Commn., Special Issue 1: 113-116.

Mendonca, M.T. and L.M. Ehrhart. 1982. Activity, population size and structure of immature *Chelonia mydas* and *Caretta caretta* in Mosquito Lagoon, Florida. Copeia. (1):161-167.

Meylan, A. 1995. Facsimile dated April 5, 1995, to Sandy McPherson, National Sea Turtle Coordinator, U.S. Fish and Wildlife Service, Jacksonville, Fla. Florida Dept. of Environmental Protection, St. Petersburg, Fla.

Mexico. 1966. Instituto Nacional de Investigaciones Biologico-Pesqueras. Programa nacional de marcado de tortugas marinas. Mexico, INIBP:1-39.

Meyers-Schone, L. and B.T. Walton.1994. Turtles as monitors of chemical contaminants in the environment. Rev. Environ. Contam. Toxicol.; 1994, v. 135, p. 93-153

Meylan, A., B. Schroeder, and A. Mosier. 1995. Sea Turtle Nesting Activity in the State of Florida. Florida Marine Research Publications, No. 52.

Meylan, A.B. 1984. The Ecology and Conservation of the Caribbean Hawksbill (*Eretmochelys imbricata*). Final Report: WWF Project No. 1499.

Mignucci-Giannoni, A.A., B. Pinto-Rodriguez, M. Velasco-Escudero, R.A. Montoya-Ospina, N.M. Kimenez-Marrero, M.A. Rodriguez-Lopez, E.H. Williams, Jr., and D.K. Odell. 1999. Cetacean strandings in Puerto Rico and the Virgin Islands. J. Cetacean Res. Manage. 1: 191-198.

Mignucci-Giannoni, A.A. 1998. Zoogeography of cetaceans off Puerto Rico and the Virgin Islands. Carib. J. Sci. 34: 173-190.

Mignucci-Giannoni, A.A. 1996. Marine mammal strandings in Puerto Rico and the United States and British Virgin Islands. PhD thesis, University of Puerto Rico, Mayaguez Campus.

Mignucci-Giannoni, A.A. 1989. Zoogeography of marine mammals in Puerto Rico and the Virgin Islands. M.S. thesis, Univ. Rhode Island. 448 pp.

Miller, G.S. 1991. The bow shock environment from a 16-inch projectile flyby. NSWC Technical Report TR91-621, October.

Miller, K., G.C. Packard, and M.J. Packard. 1987. Hydric conditions during incubation influence locomotor performance of hatchling snapping turtles. Journal of Experimental Biology 127:401-412.

Milton, S. L., S. Leone-Kabler, A.A. Schulman, and P.L. Lutz. 1994. Effects of Hurricane Andrew on the sea turtle nesting beaches of South Florida. Bulletin of Marine Science 54-3: 974-981.

Moncada-G., A. Rodriguez, R. Marquez-M., and E. Carrillo. 2000. Marine Turtle Newsletter No. 90, pp. 13-15.

Morreale, S.J. 1993. Personal Communication. Cornell University, Ithaca, New York.

Morreale, S.J. and E.A. Standora. 1999. Vying for the same resources: potential conflict along migratory corridors. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-415: 69.

Morreale, S.J. and E.A. Standora. 1998. Early life stage ecology of sea turtles in northeastern U.S. waters. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-413, 49 pp.

Mrosovsky, N. and A. Carr. 1967. Preference for light of short wavelengths in hatchling green sea turtles (*Chelonia mydas*) tested on their natural nesting beaches. Behavior 28:217-231.

Mrosovsky, N. and S.J. Shettleworth. 1968. Wavelength preferences and brightness cues in water-finding behavior of sea turtles. Behavior 32:211-257.

Mullin, K.D. and W. Hoggard. 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships, p.111- 322. In R.W. Davis, W.E. Evans, and B. Wursig, eds. Cetaceans, sea turtles and seabirds in northern Gulf of Mexico: distribution, abundance and habitat associations. Unpublished report. USGS/BRD/CR-1999-0006, OCS Study MMS 2002-002. Department of Marine Biology, Texas A&M University, Galveston, Texas.

Mullin, K.D., W. Hoggard, C.L. Roden, R.R. Lohoefener, C.M. Rogers, and B. Taggart. 1994. Cetaceans on the upper continental slope in the north-central GOM. Fishery Bulletin 92: 773-786.

Munsell, E. 2000. Department of the Navy. Deputy Assistant Secretary of the Navy for Installations and Environment. Personal Communication to Eric Hawk, NMFS. October 12.

NMFS & FWS. 1998. Recovery Plan for U.S. Pacific populations of the olive ridley sea turtle (*Lepidochelys olivacea*). NMFS, Silver Spring, MD.

NMFS & FWS. 1992. Recovery Plan for leatherback turtles in the U.S. Caribbean, Atlantic and Gulf of Mexico. NMFS, Washington, D.C.

NMFS & FWS. 1991. Recovery plan for the U.S. population of loggerhead turtle. National Marine Fisheries Service, Washington, D.C.

National Research Council. 1990. Decline of the sea turtles: Causes and prevention. National Academy Press, Washington, D.C., 259 p.

NMFS. 2001. Endangered Species Act Section 7 Reinitiation of consultation on the Atlantic Highly Migratory Species Fishery Management Plan and its Associated Fisheries. Biological Opinion. June 8.

NMFS SEFSC. 2001. Southeast Fisheries Science Center. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. U.S. Department of Commerce, National Marine Fisheries Service, Miami, Fla, SEFSC Contribution PRD-00/01-08; Parts I-III and Appendices I-V1.

NMFS. 2000. Endangered Species Act Section 7 consultation on the Atlantic Pelagic Fisheries for Swordfish, Tuna, Shark, and Billfish in the U.S. Exclusive Economic Zone. Biological Opinion. June 30.

NMFS. 2000b. Endangered Species Act Section 7 consultation on the proposed shock testing of the DDG-81 WINSTON CHURCHILL destroyer. Biological Opinion. October 10.

NMFS. 2000. E-mail from Wendy Teas to Terri Jordan regarding loggerhead turtle strandings in Puerto Rico since 1990.

NMFS. 1998. Turtle Expert Working Group, An Assessment of the Kemp's ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Sea Turtle Populations in the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409. 96 pp.

NMFS. 1998. Recovery plan for the blue whale (*Balaenoptera musculus*). Prepared by R.R. Reeves, P.J. Clapham, R.L. Brownell, and G.K. Silber for the National Marine Fisheries Service, Silver Spring, MD. 39 pp.

NMFS. 1998. Endangered Species Act Section 7 consultation on shrimp trawling in the southeastern U.S. under the sea turtle conservation regulations. Biological Opinion, March 24. 32 pp.

NMFS. 1997a. Endangered Species Act Section 7 consultation on Navy activities off the southeastern United States along the Atlantic Coast, May 15. 73 pp.

NMFS. 1997b. Endangered Species Act Section 7 consultation on the Atlantic Pelagic Fishery for Swordfish, Tuna, and Shark, in the Exclusive Economic Zone. Biological Opinion, May 29. 95 pp.

NMFS. 1997c. Endangered Species Act Section 7 consultation on the continued hopper dredging of channels and borrow areas in the southeastern United States. Biological Opinion, September 25. 15 pp.

NMFS. 1997e. Endangered Species Act Section 7 consultation on the continued operation of the circulating water system of the St. Lucie nuclear generating plant. Biological Opinion, February 7. 39 pp.

NMFS. 1996a. Endangered Species Act Section 7 consultation on the Fishery Management Plan (FMP) for Summer Flounder to include the management and fishing activities under the Draft FMPs for Scup and Black Sea Bass. Biological Opinion.

NMFS. 1996b. Endangered Species Act Section 7 consultation on the proposed shock testing of the U.S.S. SEAWOLF submarine off the Atlantic Coast of Florida during the summer of 1997. Biological Opinion, December 12. 50 pp.

NMFS. 1995. Endangered Species Act Section 7 consultation on United States Coast Guard vessel and aircraft activities along the Atlantic coast. Biological Opinion, September 15. 56 pp.

NMFS. 1995a. Endangered Species Act Section 7 consultation on channel maintenance dredging using a hopper dredge in the Galveston and New Orleans Districts of the Army Corps of Engineers. Biological Opinion, September 22. 23 pp.

NMFS. 1991. Recovery plan for the humpback whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 105 pp.

NMFS. 1991a. Endangered Species Act Section 7 consultation on Corps of Engineeers' dredging of channels in the southeastern United States from North Carolina through Cape Canaveral, Florida. Biological Opinion, November 25, 1991. 28 pp.

NRC. 1990. National Research Council (USA), Committee on Sea Turtle Conservation. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington DC.

NWS. 1999. National Weather Service. Hurricane Georges Preliminary Storm Report. From the Tropical Atlantic to the United States Virgin Islands and Puerto Rico.

Norrgard, J. 1995. Determination of stock composition and natal origin of a juvenile loggerhead turtle population (*Caretta caretta*) in Chesapeake Bay using mitochondrial DNA analysis. M.S. Thesis, College of William and Mary, Gloucester Point, Virginia. 47 pp.

Norris and Mohl. 1983. Can odontocetes debilitate prey with sound? American Naturalist. 122(1): 85-104.

Ogren, L.H. Biology and Ecology of Sea Turtles. 1988. Prepared for National Marine Fisheries, Panama City Laboratory. September 7.

Oravetz, C. 2001. Personal communication to Eric Hawk, NMFS, St. Petersburg, Fla.

Packard, G.C., M.J. Packard, K. Miller, and T.J. Boardman. 1988. Effects of temperature and moisture during incubation on carcass composition of hatchling snapping turtles (*Chelydra serpentina*). Journal of Comparative Physiology B 158:117-125.

Packard, G.C., M.J. Packard, T.J. Boardman, and MD. Ashen. 1981. Possible adaptive value of water exchange in flexible-shelled eggs of turtles. Science 213:471-473.

Paladino, F.V., M.P. O'Connor, and J.R. Spotila. 1990. Metabolism of leatherback turtles, gigantothermy and thermoregulation of dinosaurs. Nature 344:858-860.

Palsboll, P.J. J. Allen, M. Berube, P.J. Clapham, T.P Feddersen, et al. 197. Genetic tagging of humpback whales. Nature 388: 767-769.

Parsons, J.J. 1962. The green turtle and man. Gainesville, University of Florida Press.

Pater, L.L. 1981. Gun blast far field peak overpressure contours. NSWC TR79-442. Combat Systems Department, Naval Surface Weapons Center, Dahlgren, VA. March.

Peters, J.A. 1954. The amphibians and reptiles of the coast and coastal sierra of Michoacan, Mexico. Occ. Pap. Mus. Zool. 554:1-37.

Philbosian, R. 1976. Disorientation of hawksbill turtle hatchlings (*Eretmochelys imbricata*) by stadium lights. Copeia 1976:824.

Pilling, D. 2000. Captitol Hill Hearing Testimony by Admiral Donald Pilling, February 29.

Plotkin, P.T. 1995. Personal Communication. Drexel University, Philadelphia, Pennsylvania.

Plotkin, P.T., M.K. Wicksten, and A.F. Amos. 1993. Feeding ecology of the loggerhead sea turtle *Caretta caretta* in the Northwestern Gulf of Mexico. Marine Biology 115: 1-15

Plotkin, P. and A.F. Amos. 1990. Effects of anthropogenic debris on sea turtles in the northwestern Gulf of Mexico. *in* R.S. Shomura and M.L. Godfrey (eds.). Proceedings of the Second International Conference on Marine Debris. NOAA Tech. Memo NMFS- SWFSC-154: 736-743.

Plotkin, P. and A.F. Amos. 1988. Entanglement in and ingestion of marine debris by sea turtles by sea turtles stranded along the south Texas coast. The Eighth Annual Workshop on Sea Turtle Conservation and Biology, Fort Fisher, North Carolina.

Prescott, R.L. 1988. Leatherbacks in Cape Cod Bay, Massachusetts, 1977-1987. In: Schroeder, B.A. (compiler). Proceedings of the Eighth Annual Workshop on Sea Turtle Conservation and Biology. NOAA Tech. Memo. NMFS-SEFC-214:83-84.

Pritchard, P.C.H. 1969. Sea turtles of the Guianas. Bull. Fla. State Mus. 13(2):1-139.

Provancha, J. 1998. Annual report for sea turtle nesting in Mosquito Lagoon. Kennedy Space Center Florida.

Provancha, J. 1997. Annual report for sea turtle nesting in Mosquito Lagoon. Kennedy Space Center Florida.

Quantum Resources, Inc. 1994. Florida Power & Light Co., St. Lucie Unit 2 annual environmental operating report. Prepared by Quantum Resources, Inc. for Florida Power & Light Co. Juno Beach, Florida. Vol. 1, 49 pp.

Rankin-Baransky, K.C. 1997. Origin of loggerhead turtles (*Caretta caretta*) in the western North Atlantic as determined by mt DNA analysis. M.S. Thesis, Drexel University, Philadelphia, Penn.

Rebel, T.P. 1974. Sea turtles and the turtle industry of the West Indies, Florida and the Gulf of Mexico. Univ. Miami Press, Coral Gables, Florida.

Rice, D.W. Sperm Whale – *Physeter macrocephalus* Linnaeus, 1758. In: S. H. Ridgway and R. Harrison. Handbook of Marine Mammals. Vol. 4: River Dolphins and the Larger Toothed Whales. Academic Press, London. pp. 177 - 234.

Richardson, J.I. 1982. A population model for adult female loggerhead sea turtles (*Caretta caretta*) nesting in Georgia. Ph.D. Dissertation, University of Georgia, Athens, Georgia, 204 pp.

Richardson, J.I. and T.H. Richardson. 1982. An experimental population model for theloggerhead sea turtle (*Caretta caretta*), pp. 165-174. In K.A. Bjorndal, ed. Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C.

Roden, C.L. and K.D. Mullin. In press. Sightings of cetaceans in the northern Caribbean Sea and adjacent waters, Winter 1995. Carib. J. Sci.

Ross, J.P. and M.A. Barwani. 1982. Review of sea turtles in the Arabian area. In: Bjorndal, K.A. (editor), Biology and Conservation of Sea Turtles. pp. 373-383. Smithsonian Institution Press, Washington, D.C. 1995.

Ryder, C. 1995. Personal Communication. NMFS Northeast Fisheries Science Center.

Sakai, H., Ichihashi, H., Suganuma, H., and R. Tatsukawa. 1995. Heavy metal monitoring in sea turtles using eggs. Marine Pollution Bulletin 30:347-353.

Salmon, M., and J. Wyneken. 1990. Orientation by Swimming Sea Turtles: Role of Photic Intensity Differences While Near-shore. Proceedings of the Tenth Annual Workshop on Sea Turtle Biology and Conservation. NOAA Tech. Memo SEFSC-278. pp: 107-108

Sarti M., L., S.A. Eckert, N. Garcia T., A.R. Barragan. 1996. Decline of the world's largest nesting assemblage of leatherback turtles. Marine Turtle Newsletter 74: 2-5.

Schmidley, D.J. 1981. Marine mammals of the southeastern United States and the Gulf of Mexico. U.S. Fish and Wildlife Service. Office of Biological Services, Washington, DC, FWS/OBS-80/41, 165 pp.

Schmidt, H. 2000. Professor and Acting Head of Ocean Engineering, Massachusetts Institute of Technology. E-mail to Eric Hawk, NMFS, St. Petersburg, Fla.

Schroeder. B.A. 2000. Personal Communication to Anne Meylan, Florida Department of Environmental Protection, FMRI, St. Petersburg, Florida.

Schroeder. B.A. 1995. Personal Communication. Florida Department of Environmental Protection. Tequesta, Florida.

Schroeder, B.A. 1994. Florida index nesting beach surveys: are we on the right track? Pages 132-133 in Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar (compilers). Proceedings of the 14th Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.

Schroeder, B.A., A.M. Foley, B.E. Witherington, and A.E. Mosier. 1998. Ecology of marine turtles in Florida Bay: Population structure, distribution, and occurrence of fibropapilloma. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SEFSC-415:265-267.

Schultz, J.P. 1975. Sea turtles nesting in Surinam. Zoologische Verhandelingen (Leiden), Number 143: 172 pp.

Sears, C.J. 1995. Preliminary genetic analysis of the population structure of Georgia loggerhead sea turtles. Presented at the Fifteenth Annual Symposium of Sea Turtle Biology and Conservation, February 1995, Hilton Head, SC.

Sears, C.J. 1994. Preliminary genetic analysis of the population structure of Georgia loggerhead sea turtles. U.S. Dep. Commer. NOAA Tech. Memo NMFS-SEFSC-351:135-139.

Sears, C.J., B.W. Bowen, R.W. Chapman, S.B. Galloway, S.R. Hopkins-Murphy, and C.M. Woodley. 1995. Demographic composition of the juvenile loggerhead sea turtle (*Caretta caretta*) feeding population off Charleston, South Carolina: evidence from mitochondrial DNA markers. Mar. Biol. 123:869-874.

Shaver, D.J. 2000. Personal communication regarding Head Start turtles nesting on Padre Island, Texas.

Shaver, D.J. 1994. Sea turtle abundance, seasonality and growth data at the Mansfield Channel, Texas. In B.A. Schroeder and B.E. Witherington (compilers), Proceedings of the thirteenth annual symposium on sea turtle biology and conservation, NOAA Tech. Memo NMFS-SEFC-341: 166-169.

Shaver, D.J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology. Vol. 23. 1991.

Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs. 6:43-67.

Simpendorfer, C.A. 2000. Predicting population recovery rates for endangered western Atlantic sawfishes using demographic analyses. Environmental Biology of Fishes 58:371-377.

Simpendorfer, C.A. 2001. Essential habitat of smalltooth sawfish (*Pristis pectinata*). Mote Marine Laboratory Technical Report 786, November 2001. 21pp.

Smith, T.D., J.Allen, P.J. Clapham, S. Katona, F. Larsen, J. Lien, D. Mattila, et al. 1997. An ocean-basin wide mark-recapture study of the North Atlantic humpback whale. Mar. Mammal Sci. 15(1):1-32.

South, C. and S. Tucker. 1991. Personal communication regarding sea turtle nesting in the state of Alabama. U.S. Fish and Wildlife Service, Daphne Field Office, Alabama.

Stanley. K.M., E.K. Stabenau, and A.M. Landry. 1988. Debris ingestion by sea turtles along the Texas Coast. Eighth Annual Workshop on Sea Turtle Conservation and Biology, Fort Fisher, North Carolina.

Standora, E.A., S.J. Morreale, A. Bolten, M.D. Eberle, J.M. Edbauer, T.S. Ryder; and K.L. Williams. 1993 Diving behavior, daily movements, and homing of loggerhead turtles (Caretta caretta) at Cape Canaveral, Florida. March and April 1993. Contr. Report to COE.

Starr-Hillis, Z. 2000. Personal communication to Anne Meylan, Florida Marine Research Institute, FMRI. St. Petersburg, Fla.

Stabenau, E.K. and K.R. Vietti. 1999. Physiological effects of short-term submergence of loggerhead sea turtles, *Caretta caretta*, in TED-equipped commercial fishing nets. Final Report to National Marine Fisheries Service, Pascagoula Laboratory, Pascagoula, Mississippi.

Storelli, M.M., E.Ceci and G.O. Marcotrigiano. 1998. Distribution of heavy metal residues in some tissues of *Caretta caretta* (Linnaeus) specimens beached along the Adriatic Sea (Italy). Bulletin of Enviromental Contamination and Toxicology 60:546-552.

Swingle, W.M., S.G. Barco, T.D. Pitchford, W.A. McLellan, and D.A. Pabst. 1993. Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia. Mar. Mamm. Sci. 9: 309-315.

Teas, W. 2000. NMFS SEFSC, Personal Communication to Eric Hawk, NMFS St. Petersburg, Fla.

Teas, W.G. and A. Martinez. 1992. Annual report of the sea turtle stranding and salvage network Atlantic and Gulf coasts of the United States, January-December 1989.

Thompson, N.B., and H. Huang.1993. Leatherback turtles in southeast U.S. waters. NOAA Tech. Mem. NMFS-SEFSC-318. 11pp.

Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whale ships. Zoologica 19: 1-50.

Turtle Expert Working Group. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

Turtle Expert Working Group. 1998. (Byles, R., C. Caillouet, D. Crouse, L. Crowder, S. Epperly, W. Gabriel, B. Gallaway, M. Harris, T. Henwood, S. Heppell, R. Marquex-M, S. Murphy, W. Teas, N. Thompson, and B. Witherington). An Assessment of the Kemp's ridley sea turtle (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the Western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-409, 96 pp.

Underwood, G. 1951. Introduction to the study of Jamaican reptiles. Part 5. Nat. Hist. Notes Nat. Hist. Soc. Jamaica. 46:209-213.

U.S. Atomic Energy Commission. 1974. Final environmental statement related to construction of St. Lucie Plant Unit 2, Docket No. 50-389. USAEC, Directorate of Licensing. Washington, D.C.

Vargo, S., P. Lutz, D. Odell, E. Van Vleep and G. Bossart. 1986. Final report: Study of effects of oil on marine turtles. Tech. Rep. O.C.S. study MMS 86-0070. Vol. 2, 181pp.

Vicente, V.P. 1993. Spongivory in Caribbean hawksbill turtles, *Eretmochelys imbricata*: data from stranded specimens. Extended abstract for Proceedings: Thirteenth Annual Symposium on Marine Turtle Biology and Conservation. NOAA NMFS, Suite 1108, Banco de Ponce Building, Hato Rey, Puerto Rico 00918.

Wallmeyer, J. 2001. U.S. Navy Environmental Division, USN Southeast Region, Jacksonville, Florida. Personal communication to Eric Hawk, NMFS, St. Petersburg, Fla.

Wallmeyer, J. 2000. U.S. Navy Environmental Division, USN Southeast Region, Jacksonville, Florida. Personal communication to Eric Hawk, NMFS, St. Petersburg, Fla.

Waring, G.T., J.M. Quintal,and S.L. Swartz (Editors). 2000. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-NE-162. November. 303 pp.

Waring, G.T., D.L. Palka, P.J. Clapham, S. Swartz, M. Rossman, T.V.N. Cole, L.J. Hansen, K.D. Bisack, K.D. Mullin, R.S. Wells, and N.B. Barros. 1999. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NMFS-NE-153. October.

APPENDIX A - PERMITS

USACE PERMIT - BIOLOGICAL OPINION:

NMFS GULF REGIONAL BIOLOGICAL OPINION FOR HOPPER DREDGES/BEACH NOURISHMENT (GRBO) (REV 1- 24 JUNE 2005)

28 PAGES

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JUN 24 2005

F/SER3:EH

B Gen Michael J. Walsh, USA
Division Engineer
South Atlantic Division
U.S. Army Corps of Engineers
60 Forsyth Street S.W.
Atlanta, GA 30303-8801

Dear General Walsh:

This letter responds to the U.S. Army Corps of Engineers' (COE), South Atlantic Division (SAD) letter dated September 27, 2004, addressing changes proposed by SAD to the current NOAA's National Marine Fisheries Service (NMFS) regional biological opinion (RBO) authorizing takes of federally listed protected species during COE permitted or authorized hopper dredging in the U.S. Gulf of Mexico (GOM). Your letter contained many of the points brought forth by the COE in our interagency meeting here in St. Petersburg on July 23, 2004. That meeting and your letter addressed various changes to the RBO that the COE would like to have made.

NMFS and the COE – the SAD in particular – have been cooperating since the 1980s to address the problem of sea turtle mortality in hopper dredges used for maintenance and deepening of navigation channels and for sand mining. Great strides have been made since then to reduce drastically the number of endangered and threatened sea turtles killed, while allowing the COE to plan, permit, and carry out dredging in the southeast U.S. with a minimum of bureaucratic authorizations and a maximum of control and certainty. The process has been evolutionary over that period; different turtle conservation measures have been added, removed, or replaced, and sequentially more efficient administrative mechanisms have been introduced. The COE's own research and management efforts and its open cooperation with NMFS have been essential and commendable. I recognize and applaud the COE for the significant past and ongoing investment it makes for sea turtle conservation in the southeast U.S. We also recognize that the COE is a major partner in the conservation of federally-listed species, not only in the Southeast, but across the Nation.

The November 19, 2003, RBO on hopper dredging of navigation channels and borrow areas in the U.S. Gulf of Mexico is the result of the jointly-gained knowledge and experience from working to address sea turtle-hopper dredge interactions. The RBO was shared with the COE in draft form several times over its development. Comments received from the COE during the RBO's drafting were considered and addressed in the final opinion, and text in the RBO specifically addresses several of the points raised in your letter. That history and previous discussion were considered in our evaluation of your requests for changes to the RBO. Our responses to your requests are presented below. Where we concur with your requests, we are amending the RBO to make the necessary changes. We also discuss below additional amendments to the RBO that have been raised during the July 23 meeting or other discussions with the COE. The enclosed Revision No. 1 to the RBO contains revised language amending the November 19, 2003 RBO. Please replace pages 65-81 (Sections 9, 10, and 11) of the GOM RBO with the new pages in the enclosure.

Inclusion of Non-Federal Applicant Dredging Activities

NMFS disagrees that COE-permitted hopper dredging projects be removed from the RBO or segregated from COE-conducted hopper dredging. We believe that would be artificially segregating the cumulative effects of hopper dredging and that addressing COE-permitted and COE-conducted dredging is the best way to ensure the total cumulative effects of hopper dredging in the Gulf of Mexico are accounted for. NMFS considers that the COE, as permitting agency, retains ultimate control and responsibility over hopper dredging projects and their compliance with Endangered Species Act consultation and conservation requirements. Effects to turtles from COE-permitted and COE-conducted hopper dredging are the same. The contractors, equipment, and operations are the same. If regulatory-permit project sea turtle takes are factored out of the existing Gulf-wide incidental take statement, the remaining take level for the COE's civil works will be correspondingly reduced. In addition, the considerable administrative savings in time and certainty resulting from the current coverage of regulatory projects in the RBO would be lost, and significant delays would result from conducting separate, formal consultations on individual regulatory projects. The COE would be required to prepare and submit timely BAs for any new biological opinions that would result from removing non-federal projects from the RBO, and NMFS would require 135 days to prepare each new opinion. Both NMFS and the COE are currently struggling to complete consultations in a thorough and timely manner, with existing staffing and workload; creating additional consultations for projects that are already authorized would therefore seem a very poor decision. Finally, we do not believe that non-federal permit applicants are prejudiced by inclusion of these projects in the RBO, since the per-project effects analyses and terms and conditions to reduce the impacts of hopper dredging for these projects will be the same as those in the RBO (it is highly unlikely there would be drafts of biological opinions for these projects). To the contrary, the existence of the RBO advances the interests of permit applicants, through the certainty and time-savings it provides: consultation with NMFS is not necessary, only the securing of a permit from the COE. Further, the RBO does not predetermine the outcome of any permit application, beyond the application of the terms and conditions to permits the COE chooses to issue: the COE has the authority to deny permit applications or issue permits with additional conditions, as appropriate.

Temperature-Based Windows

NMFS disagrees with moving to the discretionary, Conservation Recommendations section of the GOM RBO the current, non-discretionary requirement (RPM No. 1) that hopper dredging "shall be conducted, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters." The COE's own CPUE data support the fact that sea turtles are taken significantly less frequently in winter months. The GOM RBO's jeopardy analysis conducted by NMFS was based in part on the requirement to conduct hopper dredging during the aforementioned window when sea turtle abundance is lower, resulting in fewer takes. We believe, however, that there is significant flexibility built into the RPM No.1 that enables the COE, when necessary, to hopper dredge outside of the required window, as occurred successfully during recent hopper dredging of the Mississippi River-Gulf Outlet (MR-GO).

Exceptions to the Observer Requirement

Currently, NMFS considers that not enough hopper dredging effort has been observed in Mobile Bay or Mobile Bay Entrance Channel[1] to support the COE Mobile District's request to eliminate or reduce observer coverage there; observer coverage was only instituted there in June 2002.

Sea Turtle Strandings

NMFS disagrees with the COE's request that RPM No. 10 be moved to Conservation Recommendations but agrees that a change in that RPM is warranted. NMFS has revisited its analysis leading to the requirement of potentially counting stranded turtles bearing significant evidence of hopper/bed-leveler dredge interaction as documented takes. NMFS concludes that to count stranded turtles as hopper dredge takes, even if they were indeed hopper dredge takes which is difficult to establish with certainty, would result in double-counting of turtles. Those deaths had been previously accounted for in NMFS' jeopardy analysis. NMFS therefore is revising the language of RPM No. 10 to clarify that, while notification of the stranding network of dredging operations is still required, possible dredge-related strandings will not be counted against the COE's take limit.

Relocation Trawling

NMFS disagrees with moving the requirements for relocation trawling (RPM Nos. 13-15) to Conservation Recommendations. NMFS' jeopardy analysis was predicated on the requirement for relocation trawling. NMFS would have to assume much greater turtle mortality would occur during hopper dredging projects if relocation trawling were a discretionary action on the part of the COE as opposed to a mandated term and condition. NMFS notes that while relocation trawling is a necessary requirement (only if certain conditions are met), RPM No. 14 allows a waiver of part or all of the relocation trawling requirement subject to NMFS approval. None of the four COE districts has yet to request a waiver under RPM No. 14, and the Galveston district has voluntarily opted to require relocation trawling during all its hopper dredging projects. NMFS also notes that NMFS' relocation trawling requirements closely parallel the SAD's own longstanding internal relocation trawling protocol document.

Relocation Trawling Takes

The COE noted that allowing one lethal take from relocation trawling and establishing a limit of 300 trawled turtles per year causes administrative challenges to dredging programs across four districts, and requests clarification as to how one lethal take in a district would affect dredging activities in the other three districts. NMFS wishes to clarify the apparent conflict in the biological opinion regarding authorized take for relocation trawling. The biological opinion estimated that up to 300 sea turtles and eight Gulf sturgeon could be captured non-injuriously by the COE's Gulf-wide relocation trawling activities each fiscal year, and that an additional 2 ("0 to 2") sea turtles and 1 ("0 to 1") Gulf sturgeon could be killed or injured each year during these relocation activities. These lethal or injurious takes are in addition to the harmful takes anticipated to result from hopper dredging. NMFS did not choose to separate the 300 authorized,

[1] A dead floating loggerhead was documented by REMSA observers while the hopper dredge was transiting from the Entrance Channel to the disposal site (REMSA Mobile Harbor Entrance Channel project ESO Report, Jan. 2005)

trawl captured turtles between districts because the history of relocation trawling shows great variability between projects in the number of turtles captured. In addition, because lethal or injurious take by relocation trawling of either turtles or Gulf sturgeon is expected to be so rare it would not result in numbers sufficient to produce district-specific allocations of these takes. The districts may agree among themselves to a division of the relocation trawling takes, harmful and non-harmful, and manage these totals between themselves, only notifying NMFS for reinitiation of consultation once either Gulf-wide total take limit is exceeded. Please see additional, related discussion below under Dredging/Trawling Operations During Reinitiation of Consultation.

Tissue Samples and Funding of Genetic Analyses
NMFS disagrees that the requirement of RPM No. 15(l) to collect and genetically analyze tissue samples of turtles should be revised and downgraded to a discretionary conservation recommendation. NMFS' arguments for tissue sampling requirement are presented on p.53 and pp.70-71 of the GOM RBO. Tissue sampling is performed to genetically determine the likely nesting beach or subpopulation identity of captured sea turtles to monitor the effects of hopper dredging on sea turtle populations. This is a proper application of Reasonable and Prudent Measures in a biological opinion; the ESA provides that RPMs be used to confirm the validity of a biological opinion through monitoring. While this type of genetic analysis is a relatively new tool, it is now a common and well scientifically established one.

However, NMFS does agree with Dr. Dena Dickerson of the COE's ERDC that the sampling requirement should be refined further so that specific species, or areas, or seasons may be targeted for sampling, rather than the cruder, current requirement to simply sample the first 300 turtles captured or killed in various projects. NMFS also agrees that the COE should be able to contract with other reputable laboratories to do the genetics analyses if it so desires. Methods and output of those analyses for sea turtles must be consistent, however, with the standard of the NMFS SWFSC. The text of RPM No. 15(m) is modified accordingly.

Handling Fibropapillomatose Turtles
NMFS agrees that the language in RPM No. 15(p) is unclear and that sampling of fibropapilloma tumors should not be required through the RBO. Observers must necessarily handle all trawl or dredge-caught turtles including fibropapillomatose turtles, however, and reasonable measures to prevent exposure of other turtles to potential fibropapilloma vectors are maintained. The text of RPM No. 15(p) is modified accordingly.

Hardground Buffer Zones
NMFS disagrees that RPM No. 16, which specifies a 400-ft buffer zone between any hopper dredging activity and significant hardground habitats, be modified to allow more flexibility in its implementation and be moved to the discretionary Conservation Recommendation section. Sea turtles are often associated with hardgrounds in proximity to sand mining sites. Therefore, NMFS believes reducing the likelihood of sea turtle takes by ensuring a reasonable separation is maintained between the turtles and the dragheads is an appropriate Reasonable and Prudent Measure. A 200-ft buffer as requested by the COE requires feats of navigation that are not consistently attainable by helmsmen piloting the heavily-laden vessels dragging two large suction dragheads across sometimes irregular bottom in sea conditions varying from flat calm to 10-ft swells. The EAGLE 1/Key West channel dredging incident last summer clearly bears this

statement out. The 400-ft separation distance provides the additional benefit of protecting hardgrounds that may serve as foraging habitat for sea turtles from the probable adverse effects of sedimentation from the dredged material plume. NMFS reiterates that this restriction applies only if *significant* hardgrounds are present. The current requirement appears to be working as planned; the Venice/Sarasota County Beach Renourishment Project mentioned in your letter is a good example.

Dredging/Trawling Operations During Reinitiation of Consultation

Although you did not raise it directly in your letter, one of the COE's underlying concerns appears to be the impact of automatic suspension of dredging or trawling operations if the District-specific take levels specified in the incidental take statement are exceeded. Since the signing of the RBO, NMFS has had several discussions with various COE districts on this issue and given advice on how to proceed in the event of take levels approaching the authorized levels. Those discussions led us to conclude that the language on reinitiation of consultation in Section 11 of the RBO requires revision. First, NMFS has determined that exceedance of District-specific take levels should not automatically trigger the need for reinitiated consultation, since the jeopardy analyses are based on total Gulf-wide takes. Moreover, takes in excess of the Gulf-wide authorized level of take are not illegal takes and dredging or trawling need not stop so long as the COE is complying with the RPMs and Terms and Conditions of the Incidental Take Statement, and so long as continuing the activity would not violate sections 7(a)(2) (ensuring that actions do not jeopardize a listed species) and 7(d) (prohibition on irreversible and irretrievable commitments of resources) of the ESA. If a district has to continue operations that are likely to result in exceedance of any of the Gulf-wide authorized take levels, the responsible district should prepare documentation explaining its compliance with those requirements and should seek NMFS' concurrence.

Gulf-Wide Take Levels and Take Sharing by Districts

There has been some discussion of NMFS' proposition to allow the COE's GOM districts to share with each other some or all of their authorized protected species takes, if the affected districts agree to such an action. NMFS believes there is no biological difference to the species (Gulf sturgeon and sea turtles) and the GOM RBO's jeopardy analysis remains valid even if the previously analyzed level of take that was established/anticipated in that opinion comes all from one district or is spread out among districts. Thus, the reinitiation trigger is more appropriately tied to Gulf-wide estimated take levels. The ability to share authorized takes between districts will greatly reduce the risk of take exceedance and the need for reinitiation of consultation. Section 9 of the RBO is revised by adding a new analysis explaining and justifying take sharing and a new, RPM No. 19, detailing the procedures and restrictions placed upon it. This is intended to increase the COE's flexibility in conducting its operations while complying with the incidental take statement.

Conclusion

The new, enclosed text revises some of the language in the GOM RBO. We are providing replacement text for all the affected sections, so there will be no confusion in trying to read two separate documents together. For additional clarity, the modified sections of text are underlined. The amended document, its conclusions, and incidental take statement constitute NMFS biological opinion on GOM hopper dredging, effective as of the date of this letter. The revised

Reasonable and Prudent Measures and terms and conditions of the GOM RBO continue to be non-discretionary and must be implemented by the COE's GOM districts for the protection of section 7(o)(2) to apply. None of the changes affect the basis for the jeopardy analyses in the RBO and therefore do not change our no-jeopardy conclusions.

We welcome the frank discussions we have had with the COE both during the drafting of the GOM RBO and in subsequent meetings and discussions leading to the present, attached revisions. I hope that our responses, plus the existing discussion in the RBO, have contributed to a better understanding of why we disagree with some of the other changes requested by the COE, at least until new information dictates a re-analysis of the situation.

As we continue to try to move forward with improving the conservation value and administrative efficiency of managing sea turtle-hopper dredge interactions, I believe our time and efforts would now be better spent if the COE were to start gathering information to enable crafting the replacement biological opinion to the 1995/1997 RBO regarding hopper dredging operations in the South Atlantic, rather than further debate on the GOM RBO. Consultation on the 1995/1997 RBO should be reinitiated immediately for a number of important reasons. Since consultation was last concluded in September 1997, smalltooth sawfish and Johnson's seagrass have been listed; critical habitat for Johnson's seagrass has been designated; and elkhorn and staghorn coral have been proposed for listing. Significant new information on the factors affecting sea turtles and right whales and the status of those species has also arisen in that time. Finally, the 1995/1997 RBO states, "The authorization for these incidental takes expires on August 31, 2000." NMFS is concerned that these factors may make the RBO, and the COE's hopper dredging operations conducted under its authorization, legally vulnerable. Preparation of a new South Atlantic RBO could also give the COE more flexibility to enable it to better accomplish its mission requirements and better protect listed species, for example, by providing authorization for relocation trawling, which is currently not authorized in the 1995/1997 RBO.

We appreciate all the COE's past and ongoing conservation efforts during hopper dredging activities in the Gulf and South Atlantic, and look forward to the continuation of our collaborative efforts to conserve protected species. My staff point of contact for issues related to your requested changes of the GOM RBO is Mr. David Bernhart, Assistant Regional Administrator for Protected Resources. He may be reached at (727) 824-5312. To discuss reinitiation of consultation on the South Atlantic RBO, please contact Mr. Eric Hawk, ESA Section 7 Coordinator, at the same number.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

cc: F/PR3
File: 1514-22.f.1 GOM, SAD
Ref: F/SER/2004/02187

Revision No. 1 to November 19, 2003, Gulf of Mexico Regional Biological Opinion (GOM RBO) on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico

The following replaces and supersedes the corresponding sections on pages 65-81 (Sections 9, 10, and 11) of the November 19, 2003, GOM RBO. New or revised text or paragraphs are identified by underline.

9.0 Reasonable and Prudent Measures

Regulations (50 CFR 402.02) implementing section 7 of the ESA define reasonable and prudent measures as actions the Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take. The reasonable and prudent measures that NOAA Fisheries believes are necessary to minimize the impacts of hopper dredging in the Gulf of Mexico have been discussed with the COE and include use of temporal dredging windows, intake and overflow screening, use of sea turtle deflector dragheads, observer and reporting requirements, and sea turtle relocation trawling. The following reasonable and prudent measures and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent section 7 consultation.

Seasonal Dredging Windows, Observer Requirements, Deflector Dragheads, and Relocation Trawling[1]

Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Current regional opinions for hopper dredging require seasonal dredging windows and observer monitoring requirements, deflector dragheads, and conditions and guidelines for relocation trawling, which NOAA Fisheries' believes are necessary to minimize effects of these removals on listed sea turtle species that occur in inshore and nearshore Gulf and South Atlantic waters.

Temperature- and date-based dredging windows:

Both the Mobile and Jacksonville Districts expressed comments opposing NOAA Fisheries' imposition of seasonal dredging windows in their respective Gulf of Mexico dredging areas. In their November 28, 2000, BA on their Florida west coast hopper dredging activities, the Jacksonville District indicated that sea turtles are present year-round in the Gulf, so windows would only be of limited effectiveness. In their October 30, 2002, comments to NOAA Fisheries, the Mobile District noted it did not want to be restricted to seasonal hopper dredging windows, indicating that these would potentially seriously and detrimentally impact its ability to complete its operations and maintain Federal navigation projects due to "no excess of large dredges of the type required to perform maintenance of most Federal projects" and other reasons

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[1]The COE Wilmington District's sidecast dredges FRY, MERRITT, and SCHWEIZER, and split-hull hopper dredge CURRITUCK, are exempt from the above hopper dredging requirements (operating windows, deflectors, screening, observers, reporting requirements, etc.). Their small size and operating characteristics including small draghead sizes [2-ft by 2-ft, to 2-ft by 3-ft], small draghead openings [5-in by 5-in to 5 in by 8 in], small suction intake pipe diameters [10-14 in], and limited draghead suction [350-400 hp]) have been previously determined by NOAA Fisheries to not adversely affect listed species (March 9, 1999, ESA consultation with COE Wilmington District, incorporated herein by reference). The aforementioned vessels and commercial hopper and sidecast dredges of the same or lesser sizes and operating characteristics working in the Gulf of Mexico would be considered similarly exempt by NOAA Fisheries' SERO after consultation with SERO.

related to dredging industry capacity, downsizing, "loss of production" associated with the deflector draghead, and safety concerns.

Sea turtles generally move inshore with warming waters and offshore with cooling waters. In East Coast channels, Dickerson et al. (1995) found reduced sea turtle abundance with water temperatures less than 16°C. They found that 1,008 trawls conducted at or below 16°C captured 22 turtles (4.4 percent), while 1,791 trawls conducted above 16°C resulted in 473 (95.6 percent) captures. Dickerson et al. also found that sea turtles tend to avoid water temperatures less than 15°C; however, hopper dredging Kings Bay, Georgia between March 1-12, 1997 with surface water temperatures of 57-58°F (13.9-14.4°C) resulted in 11 turtle takes in nine days (NMFS 1997).

More recently, the Savannah District COE (COE 2003) reported that the average surface temperature at which recent hopper dredge turtle takes have occurred in Brunswick is 57.7°F (14.3°C) and that "there are scattered takes at lower temperatures than turtles would normally be expected to occur" but that "These lower temperatures may not have played a significant role in those takes." The lowest temperature at which multiple takes have occurred in Brunswick in 2003 is 57°F (13.9°C).

Recognizing the relationship between water temperature and sea turtle presence and based on work by the NOAA Fisheries' Galveston Laboratory (Renaud et al. 1994, 1995) funded by the COE, NOAA Fisheries wrote in its September 22, 1995 RBO to the Galveston and New Orleans Districts that sea turtles might be taken by hopper dredges "in all ship channels in the northern Gulf when temperatures exceed 12°C," and that "Lacking seasonal water temperature data, NMFS believes takes may occur from April through November northeast of Corpus Christi, Texas." Consequently, Term and Condition No. 3 of the 1995 RBO required that observers be aboard hopper dredges year-round from Corpus Christi southwest to the Mexican border, but "If no turtle take is observed in December, then observer coverage can be terminated during January and February or until water temperatures again reach 12°C." It also required that "In channels northeast of Corpus Christi (except for MR-SWP), observers shall be aboard whenever surface water temperatures are 12°C or greater, and/or between April 1 and November 30."

NOAA Fisheries published a final rule (67 FR 71895, December 3, 2002) effective January 2, 2003, to reduce the impact of large-mesh gillnet fisheries on the Atlantic Coast on sea turtles. This rule was directed primarily at the monkfish fishery, which uses large-mesh gillnet gear and operates in the area when sea turtles are present. The rule reduces impacts on endangered and threatened species of sea turtles by closing portions of the Mid-Atlantic Exclusive Economic Zone (EEZ) waters to fishing with gillnets with a mesh size larger than 8-inch (20.3-cm) stretched mesh. The timing of the restrictions was based upon an analysis of sea surface temperatures for the above areas. Sea turtles are known to migrate into and through these waters when the sea surface temperature is 11°C or greater (Epperly and Braun-McNeill 2002). The January 15 date for the re-opening of the areas north of Oregon Inlet, North Carolina to the large-mesh gillnet fisheries was also based upon the 11°C threshold and is consistent with the seasonal boundary established for the summer flounder fishery-sea turtle protection area (50 CFR

223.206(d)(2) (iii)(A)). In summary, NOAA Fisheries believes that the 11°C threshold established to protect East Coast sea turtles is reasonable and prudent to protect sea turtles in the Gulf of Mexico from hopper dredging operations.

Temperature- and date-based dredging windows appear to have been very effective in reducing sea turtle entrainments. Observer requirements and monitoring including assessment and relocation trawling have provided valuable real-time estimates of sea turtle abundance, takes, and distribution which have been helpful to COE project planning efforts. Evidence that the windows and observer requirements are effective and valuable is that neither the Galveston or New Orleans District's hopper dredging projects have exceeded their anticipated incidental takes since their combined RBO was issued in 1995; SAD has not exceeded its anticipated incidental take since its RBO was amended in 1997.

NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many projects; however, screening is only partially effective and observed, documented takes provide only partial estimates of total sea turtle and Gulf sturgeon mortality. NOAA Fisheries believes that some listed species taken by hopper dredges go undetected because body parts are forced through the sampling screens by the water pressure and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed. The only mortalities that are documented are those where body parts either float, are large enough to be caught in the screens, and can be identified as from sea turtle or sturgeon species. However, this Opinion estimates that with 4-inch inflow screening in place, the observers probably detect and record at least 50% of total mortality.

Relocation trawling has proved to be a useful conservation tool in most dredging projects where it has been implemented. The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries (Amendment No. 1, June 13, 2002) to change the Conservation Recommendation to a Term and Condition of the RBO. Overall, it is NOAA Fisheries' opinion that the COE Districts choosing to implement relocation trawling have benefitted from their decisions. For example, in the Galveston District, Freeport Harbor Project (July 13-September 24, 2002), assessment and relocation trawling resulted in one loggerhead capture. In Sabine Pass (Sabine-Neches Waterway), assessment and relocation trawling in July-August 2002 resulted in five loggerhead and three Kemp's ridley captures. One turtle was killed by the dredge; this occurred while the relocation trawler was in port repairing its trawl net (P. Bargo, pers. comm. 2002). In the Jacksonville District, sea turtles have been relocated out of the path of hoppers dredges operating in Tampa Bay and Charlotte Harbor or their entrance channels. During St. Petersburg Harbor and Entrance Channel dredging in the fall of 2000, a pre-dredging risk assessment trawl survey resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. In February 2002 during the Jacksonville District's Canaveral Channel emergency hopper dredging project for the Navy, two trawlers working around the clock captured and relocated 69 loggerhead and green turtles in seven days, and no turtles were entrained by the hopper dredge. In the Wilmington District's Bogue Banks Project in North Carolina, two trawlers successfully relocated five turtles in 15 days between March 13 and 27, 2003; one turtle was taken by the dredge. Most recently, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released (with three recaptures) in three months of dredging and relocation trawling. Five turtles were killed by the dredge. No turtles were killed after relocation trawling was increased from 12 to 24 hours per day (Trish Bargo, October 27, 2003, pers. comm. to Eric Hawk).

This Opinion authorizes the per-fiscal-year non-lethal non-injurious take (minor skin abrasions resulting from trawl capture are considered non-injurious), external flipper-tagging, and taking of tissue samples of 300 sea turtles and eight Gulf sturgeon in association with all relocation trawling conducted by the COE throughout the Gulf of Mexico. This take shall not be broken down by District but rather is a Gulf-wide take limit. This take is limited to relocation trawling conducted during the 0-3 days immediately preceding the start of hopper dredging (as a means to determine/reduce the initial abundance of sea turtles in the area and determine if additional trawling efforts are needed), and during actual hopper dredging. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this Opinion.

NOAA Fisheries estimates that 0-2 turtles and 0-1 Gulf sturgeon will be killed or injured annually pursuant to annual relocation trawling in the Gulf of Mexico. <u>These Gulf-wide take levels **are in addition to** the harmful takes estimated to result from hopper dredging. In Section 7 of this opinion, NMFS conducted its jeopardy analyses based on the anticipated, documented lethal take across the GOM per fiscal year (i.e., by the combined districts) of 4 Gulf sturgeon and 40 loggerhead, 20 Kemp's ridley, 14 green, and 4 hawksbill sea turtles; 300 turtle and 8 Gulf sturgeon captures (non-injurious takes) by relocation trawling, and an additional 0-2 turtles and 0-1 Gulf sturgeon injured or killed during relocation trawling. NMFS has determined that it would not alter the jeopardy analyses if the total number of individuals of all the species authorized to be taken by the combined GOM districts (i.e., combined hopper dredge takes or combined relocation trawling takes) are taken all by one district in one fiscal year, or are taken across all 4 districts across the fiscal year. NMFS has determined that no individual species population will be unduly impacted if, for example, all 40 authorized, documented loggerhead takes were to occur in any one of the 4 GOM districts, rather than across all districts, the Mobile district were to take all 4 Gulf sturgeon, or all 20 green turtle takes occurred in the Galveston district. None of the species analyzed in the opinion for which takes have been authorized – turtles and Gulf sturgeon – have sub-populations that would be believed to be disproportionately adversely affected if all the takes came from one district versus another district.</u>

<u>Consequently, the district-specific take levels specified above shall constitute *initial* allocations, based on the COE's desire to have separate take allotments for each district. Districts that exceed their initial allocations may borrow takes from other districts, without adversely affecting listed species. However, if any district exceeds its initial allocation and continues operations using borrowed takes, that district should notify NMFS so NMFS can analyze why the district's anticipated take levels were exceeded. Also, the COE would need to tell NMFS which district</u>

<u>the takes are being re-allocated from. NMFS does not believe that inter-district take sharing will result in significantly increased take levels by district, since each district will still want to conservatively manage its protected species allotment to ensure its ability to complete its own hopper dredging requirements. Nevertheless, NMFS will monitor for such a possibility. Take sharing restrictions are described in R&PM No. 19.</u>

Deflector Dragheads
V-shaped, sea turtle deflector dragheads prevent an unquantifiable yet significant number of sea turtles from being entrained and killed in hopper dredges each year. Without them, turtle takes during hopper dredging operations would unquestionably be higher. Draghead tests conducted in May-June 1993 by the COE's WES in clear water conditions on the sea floor off Fort Pierce, Florida, with 300 mock turtles placed in rows, showed convincingly that the newly-developed WES deflector draghead "performed exceedingly well at deflecting the mock turtles." Thirty-seven of 39 mock turtles encountered were deflected, two turtles were not deflected, and none were damaged. Also, "the deflector draghead provided better production rates than the unmodified California draghead, and the deflector draghead was easier to operate and maneuver than the unmodified California flat-front draghead." The V-shape reduced forces encountered by the draghead, and resulted in smoother operation (WES, Sea Turtle Project Progress Report, June 1993)." V-shaped deflecting dragheads are now a widely accepted conservation tool, the dredging industry is familiar with them and their operation, and they are used by all COE Districts conducting hopper dredge operations where turtles may be present, with the exception of the Mobile District.

In Gulf of Mexico coastal waters, evidence indicates that turtles are present year-round, further arguing for year-round deflector draghead use by all COE Districts of the Gulf of Mexico. Recent comprehensive NOAA Fisheries' Southeast Fishery Science Center (SEFSC) review and analyses (unpublished data, December 2002: Environmental Assessment/Regulatory Impact Review of Technical Changes to the Turtle Excluder Device (TED) Regulations to Enhance Turtle Protection in the Southeastern United States) of seasonal sea turtle distribution and strandings throughout the Gulf of Mexico (including coastal waters dredged by the Mobile District) noted that "Aerial surveys and observer data have indicated the presence of turtles in areas where strandings data are sparse" and "Turtles were in all areas at all times." (September 13, 2002, e-mail, Epperly to Hawk). NOAA Fisheries' SEFSC's sea turtle team leader Epperly also recommended against hopper dredges operating in those same areas "without monitoring, relocation, and specialized gear (i.e., deflectors) on the dragheads."

It wasn't until late-summer 2002 that the Mobile District started requiring observers and screening on its hopper dredges. REMSA recently completed ten days of 24-hr relocation trawling/dredged material monitoring for the Mobile District during ten days of emergency maintenance hopper dredging of the Mobile Bay ship channel (July 10-20, 2003). No sea turtle specimens or parts of specimens were observed during the ten days by either the relocation trawler observers or the shipboard dredge observers. Dredging is currently conducted in the Mobile District with onboard observers and 4-inch inflow screening but without deflector dragheads (Ladner, pers. comm. to Hawk, November 26, 2002). Mobile District, in written comments dated October 30, 2002, on a draft version of the present Opinion, noted that "The District recognizes the benefits of deflector dragheads to conservation of the species in areas where sea turtle takes occur. However, dragheads reduce dredging efficiency and result in dredges being onsite for a longer period of time. Consequently, the District finds no overriding need to utilize deflectors until it is proven, through use of screens and observers, that the Mobile District actually takes sea turtles during normal operations."

Habitat Protection Buffers

COE Jacksonville District biologists expressed concern (Yvonne Haberer, email to Eric Hawk, April 2003; Terri Jordan, pers. comm. August 11, 2003) over a NOAA Fisheries' draft version of the current Opinion proposed requirement of a 200-m buffer zone around hardgrounds in the vicinity of COE-proposed sand mining areas off Florida. In discussions over the Pinellas County Shore Protection Project, the COE noted that NOAA Fisheries has previously required only a 200-ft zone around hardgrounds adjacent to COE sand mining operations in the Gulf of Mexico. NOAA Fisheries' Protected Resources Division consulted with NOAA Fisheries Habitat Conservation Division, which stated that as a general rule, buffer zones should not be less than 400 feet to protect essential fish habitat. In its response to the COE, which included a request for additional information (Eric Hawk email to Yvonne Haberer, May 14, 2003) which was never received, NOAA Fisheries' Protected Resources Division concluded that a 200-ft buffer was inadequate and that a 200-meter buffer zone was appropriate to protect sea turtles which may be foraging on or around hardgrounds adjacent to mining sites from hopper dredge entrainment. NOAA Fisheries noted that hopper dredge vessels are large (typically 300-400 ft long); limited in their ability to maneuver; and given other variable factors such as wind, tide, weather, sea state, currents, operator fatigue, operator error, and instrument error, a 200-ft margin of safety around hardgrounds was inadequate to protect NOAA Fisheries trust resources and sea turtles which could be expected to frequent hardgrounds and their vicinity. Subsequently, however, conversations with hopper dredge industry officials and dredge operators have led NOAA Fisheries to conclude that based on advances in hopper dredge construction, including the use of highly maneuverable Z-drives (on some dredges), enhanced station-keeping ability, and industry-standard navigation practices and technologies including routine use of differential global positioning systems (DGPS), dredge operators will be able to routinely and safely maintain desired safe distances from hardgrounds that are marked on their charts (E. Hawk, August 14 and 18, 2003, pers. comms. with R. Richardson, Manson Dredging; Mark Sickles, Dredge Contractors of America; and W. Murcheson, NATCO Dredging). NOAA Fisheries has determined that 400 feet is an adequate, reasonable buffer zone that should be maintained around hardgrounds, to protect endangered living resources, i.e., sea turtles that may be foraging in their vicinity. Four hundred feet also provides the additional benefit of protecting hardgrounds from some of the probable adverse effects of sedimentation from the dredged material plume. For example, a generic test case numerical model simulation of a typical situation representative of hopper dredging of MMS shoals using the Trailing Suction Hopper Dredge Plume Model developed by Baird, Inc., for MMS, using inputted variables of a cross current of 20 cm/s, fine sand, two million cubic meter project, and a water depth of about 15 to 20 m, gave a sedimentation footprint of 200 m beyond the boundary of the dredge area (Rob Nairn, October 3, 2003, pers. comm. to Eric Hawk).

Summary
NOAA Fisheries has carefully reviewed and fully considered these and all other comments received from the affected COE Districts; however, in summary, after review of WES studies, SEFSC survey data, and based on past experience, NOAA Fisheries believes that seasonal dredging windows, deflector dragheads, observer and screening requirements, and relocation trawling have proved convincingly over the last decade to be an excellent combination of reasonable and prudent measures for minimizing the number and impact of sea turtle takes, enabling NOAA Fisheries to assess the quantity of turtles being taken, and allowing the affected COE Districts (Wilmington, Charleston, Savannah, Jacksonville, New Orleans, and Galveston) to meet their essential dredging requirements to keep Federal navigation channels open.

There are increased costs associated with observers and relocation trawling (current estimates are \$3,500-\$5,000/day for 24 hours of relocation trawling, \$150-\$200/day for a hopper dredge endangered species observer); delays sometimes occur, particularly when two turtles are taken in 24 hours, or when clay-like materials clog the inflow screening boxes; and dredging projects may take longer to complete. However, overall, NOAA Fisheries believes that loss of production associated with the deflector draghead is insignificant, while saving significant numbers of sea turtles from almost-certain death by dismemberment in suction dragheads; increased production costs, including costs of observers and relocation trawlers, pale in comparison to overall project costs; and NOAA Fisheries' experience over the past decade with the COE's SAD Districts and the Gulf of Mexico's Galveston and New Orleans Districts has shown that Federal hopper dredging projects get completed in a timely fashion. Also, allowable overdredging by the COE reduces to some degree the need for frequent maintenance dredging, and the conservation measures required by the biological opinions in place result in significantly reduced dredge interactions, usually fatal, with sea turtles.

NOAA Fisheries considers that PIT tagging, external flipper tagging, and tissue sampling of turtles captured pursuant to relocation trawling, including genetic analysis of tissue samples taken from dredge- and trawl-captured turtles, will provide benefits to the species by providing data which will enable NOAA Fisheries to make determinations on what sea turtle stocks are being impacted, and how that may change over time as the population growth rates change among the different stocks (Sheryan Epperly, pers. comm. to Eric Hawk).

<u>NMFS and COE shall jointly develop and implement a Sampling and Analysis Plan for the collection and genetic analysis of sea turtle tissue samples that will provide information on the nesting or subpopulation identity of sea turtles being captured across the Gulf of Mexico, in order to validate the assumptions underlying the analysis of the effects of hopper dredging on sea turtles. NOAA Fisheries initially estimates that up to 340 sea turtle tissue samples may be taken annually in the Gulf of Mexico during COE dredging and relocation trawling operations, but the final total number of yearly samples, number of samples per species, distribution of samples across dredging locations in the Gulf of Mexico, and genetic and statistical analyses of samples will be determined in the Sampling and Analysis Plan.</u>

There are several alternatives for funding the genetic sampling and analysis. COE funds may be provided to NOAA Fisheries' Southwest Fisheries Center's Dr. Peter Dutton, preferably in a lump-sum, one-time payment as a part of a Memorandum of Understanding (MOU) to be developed between Dr. Dutton and the COE's combined Gulf of Mexico Districts (similar to the current MOU nearing completion between the COE's South Atlantic Division and the Southwest Fisheries Science Center for hopper dredging/relocation trawling conducted by the South Atlantic Divisions four Atlantic Districts). Alternatively, the COE may conduct the analyses at their facilities. Another alternative is for the COE to contract out the sample analyses to independent laboratory(s) outside of NMFS and the COE. Inclusion of this sampling and analysis requirement as a reasonable and prudent measure of this Opinion will result in the gathering of knowledge that will test the assumptions underlying the effects analyses of the Opinion, and may be helpful in reducing the effect of the takes from Gulf of Mexico dredging projects.

The dredging windows set forth in the terms and conditions of the 1995 Gulf of Mexico hopper dredging RBO, while very strongly encouraged by NOAA Fisheries for previously stated reasons, were ultimately discretionary activities by the COE and could be deviated from by the SAD or the Galveston or New Orleans Districts when they deemed essential or necessary after consultation with NOAA Fisheries, though this was infrequent. This flexibility is also stipulated in the Proposed Action section of the present Opinion, which applies to all four COE Districts. Terms and conditions of the present Opinion remain largely the same, with the following significant exceptions:

1) The allowable window for hopper dredging has been extended to include the Mobile and Jacksonville Districts so that the December-March window is now Gulf-wide, from the Texas-Mexico border to Key West channels.

2) Previous temperature requirements of Term and Condition No. 3 of the 1995 RBO (i.e., "If no turtle take is observed during December, observer coverage can be terminated during January and February or until water temperatures again reach 12°C; In channels northeast of Corpus Christi, Texas [except for Southwest Pass as discussed below], observers shall be aboard whenever surface water temperatures are 12°C or greater, and/or between April 1 and November 30.") have been modified downward to 11°C based on new sea turtle distribution information which indicates that sea turtles are more tolerant of cold than was previously thought. The discussion of temperature/sea turtle distribution supporting this change is incorporated herein by reference to the Monkfish Biological Opinion (dated April 14, 2003, prepared by NOAA Fisheries Northeast Region).

3) The September 22, 1995, RBO included a Conservation Recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NOAA Fisheries SER (Amendment No. 1, June 13, 2002), to change the Conservation Recommendation to a Term and Condition of the RBO. Term and Condition No.

10 of the amended RBO specified conditions under which relocation trawling "should be considered" and subject to what precautions it should be carried out, and authorized unlimited non-lethal, non-injurious take of sea turtles and Gulf sturgeon in association with relocation trawling deemed necessary the by COE. This amount of discretion has since been determined to be inappropriate for a non-discretionary term and condition of an ITS. Thus, the present Opinion's requirement for relocation trawling is more non-discretionary than as written in Amendment No. 1 in that it **requires** the use of relocation trawlers under specific conditions as a way to minimize turtle interactions, rather than only requiring that it be "considered" by the COE.

4) In the present Opinion, the COE Districts are authorized to request waivers from the relocation trawling requirement (which may be delivered and responded to by both agencies via electronic mail) for projects where the COE Districts do not feel relocation trawling is feasible, necessary or warranted.

5) The Districts are required to fund the cost of tissue sampling and genetic analyses of tissue samples from turtles taken during projects in their respective Districts.

The following terms and conditions implement the reasonable and prudent measures discussed above:

Terms and Conditions

1. *Hopper Dredging*: Hopper dredging activities in Gulf of Mexico waters from the Mexico-Texas border to Key West, Florida up to one mile into rivers shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters. Hopper dredging of Key West channels is covered by the existing August 25, 1995, RBO to the COE's SAD. The COE shall discuss with NOAA Fisheries why a particular project cannot be done within the December 1-March 31window.

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (No.9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NOAA Fisheries-approved observers to be aboard the hopper dredges to monitor the hopper spoil, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NOAA Fisheries-approved observers are *not* required, (as delineated in No. 4 above), the appropriate COE District must:
a. Advise inspectors, operators and vessel captains about the prohibitions on taking, harming, or harassing sea turtles

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the COE if sea turtles or whales are seen in the vicinity.

c. Notify NOAA Fisheries if sea turtles are observed in the dredging area, to coordinate further precautions to avoid impacts to turtles.

d. Notify NOAA Fisheries immediately by phone (**727/824-5312**) or fax (**727/824-5309**) if a sea turtle or Gulf sturgeon is taken by the dredge.

6. *Screening*: When sea turtle observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100% overflow screening is then required. NOAA Fisheries must be consulted **prior** to the reductions in screening, and an explanation must be included in the dredging report.

a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the COE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case **effective** 100% overflow screening is mandatory. The COE shall notify NOAA Fisheries **beforehand** if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

b. Need for Flexible, Graduated Screens: NOAA Fisheries believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7. *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed to NOAA Fisheries' Southeast Regional Office (727-570-5517) by onboard endangered species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

   A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

   An annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle Strandings*: The COE Project Manager or designated representative shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle/sturgeon strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

Information on any such strandings shall be reported in writing within 30 days of project end to NOAA Fisheries' Southeast Regional Office. Because the deaths of these turtles, if hopper dredge or bed-leveler dredge-related, have already been accounted for in NMFS' jeopardy analysis, and because of different possible explanations for, and subjectivity in the interpretation of potential causes of strandings, these strandings will not be counted against the COE's take limit.

11. *Reporting - Strandings*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NOAA Fisheries' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

13. *Conditions Requiring Relocation Trawling*: Handling of sea turtles captured during relocation trawling in association with hopper dredging projects in Gulf of Mexico navigation channels and sand mining areas shall be conducted by NOAA Fisheries-approved endangered species observers. Relocation trawling shall be undertaken by the COE at all projects where any of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

a. Two or more turtles are taken in a 24-hour period in the project.

b. Four or more turtles are taken in the project.

c. 75% of a District's sea turtle species initial take allocation for a particular species has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to NOAA Fisheries a waiver of part or all of the relocation trawling requirements. NOAA Fisheries will consider these requests and decide favorably if the evidence is compelling.

15. *Relocation Trawling - Annual Take Limits*: This Opinion authorizes the annual (by fiscal year) non-injurious take of 300 sea turtles (of one species or combination of species) and 8 Gulf sturgeon, and lethal or injurious takes of up to 2 sea turtles and 1 Gulf sturgeon annually, by duly-permitted, NOAA Fisheries-approved observers in association with all relocation trawling conducted or contracted by the four Gulf of Mexico COE Districts to temporarily reduce or assess the abundance of these listed species during (and in the 0-3 days immediately preceding) a hopper dredging project in order to reduce the possibility of lethal hopper dredge interactions, subject to the following conditions:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *Handling During Trawling*: Sea turtles and sturgeon captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix IV).

c. *Captured Turtle Holding Conditions*: Captured turtles shall be kept moist, and shaded whenever possible, until they are released.

d. *Weight and Size Measurements*: All turtles shall be measured (standard carapace measurements including body depth) and tagged, and weighed when safely possible, prior to release; Gulf sturgeon shall be measured (fork length and total length) and—when safely possible—tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NOAA Fisheries-approved observers or observer candidates in training under the direct supervision of a NOAA Fisheries-approved observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

e. *Take and Release Time During Trawling - Turtles*: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than three nautical miles (nmi) from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than five nmi away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. *Take and Release Time During Trawling - Gulf Sturgeon*: Gulf sturgeon shall be released immediately after capture, away from the dredge site or into already dredged areas, unless the trawl vessel is equipped with a suitable (not less than: 2 ft high by 2 ft wide by 8 ft long), well-aerated seawater holding tank where a maximum of one sturgeon may be held for not longer than 30 minutes before it must be released or relocated away from the dredge site.

g. *Injuries and Incidental Take Limits*: Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the Gulf-wide limit for injurious or lethal takes during relocation trawling. Minor skin abrasions resulting from trawl capture are considered non-injurious. Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility.

h. *Flipper Tagging*: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

i. *Gulf Sturgeon Tagging*: Tagging of live-captured Gulf sturgeon may also be done under the permitting authority of this Opinion; however, it may be done only by personnel with prior fish tagging experience or training, and is limited to external tagging only, unless the observer holds a valid sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing sampling, either as the permit holder, or as designated agent of the permit holder.

j. *PIT-Tag Scanning*: All sea turtles captured by relocation trawling (or dredges) shall be thoroughly scanned for the presence of PIT tags prior to release using a scanner powerful enough to read dual frequencies (125 and 134 kHz) and read tags deeply embedded deep in muscle tissue (e.g., manufactured by Biomark or Avid). Turtles which scans show have been previously PIT tagged shall never-the-less be externally flipper tagged. The data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All data collected shall be submitted in electronic format within 60 working days to Lisa.Belskis@noaa.gov.

k. *CMTTP:* External flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program

(CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

l. *Tissue Sampling*: All live or dead sea turtles captured by relocation trawling or dredging shall be tissue-sampled prior to release, according to the protocols to be developed, as described below. This Opinion serves as the permitting authority for any NOAA Fisheries-approved endangered species observers aboard relocation trawlers or hopper dredges to tissue-sample live- or dead-captured sea turtles, without the need for a section 10 permit.

m. *Tissue Sampling and Genetic Analysis*: The COE's Gulf of Mexico Districts shall collect and analyze a sufficient number of sea turtle tissue samples taken annually during COE hopper dredging/trawling operations in the Gulf of Mexico, to provide reliable information on the nesting or subpopulation identity of sea turtles being captured across the Gulf of Mexico. NMFS and the COE shall jointly design a Sampling and Analysis Plan, to be implemented by no later than the end of calendar year 2005, that prescribes, among other things, the total numbers of samples, numbers of samples per species, distribution of sample collections across dredging locations, and genetic and statistical analyses. The NMFS Southwest Fisheries Science Center (SWFSC) is the NMFS center for sea turtle genetic analysis, and NMFS' preferred approach to analyzing tissue samples is for the COE to enter into a memorandum of understanding with SWFSC to conduct the required analyses. The COE may arrange to have the genetic analyses conducted by any other qualified laboratory that may exist, so long as the results are consistent with the national standards for sea turtle genetic analysis in use at the SWFSC, and consistent with the Sampling and Analysis Plan to be developed under this Opinion.

n. *PIT Tagging:* PIT tagging is **not required or authorized for, and shall not be conducted** by ESOs who do not have 1) section 10 permits authorizing said activity and 2) prior training or experience in said activity; however, if the ESO has received prior training in PIT tagging procedures and is also authorized to conduct said activity by a section 10 permit, then the ESO **must** PIT tag the animal prior to release (in addition to the standard external flipper tagging). PIT tagging must then be performed in accordance with the protocol detailed at NOAA Fisheries' Southeast Science Center's webpage: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEC's "Fisheries Observers" webpage). PIT tags used must be sterile, individually wrapped tags to prevent disease transmission. PIT tags should be 125 kHz, glass-encapsulated tags - the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then **do not** insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400 mHz tag), then insert one in the other shoulder.

o. *Other Sampling Procedures*: All other tagging and external or internal sampling procedures (e.g., PIT tagging, blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles or live sturgeon are **not permitted under this Opinion unless** the observer holds a valid sea turtle or sturgeon research permit (obtained pursuant to section 10 of the ESA, from the NOAA Fisheries' Office of Protected Resources, Permits Division) authorizing the activity, either as the permit holder, or as designated agent of the permit holder.

p. *Handling Fibropapillomatose Turtles*: <u>When handling sea turtles infected with fibropapilloma tumors, observers must either: 1) clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with mild bleach solution, between the processing of each turtle or 2) maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.</u>

16. *Hardground Buffer Zones*: All dredging in sand mining areas will be designed to ensure that dredging will not occur within a minimum of 400 feet from any significant hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NOAA Fisheries considers (for the purposes of this Opinion only) a significant hardground in a project area to be one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet or greater, <u>and</u> has algae growing on it. The COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE is uncertain as to what constitutes significance, it shall consult with NOAA Fisheries' Habitat Conservation Division and NOAA Fisheries' Protected Resources Division for clarification and guidance.

17. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of each hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, COE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

18. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within three nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the

water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

19. *Reallocation of Initial Take Allotments Among Districts:* As discussed above, the district-specific take allotments in Section 8.0 of this Opinion are initial allocations, based on past and projected future patterns of take in different areas of the Gulf of Mexico, but the jeopardy analyses are based upon the total Gulf-wide levels of take. Thus, the district-specific allotments may be used by the COE for planning purposes. Gulf of Mexico districts that exceed their initial allotments must request and receive re-allocation of takes from other districts within the GOM. The ceding district's initial take level is then correspondingly reduced. The district exceeding its initial allotment and borrowing take from another district must notify NMFS that it has exceeded its initial take allotment and which district it is borrowing from, so that NMFS may determine whether or not the exceedance represents new information in conflict with the assumptions underlying the effects analyses of the Opinion. A single district's exceedance of its initial allotment alone does not require reinitiation of consultation of the Opinion.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

1. *Channel Conditions and Seasonal Abundance Studies*: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NOAA Fisheries) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and WES to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NOAA Fisheries should be consulted regarding the development of a protocol for draghead evaluation tests. NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon

takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NOAA Fisheries considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits and Relocation Trawling*: NOAA Fisheries recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NOAA Fisheries for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process.

6. *Draghead Improvements - Water Ports*: NOAA Fisheries recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

NOAA Fisheries supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include:

a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NOAA Fisheries recommends water column sediment load deposition rates of no more than 200 mg/cm^2/day, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE's Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NOAA Fisheries recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance Channel, and shall report to NOAA Fisheries biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this Opinion, the COE's Gulf of Mexico Districts, in coordination with COE's SAD, shall develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NOAA Fisheries' Protected Resources Division.

11. *Sodium Vapor Lights on Offshore Equipment*: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the total GOM-wide amount or extent of taking specified in the incidental take statement is exceeded, (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or to an extent not previously considered, (c) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Opinion, or (d) a new species is listed or critical habitat designated that may be affected by the identified action.

Advance Discussions of Potential Need for Reinitiation: NOAA Fisheries requests that COE districts initiate discussions with the Southeast Regional Office Protected Resources Division early to identify the potential need for reinitiation of consultation, well in advance of actually exceeding the amount or extent of taking specified in the incidental take statement. NOAA Fisheries requests notification when a) more than one turtle is taken by a dredge in any 24-hour period; b) four turtles are taken by a dredge during a single project; c) the dredge take reaches 75% of the total take level established for any one species; d) a Gulf sturgeon is taken by a dredge; e) a hawksbill turtle is taken by a dredge; f) a turtle or Gulf sturgeon is injuriously or lethally taken by a relocation trawler; or g) the relocation trawling incidental take limit for turtles or sturgeon is reached. The NOAA Fisheries Southeast Regional Office will work with the COE to quickly review such incidents, to discuss the need and advisability of further mitigating measures, and to plan for a reinitiation of consultation if it appears that one of the reinitiation triggers is likely to be met.

Dredging/Trawling Operations During Reinitiation of Consultation: Once the need for reinitiation is triggered, the COE is not necessarily required to suspend dredging or relocation trawling operations pending the conclusion of the reinitiated consultation, so long as the continuation of operations (by all districts) would not violate section 7(a)(2) or 7(d) of the ESA. In that case, the COE is advised to document its determination that these 6/24/2005provisions would not be violated by continuing activities covered by this Opinion during the reinitiation period and to seek NMFS' concurrence with its findings.

APPENDIX A - PERMITS

USACE PERMIT - BIOLOGICAL OPINION:

NMFS GULF REGIONAL BIOLOGICAL OPINION FOR HOPPER DREDGES/BEACH NOURISHMENT (GRBO) (REV 2- 9 JAN 2007)

19 PAGES

SAJ-2014-00606 (SP-MEP)

UNITED STATES DEPARTMENT OF COMMERCE
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JAN - 9 2007 F/SER3:EH

BG Joseph Schroedel, USA
Division Engineer
South Atlantic Division
U.S. Army Corps of Engineers
60 Forsyth Street S.W.
Atlanta, GA 30303-8801

Dear General Schroedel:

This responds to the U.S. Army Corps of Engineers' (COE), South Atlantic Division (SAD) e-mail request dated May 31, 2006, by Mr. Dennis Barnett of your Planning and Policy Division (PPD) to Mr. Eric Hawk of my Protected Resources Division (PRD). Mr. Barnett, acting as spokesperson for the three COE divisions containing the four COE Gulf of Mexico districts, submitted COE-requested changes to the current National Marine Fisheries Service (NMFS) Gulf of Mexico hopper dredging regional biological opinion (GRBO), issued November 19, 2003. Our response also addresses the Endangered Species Act (ESA) section 7(a)(2)/7(d) analysis submitted by e-mail on September 12, 2006, by Mr. Daniel Small of COE PPD in response to a take of a federally-listed smalltooth sawfish on August 12, 2006, by a COE-authorized relocation trawler during Tampa Harbor Entrance Channel maintenance dredging. A June 27, 2006, conference call and numerous subsequent e-mails, phone calls, and sharing of ideas between our respective staffs resulted in Revision 2 to the GRBO, enclosed herein.

NMFS previously amended the GRBO on June 24, 2005 (Revision 1). The COE requested additional changes to address remaining issues of concern, specifically: 1) GRBO-required funding for genetic testing of tissue samples collected from sea turtles taken on COE projects or COE-permitted projects; and 2) the methodology of how applicants on COE permits will be involved in consultation discussions regarding authorized levels of protected species take. Other COE requests included, specifically: 1) A request for a 25-percent annual overage of authorized take under the GRBO for any one calendar year, as long as the total anticipated take for the encompassing 5-year period was not exceeded; and 2) a request that the GRBO be revised to authorize relocation trawling takes of smalltooth sawfish. Currently, the GRBO authorizes takes of federally-listed sea turtles and Gulf sturgeon, but not smalltooth sawfish.

The COE and NMFS agreed during their conference call to hold the COE request for a 25-percent overage in abeyance pending significant additional analysis needed by both the COE and NMFS. Because these analyses will require significant additional effort and time, it was agreed to proceed with resolving those high-priority issues that can be addressed with a simple revision to the Incidental Take Statement (ITS). However, it will be reconsidered during NMFS' reinitiation of formal consultation on the GRBO to analyze the effects of the COE's request for an increase in its currently authorized non-lethal relocation trawling take limits for sea turtles and Gulf sturgeon. At that time, NMFS will also consider the COE's requested increase in its lethal relocation trawling take limit for sea turtles and its request for relocation trawling take authority for smalltooth sawfish. Increased take limits and take authority for species not included in the GRBO's ITS cannot be authorized without a thorough effects assessment and jeopardy analysis.

With respect to the COE's concern about genetic sampling, NMFS agrees that the GRBO requirement for COE funding of genetic sampling be modified because the COE has provided evidence that it cannot, within its current fiscal authority, fund this requirement. The COE, however, agrees to require the collection and shipment to NMFS for genetic analysis of tissue samples from all sea turtles and Gulf sturgeon taken by hopper dredges and relocation trawlers until NMFS, in consultation with COE scientists, determines they are no longer needed. The GRBO has been modified accordingly; this requirement has been included in the reasonable and prudent measures of the ITS.

With respect to applicant participation in the ESA consultation process and input into permitted-project protected species take levels, the COE will coordinate with NMFS prior to permit issuance. The COE will forward draft permit conditions to NMFS that are consonant with the RPMs and terms and conditions of the GRBO, including a proposed amount of authorized take of sea turtles and Gulf sturgeon per project allocated from the overall annual authorized take limit. Currently the COE's sea turtle and Gulf sturgeon take database and NMFS' take records are useful for estimation purposes, but are still too incomplete to support analyses to accurately predict particular dredging project protected species takes levels with any degree of certainty.

As requested by the COE and based on information provided by the COE with input from NMFS, Revision 2 segregates the previously established Gulf-wide protected species take limits into two allotments – one for COE civil works projects and one for COE-permitted projects. The COE retains the authority and flexibility to manage the allotment ratio, initially set at 80:20 (i.e., 80% for civil, 20% for permitted) for the combined Gulf districts, and adjust them yearly as necessary within the established ITS ceiling, according to its operational needs and its own internal hopper dredging protocol, in coordination with NMFS.

At the COE's request, NMFS' partitioning of the GRBO's Gulf-wide authorized take level into fixed allotments for each of the four COE districts has been superseded by the 80:20 ratio allotment take-limit scheme described above. Revision 2 includes NMFS' estimates of *anticipated* take by each district, unchanged from the original GRBO; however, NMFS has eliminated the district-level protected species allocations, where each district formerly held a guaranteed share of the Gulf-wide authorized level of per-fiscal-year take. The COE is developing an internal protocol to handle within-year management and sharing of takes between Gulf of Mexico COE districts. Other minor modifications to the GRBO and noteworthy changes included in Revision 2 are:

1) The COE is no longer required to consult with/notify NMFS whenever it deviates from the recommended hopper dredging windows (T&C 1).
2) Notification to NMFS and transmittal of information on protected species takes by hopper dredge can now occur by electronic mail to **takereport.nmfsser@noaa.gov** (T&C 9).
3) Any strandings or relocation trawler takes of protected species bearing evidence of potential dredge interaction, regardless of type of dredge implicated, shall not be counted against the GRBO's ITS (T&C 10), although the reporting requirement remains unchanged (T&C 11).
4) The minimum dimensions for a seawater holding tank for captured Gulf sturgeon have been eliminated and more flexible, protective standards have been instituted (T&C 15-f).
5) The GRBO is now the permitting authority to conduct PIT tagging; an ESA Section 10 permit is no longer required to conduct PIT tagging (T&C 15-h, T&C 15-i, T&C 16).
6) Submission requirements for PIT tag scan and external tag data, and genetic samples, have been standardized, to within 60 days after project completion (T&C 15-j, T&C 16).
7) The definition of hardgrounds is clarified to exclude navigation channels and jettys (T&C 17).

In addition, there are some minor changes to address inconsistent or unclear language use in the original GRBO: e.g., the terms "NMFS-approved observer," "observer," and "endangered species observer," have been standardized/changed to "NMFS-approved protected species observer." Other minor language changes clarify that weighing/measuring/sampling of protected species is only required when it can be done safely (T&C 15-d, T&C 20), and that NMFS-approved protected species observers are not required to take tissue samples of sea turtle viral fibropapillomas when these are encountered (T&C 15-l). Finally, NMFS encourages the COE to make fuller use of protected species taken during hopper dredging and relocation trawling by allowing and encouraging duly-permitted "piggy-back" research projects on protected species taken during these activities (T&C 15-d, Conservation Recommendation 5).

Revision 2 to the GRBO is enclosed. It replaces and supersedes Revision 1, and replaces and supersedes the corresponding sections of the 2003 GRBO. If you have any questions, please contact Eric Hawk at (727) 551-5773 or by e-mail at Eric.Hawk@noaa.gov.

We sincerely appreciate all the COE's past and ongoing protected species conservation efforts during hopper dredging activities in the Gulf and South Atlantic, and look forward to continued collaborative efforts to preserve our protected species. My compliments to your staff at SAD, in particular Mr. Daniel Small, and in the four Gulf of Mexico COE districts for working assiduously and effectively with NMFS staff, which enabled us to resolve your remaining concerns with the GRBO. We look forward to working closely with the COE to facilitate other activities, including reinitiation of consultation on the South Atlantic Regional Biological Opinion on hopper dredging, while conserving endangered and threatened species.

I would especially like to take this opportunity to applaud and congratulate the U.S. Army Corps of Engineers, and especially Dr. Dena Dickerson and her staff at the Environmental Data Research Center in Vicksburg, Mississippi, for the excellent job they have done developing and maintaining the COE's Sea Turtle Data Warehouse. The wealth of historic and current information contained in this database regarding hopper dredging project/protected species interactions, and the ease of use of the Sea Turtle Data Warehouse Website, has been exceedingly valuable to NMFS, and will continue to be very useful to both our agencies when making management and conservation decisions regarding protected species.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

cc: COE SAD, Atlanta – Daniel Small, Dennis Barnett
COE MVD, Vicksburg
COE SWD, Dallas
COE, Mobile District – Susan Ivester Rees
COE, Galveston District – Carolyn Murphy
COE, Jacksonville District – Marie Burns, Terri Jordan
COE, New Orleans District – Linda Mathies
F/PR2 – Barbara Schroeder
F/SEC3 – Sheryan Epperly Chester

File: 1514-22.f.1.GOM, SAD
Ref: I/SER/2006/02953; I/SER/2006/01096

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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Revision 2 to the National Marine Fisheries Service (NMFS) November 19, 2003, Gulf of Mexico Regional Biological Opinion (GRBO) to the U.S. Army Corps of Engineers (COE) on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico

The followings replaces parts of the original GRBO and supersedes Revision 1 to the GRBO. All replacements/revisions noted below are to be made to the November 19, 2003, biological opinion. Revision 1 should be discarded in its entirety.

REPLACE:
Anticipated Gulf-wide Take of Sea Turtles and Gulf Surgeon by Hopper Dredges (in Section 5, pp. 57-58 of GRBO), with the following:

Anticipated Gulf-wide Take of Sea Turtles and Gulf Sturgeon by Hopper Dredges and Bed-leveling associated with Hopper Dredging Projects:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, forty (40) loggerhead turtles, and four (4) Gulf sturgeon. This take level represents a total take per fiscal year for all channel dredging and sand mining by hopper dredges in the Gulf of Mexico under the purview of the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts collectively. These totals include hopper dredging activities conducted by the COE (for maintenance of civil works and military navigation channels and for construction of federally-authorized hurricane-storm damage reduction projects) and performed by non-federal interests under COE permits (i.e., "regulatory" projects), including any bed-leveling associated with these hopper dredging activities. These totals are based on the following estimates of anticipated take levels in the Gulf of Mexico, by region, which are not allotments or limits per se. Subdivision of the COE's Gulf-wide anticipated incidental take is made later in this opinion, into two distinct and separate levels or allotments: one for COE-conducted ("civil works and national defense") projects, and the other for COE-permitted ("regulatory") projects.

Texas Coastal Area
For this area, the annual documented incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, five (5) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles.

Louisiana Coastal Area
For this area, the documented annual incidental take, by injury or mortality, is expected to consist of seven (7) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, and fifteen (15) loggerhead turtles, and one (1) Gulf sturgeon.

Florida Panhandle Coastal Area, west of Aucilla River Basin; Alabama Coastal Area; and Mississippi Coastal Area
For these areas, combined, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridley, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and two (2) Gulf sturgeon.

West Florida Coastal Area: Aucilla River Basin to, but not including, Key West
For this area, the documented annual incidental take, by injury or mortality, is expected to consist of three (3) Kemp's ridleys, three (3) green turtles, one (1) hawksbill, five (5) loggerhead turtles, and one (1) Gulf sturgeon. Hopper dredging of Key West navigation channels is covered under the September 25, 1997, regional hopper dredging biological opinion (RBO) to the COE's South Atlantic Division (SAD), which includes by reference the reasonable and prudent measures (RPMs) of the August 25, 1995, hopper dredging RBO to the SAD.

REPLACE:
Anticipated Gulf-wide Take by Hopper Dredging Activities (in Section 8, pp. 63-65 of GRBO), with the following:

8.1 Anticipated Gulf-wide Take by Hopper Dredging and Bed-leveling and Relocation Trawling Activities Associated with Hopper Dredging Projects:

For the entire Gulf of Mexico from the U.S.-Mexico border to Key West, the annual documented COE incidental take per fiscal year, by injury or mortality, is expected to consist of forty (40) loggerhead turtles, twenty (20) Kemp's ridley turtles, fourteen (14) green turtles, four (4) hawksbill turtles, and four (4) Gulf sturgeon. This take level represents total take by injury or mortality per fiscal year anticipated for all navigation channel maintenance dredging and sand mining by hopper dredges and any associated bed-leveling activity in the Gulf of Mexico within the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, by COE-conducted ("civil works and national defense") projects and COE-permitted ("regulatory") projects.

Based upon consultation with the COE, the annual documented lethal or injurious incidental take per fiscal year is allocated as follows:

8.1.1 For COE-*conducted* hopper dredging for federal civil works or national defense activities:

Thirty-two (32) loggerhead turtles, sixteen (16) Kemp's ridley turtles, eleven (11) green turtles, three (3) hawksbill turtles, and three (3) Gulf sturgeon.

8.1.2 For COE-*permitted* hopper dredging performed by others (i.e., non-COE entities):

Eight (8) loggerhead turtles, four (4) Kemp's ridley turtles, three (3) green turtles, one (1) hawksbill turtle, and one (1) Gulf sturgeon.

8.1.3 For relocation trawling:

Zero to two (2) turtles and zero to one (1) Gulf sturgeon. These numbers are in addition to anticipated lethal or injurious takes by hopper dredges noted in 8.1.1 and 8.1.2, above.

8.1.4 For relocation trawling, the following non-lethal take is anticipated/authorized per fiscal year.

Three hundred (300) sea turtles, of any combination of species (Kemp's ridley, green, loggerhead, leatherback, and hawksbill), and eight (8) Gulf sturgeon, across all the COE districts and hopper dredging projects. This take is limited to relocation trawling conducted during the 0-3 days immediately preceding the start of hopper dredging (as a means to determine/reduce the initial abundance of sea turtles in the area and determine if additional trawling efforts are needed), during actual hopper dredging, and during "down" times when the hopper dredging operations may be temporarily suspended due to lethal turtle/sturgeon takes, weather, hopper dredge mechanical problems, etc. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this opinion.

Regulatory Permits
Each COE district issuing a regulatory permit involving hopper dredging will be responsible for initiating contact with NMFS on behalf of permit applicants, and will forward draft permit conditions to NMFS that are consonant with the RPMs and terms and conditions of this Regional Biological Opinion, including a proposed amount of authorized take of sea turtles and Gulf sturgeon where applicable per project allocated from the overall annual authorized take limit. The COE will coordinate with NMFS prior to permit issuance. This may be done by electronic mail with an electronic response from NMFS. The draft permit conditions and proposed take level allocated may be of standardized content.

COE Gulf of Mexico Hopper Dredging Protocol
The COE will develop internal protocols for managing, documenting, reporting, and coordinating incidental takes for both COE-conducted and COE-permitted activities across Gulf of Mexico Districts to ensure compliance with the provisions of this Regional Biological Opinion. The protocol and any future revisions to it will be shared with the NMFS Southeast Regional Office, Protected Resources Division staff in a timely manner.

Adjustment of Take Allocations
The balance between the basic hopper dredging requirements (quantities, duration, timing, and locations) for COE-conducted dredging for civil works and national defense and for COE-permitted dredging may vary in the future. Based on annual changes in these requirements, the COE may, in coordination with NMFS, adjust the allocation of the authorized Gulf-wide incidental take numbers between COE-conducted hopper dredging and COE-permitted hopper

dredging in advance of any given fiscal year, such that changes could be made to the allotments for the start of the subsequent fiscal year. Such adjustments would not affect the jeopardy analysis of this opinion or the terms and conditions of this ITS and can be made without reinitiation of consultation on this opinion.

New information requiring subsequent reinitation of consultation on this opinion, pursuant to the reinitiation triggers of 50 CFR 402.16, could result in an increase or decrease of the total allocated incidental take numbers for COE-conducted or COE-permitted hopper dredging within the current authorized ITS limit.

REPLACE:
Terms and Conditions (in Section 9, pp. 72-78 in the GRBO), Section 10 (Conservation Recommendations, pp. 78-80 in the GRBO), and Section 11 (Reinitiation of Consultation, pp. 80-81 in the GRBO), with the following:

Terms and Conditions

1. *Hopper Dredging*: Hopper dredging activities in Gulf of Mexico waters from the Mexico-Texas border to Key West, Florida, up to one mile into rivers shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters. Hopper dredging of Key West channels is covered by the existing September 25, 1997, RBO to the COE's SAD.

2. *Non-hopper Type Dredging*: Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30 in Gulf of Mexico waters up to one mile into rivers. This should be considered particularly in channels such as those associated with Galveston Bay and Mississippi River - Gulf Outlet (MR-GO), where lethal takes of endangered Kemp's ridleys have been documented during summer months, and Aransas Pass, where large numbers of loggerheads may be found during summer months. In the MR-GO, incidental takes and sightings of threatened loggerhead sea turtles have historically been highest during April and October.

3. *Annual Reports*: The annual summary report, discussed below (No. 9), must give a complete explanation of why alternative dredges (dredges other than hopper dredges) were not used for maintenance dredging of channels between April and November.

4. *Observers*: The COE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and Gulf sturgeon and their remains.

    a. Brazos Santiago Pass east to Key West, Florida: Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges year-round from Brazos Santiago Pass to (not including) Key West, Florida, between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

b. Observer coverage of hopper dredging of sand mining areas shall ensure 50% monitoring (i.e., one observer).

c. Observers are not required at any time in Mississippi River - Southwest Pass (MR-SWP).

5. *Operational Procedures*: During periods in which hopper dredges are operating and NMFS-approved protected species observers are *not* required (as delineated in No. 4 above), the appropriate COE District must:

a. Advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles.

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the COE if sea turtles or whales are seen in the vicinity.

c. Notify NMFS if sea turtles are observed in the dredging area, to coordinate further precautions to avoid impacts to turtles.

d. Notify NMFS immediately by phone (**727/824-5312**), fax (**727/824-5309**), or electronic mail (**takereport.nmfsser@noaa.gov**) if a sea turtle or Gulf sturgeon or any other threatened or endangered species is taken by the dredge.

6. *Screening*: When sea turtle observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100% overflow screening is then required.

a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the COE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case effective 100% overflow screening is mandatory. The COE shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

b. Need for Flexible, Graduated Screens: NMFS believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

c. Exemption - MR-SWP: Screening is not required at any time in MR-SWP.

7. *Dredging Pumps*: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

8. *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf of Mexico channels and sand mining sites at all times of the year except that the rigid deflector draghead is not required in MR-SWP at any time of the year.

9. *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be faxed or e-mailed to NMFS' Southeast Regional Office **[fax: (727) 824-5309; e-mail: takereport.nmfsser@noaa.gov]** by onboard NMFS-approved protected species observers within 24 hours of any sea turtle, Gulf sturgeon, or other listed species take observed.

   A preliminary report summarizing the results of the hopper dredging and any documented sea turtle or Gulf sturgeon takes must be submitted to NMFS within 30 working days of completion of any dredging project. Reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the COE deems relevant.

   An annual report (based on fiscal year) must be submitted to NMFS summarizing hopper dredging projects and documented incidental takes.

10. *Sea Turtle and Gulf Sturgeon Strandings*: The COE or its designated representative shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging, bed-leveler dredging, and relocation trawling operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge. Similarly, the COE shall notify NMFS SERO PRD of any Gulf sturgeon strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

Information on any such strandings shall be reported in writing within 30 days of project completion to NMFS' Southeast Regional Office. Because the deaths of these turtles, if hopper dredge or bed-leveler dredge related, have already been accounted for in NMFS' jeopardy analysis, these strandings will not be counted against the COE's take limit.

11. *Reporting - Strandings*: Each COE District shall provide NMFS' Southeast Regional Office with an annual report detailing incidents, with photographs when available, of stranded sea turtles and Gulf sturgeon that bear indications of draghead impingement or entrainment or any dredge-type interaction. This reporting requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

12. *District Annual Relocation Trawling Report*: Each COE District shall provide NMFS' Southeast Regional Office with end-of-project reports within 30 days of completion of relocation trawling projects, and an annual report summarizing relocation trawling efforts and results within their District. The annual report requirement may be included in the end-of-year report required in Term and Condition No. 9, above.

13. *Conditions Requiring Relocation Trawling*: Handling of sea turtles and Gulf sturgeon captured during relocation trawling in association with hopper dredging projects in Gulf of Mexico navigation channels and sand mining areas shall be conducted by NMFS-approved protected species observers. Relocation trawling shall be undertaken by the COE at all projects where <u>any</u> of the following conditions are met; however, other ongoing projects not meeting these conditions are not required to conduct relocation trawling:

    a. Two or more turtles are taken in a 24-hour period in the project.

    b. Four or more turtles are taken in the project.

    c. 75% of any of the incidental take limits, including per species limits, specified in Section 8.1, has previously been met.

14. *Relocation Trawling Waiver*: For individual projects the affected COE District may request by letter to NMFS a waiver of part or all of the relocation trawling requirements. NMFS will consider these requests and decide favorably if the evidence is compelling.

15. *Relocation Trawling - Annual Take Limits*: This opinion authorizes, without the need for an ESA section 10 permit: the annual (by fiscal year) non-injurious take of 300 sea turtles (of one species or combination of species including Kemp's ridley, loggerhead, green, leatherback, and hawksbill) and 8 Gulf sturgeon, and annual (by fiscal year) lethal or injurious takes of up to 2 sea turtles and 1 Gulf sturgeon, by trawlers conducting relocation trawling, and handling of those captured threatened or endangered species by NMFS-approved protected species observers, in association with all relocation trawling conducted or contracted by the four Gulf of Mexico COE Districts to temporarily reduce or assess the abundance of these listed species during, and in the 0-3 days immediately

preceding, a hopper dredging or bed-leveling project in order to reduce the possibility of lethal hopper dredge or bed-leveler interactions, subject to the following conditions:

a. *Trawl Time*: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. *Handling During Trawling*: Sea turtles and Gulf sturgeon captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix IV).

c. *Captured Turtle and Gulf Sturgeon Holding Conditions*: Turtles and Gulf sturgeon may be held briefly for the collection of important scientific measurements, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released, according to the requirements of T&C 15-e, below. Captured Gulf sturgeon shall be held in a suitable well-aerated seawater enclosure until they are released, according to the conditions of T&C 15-f, below.

d. *Scientific Measurements*: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. When safely possible, all Gulf sturgeon shall be measured (fork length and total length), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NMFS-approved protected species observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissue sampling operations.

   NMFS-approved protected species observers may conduct more invasive scientific procedures (e.g., blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) and partake in or assist in "piggy back" research projects but only if the observer holds a valid federal sea turtle or Gulf sturgeon research permit (and any required state permits) authorizing the activities, either as the permit holder, or as designated agent of the permit holder, and has first notified NMFS' Southeast Regional Office, Protected Resources Division.

e. *Take and Release Time During Trawling - Turtles*: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than 3 (three) nautical miles (nmi) from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than 5 (five) nmi away. If it can be done safely and without injury to the turtle, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. *Take and Release Time During Trawling - Gulf Sturgeon*: Gulf sturgeon shall be released immediately after capture, away from the dredge site or into already dredged areas, unless the trawl vessel is equipped with a suitable well-aerated seawater holding tank, container, trough, or pool where a maximum of one fish may be held for not longer than 30 minutes before it must be released or relocated away from the dredge site.

g. *Injuries and Incidental Take Limits*: Any protected species injured or killed during or as a consequence of relocation trawling shall count toward the Gulf-wide limit for injurious or lethal takes during relocation trawling (0-2 sea turtles and 0-1 Gulf sturgeon per fiscal year). Minor skin abrasions resulting from trawl capture are considered non-injurious. Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility.

h. *Turtle Flipper External Tagging*: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from the University of Florida's Archie Carr Center for Sea Turtle Research. This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external-type tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

i. *PIT Tagging:* This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles and Gulf sturgeon. PIT tagging of sea turtles and Gulf sturgeon is not required to be done, if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures, then the observer shall PIT tag the animal prior to release (in addition to the standard external tagging):

Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS' Southeast Fisheries Science Center's Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC's "Fisheries Observers" Web page);

Gulf sturgeon PIT tagging must then be performed in accordance with the protocol detailed at the NMFS SERO PRD Web site address: http://sero.nmfs.noaa.gov/pr/protres.htm.

PIT tags used must be sterile, individually-wrapped tags to prevent disease transmission. PIT tags should be 125-kHz, glass-encapsulated tags–the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400-kHz tag), then insert one in the other shoulder.

j. *Other Sampling Procedures*: All other tagging and external or internal sampling procedures (e.g., blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles or live Gulf sturgeon are not permitted under this opinion unless the observer holds a valid sea turtle sturgeon research permit authorizing the activity, either as the permit holder, designated agent of the permit holder.

k. *PIT-Tag Scanning and Data Submission Requirements*: All sea turtles and Gulf sturgeon captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov and Sheryan.Epperly@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

Gulf sturgeon data (PIT tag scan data and external tagging data) shall be submitted within 60 days of project completion to NOAA, National Marine Fisheries Service, Protected Resources Division, 263 13th Avenue South, St. Petersburg, Florida 33701, or by **fax: (727) 824-5309;** or by **e-mail: takereport.nmfsser@noaa.gov**, Attn: Dr. Stephania Bolden.

l. *Handling Fibropapillomatose Turtles*: NMFS-approved protected species observers are not required to handle or sample viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must either: 1) Clean all equipment that comes in contact with the turtle (tagging equipment, tape measures, etc.) with mild bleach solution, between the processing of each turtle or 2) maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.

16. *Requirement and Authority to Conduct Tissue Sampling for Genetic Analyses*: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles, and live- or dead-captured Gulf sturgeon, without the need for an ESA section 10 permit.

All live or dead sea turtles and Gulf sturgeon captured by relocation trawling and hopper dredging (for both COE-conducted and COE-permitted activities) shall be tissue-sampled prior to release. Sampling shall continue uninterrupted until such time as NMFS determines and notifies the COE in writing that it has sufficient samples from specific areas across the Gulf of Mexico in order to obtain reliable genetic information on the nesting or sub-population identity of sea turtles and Gulf sturgeon being captured or lethally taken, to improve the effectiveness of future consultations.

Sea turtle tissue samples shall be taken in accordance with NMFS' Southeast Fisheries Science Center's (SEFSC) procedures for sea turtle genetic analyses (Appendix II of this opinion). The COE shall ensure that tissue samples taken during a dredging project are collected and stored properly and mailed within 60 days of the completion of their dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

Gulf sturgeon tissue samples (i.e., fin clips or barbel clips) shall be taken in accordance with NMFS SERO's Protected Resources Division's Gulf Sturgeon Tissue Sampling Protocol found at the NMFS SERO PRD Web site address: http://sero.nmfs.noaa.gov/pr/protres.htm. The COE shall ensure that tissue samples taken during a dredging project are collected and stored properly and mailed to SERO PRD (Attn: Dr. Stephania Bolden) within 60 days of the completion of their dredging project.

17. *Hardground Buffer Zones*: All dredging in sand mining areas will be designed to ensure that dredging will not occur within a minimum of 400 feet from any significant hardground areas or bottom structures that serve as attractants to sea turtles for foraging or shelter. NMFS considers (for the purposes of this opinion only) a significant hardground in a project area to be one that, over a horizontal distance of 150 feet, has an average elevation above the sand of 1.5 feet or greater, and has algae growing on it. The COE Districts shall ensure that sand mining sites within their Districts are adequately mapped to enable the dredge to stay at least 400 feet from these areas. If the COE is uncertain as to what constitutes significance, it shall consult with NMFS SERO's Habitat Conservation Division (727-824-5317) and NMFS' Protected Resources Division (727-824-5312) for clarification and guidance. Walls of federally-maintained navigation channels, and jetties and other such man-made structures, are not considered hardgrounds for the purpose of this opinion.

18. *Training - Personnel on Hopper Dredges*: The respective COE Districts must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of each hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, COE Engineering Research and Development Center experts or other persons with expertise in this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

19. *Dredge Lighting*: From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nmi of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

10.0 Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the COE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

1. *Channel Conditions and Seasonal Abundance Studies*: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles and Gulf sturgeon within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NMFS) on a channel-specific basis, if (a) the COE can provide sufficient scientific evidence that sea turtles and Gulf sturgeon are not present or that levels of abundance are extremely low during other months of the year, or (b) the COE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles or Gulf sturgeon in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis, as in the case of MR-SWP. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. *Draghead Modifications and Bed Leveling Studies*: The New Orleans, Galveston, Mobile, and Jacksonville Districts should supplement the efforts of SAD and ERDC to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom. NMFS is ready to assist the COE in conducting studies to evaluate bed-leveling devices and their potential for interaction with sea turtles, and develop modifications if needed.

3. *Draghead Evaluation Studies and Protocol*: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic

deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NMFS should be consulted regarding the development of a protocol for draghead evaluation tests. NMFS recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle and Gulf sturgeon takes.

4. *Continuous Improvements in Monitoring and Detecting Takes*: The COE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle and Gulf sturgeon takes by hopper dredge. Observation of overflow and inflow screening is only partially effective and provides only partial estimates of total sea turtle and Gulf sturgeon mortality.

   Overflow Screening: The COE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NMFS considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

   Preferential Consideration for Horizontal Overflow Screening: The COE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. *Section 10 Research Permits, Relocation Trawling, and Piggy-Back Research*: NMFS recommends that the COE's Galveston, New Orleans, Mobile, and Jacksonville Districts, either singly or combined, apply to NMFS for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the COE Districts to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and sand mining sites and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the COE Districts with the permit application process. Similarly, NMFS encourages the COE to cooperate with NMFS' scientists, other federal agencies' scientists, and university scientists to make fuller use of turtles and Gulf sturgeon taken pursuant to the authority conferred by this opinion during hopper dredging and relocation trawling, by allowing and encouraging "piggy-back" research projects by duly-permitted individuals or their authorized designees. Piggy-back projects could include *non-lethal* research of many types,

including blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.

6. *Draghead Improvements - Water Ports*: NMFS recommends that the COE's Gulf of Mexico Districts require or at least recommend to dredge operators that all dragheads on hopper dredges contracted by the COE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

   NMFS supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: a) an adjustable visor; b) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom; and c) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. *Economic Incentives for No Turtle Takes*: The COE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

8. *Sedimentation Limits to Protect Resources (Hardbottoms/Reefs)*: NMFS recommends water column sediment load deposition rates of no more than 200 $mg/cm^2/day$, averaged over a 7-day period, to protect coral reefs and hard bottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. *Boca Grande Pass - Conditions*: If the COE's Jacksonville District decides to renew dredging permits for the Boca Grande Pass, NMFS recommends that the District conduct or sponsor a Gulf sturgeon study, including gillnetting and tagging utilizing ultrasonic and radio transmitters, and mtDNA sampling, to help determine the genetic origins, relative and seasonal abundance, distribution and utilization of estuarine and marine habitat by Gulf sturgeon within Charlotte Harbor estuary and Charlotte Harbor Entrance

Channel, and shall report to NMFS biannually on the progress and final results of said study.

10. *Relocation Trawling - Guidelines*: Within six months of the issuance of this opinion, the COE's Gulf of Mexico Districts, in coordination with COE's SAD, should develop relocation trawling guidelines to ensure safe handling and standardized data gathering techniques for sea turtles and Gulf sturgeon by COE contractors, and forward copies to NMFS' Protected Resources Division.

11. *Sodium Vapor Lights on Offshore Equipment*: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low-pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11.0 Reinitiation of Consultation

Requirements for Reinitiation of Consultation: Reinitiation of formal consultation is required if (a) the amount or extent of taking specified in the incidental take statement is exceeded (any of the specified limits), (b) new information reveals effects of the action that may affect listed species or critical habitat when designated in a manner or to an extent not previously considered, (c) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the opinion, or (d) a new species is listed or critical habitat designated that may be affected by the identified action.

Advance Discussions of Potential Need for Reinitiation: NMFS requests that COE districts initiate discussions with the Southeast Regional Office Protected Resources Division early to identify the potential need for reinitiation of consultation, well in advance of actually exceeding the amount or extent of taking specified in the incidental take statement. NMFS requests notification when a) more than one turtle is taken by a dredge in any 24-hour period; b) four turtles are taken by a dredge during a single project; c) the dredge take reaches 75% of the total take level established for any one species; d) a Gulf sturgeon is taken by a dredge; e) a hawksbill turtle is taken by a dredge; f) a turtle or Gulf sturgeon is injuriously or lethally taken by a relocation trawler; or g) the relocation trawling incidental take limit for turtles or sturgeon is reached. The NMFS Southeast Regional Office will work with the COE to quickly review such incidents, to discuss the need and advisability of further mitigating measures, and to plan for a reinitiation of consultation if it appears that one of the reinitiation triggers is likely to be met.

Dredging/Trawling Operations During Reinitiation of Consultation: Once the need for reinitiation is triggered, the COE is not necessarily required to suspend dredging or relocation trawling operations pending the conclusion of the reinitiated consultation, so long as the continuation of operations (by all districts and all permittees) would not violate section 7(a)(2) or 7(d) of the ESA. In that case, the COE is advised to document its determination that these provisions would not be violated by continuing activities covered by this opinion during the reinitiation period and to notify NMFS of its findings.