

**Mexico Beach Canal Sand Bypass
Gulf of Mexico
Bay County, Florida
Public Notice 200100140 (IP-DHB)**

**Biological Opinion
September 7, 2001**

**Prepared by:
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, FL**



Table of Contents

CONSULTATION HISTORY	5
BIOLOGICAL OPINION	7
Description of the Proposed Action	7
Conservation Measures.....	7
Status of the Species/Critical Habitat	9
Sea Turtles	9
Loggerhead Sea Turtle	9
Green Sea Turtle.....	9
Leatherback Sea Turtle.....	9
Kemp's ridley.....	10
Life history (growth, life span, survivorship, and mortality).....	10
Population dynamics (population size, population variability, population stability)	12
Status and distribution (reasons for listing, rangewide trend, new threats)	13
Coastal Development.....	14
Beachfront Lighting	14
Hurricanes Erin, Opal, Earl, and Georges	14
Predation	15
Sea Turtle Nesting	15
Analysis of the species/critical habitat likely to be affected	17
Environmental Baseline	17
Sea Turtles.....	17
Status of the species within the Action Area	17
Nesting	17
Factors affecting the species environment within the action area .	18
Coastal Development	18
Hurricanes	18
Beachfront Lighting	18
Coastal Erosion	19
Predation of Sea Turtle Nests	19
Effects of the Action	19
Factors to be Considered.....	19
Analysis for effects of the action.....	20
Indirect Effects.....	21
Species response to a proposed action	23
CUMULATIVE EFFECTS.....	23
CONCLUSION	23

INCIDENTAL TAKE STATEMENT 24

AMOUNT OR EXTENT OF TAKE 24

EFFECT OF THE TAKE 25

REASONABLE AND PRUDENT MEASURES 26

TERMS AND CONDITIONS..... 26

 Proposed Work..... 27

 Protection of Sea Turtles 27

 Reporting..... 29

CONSERVATION RECOMMENDATION..... 30

REINITIATION - CLOSING STATEMENT..... 31

LITERATURE CITED 32

Figures and Tables

Figure 1: City of Mexico Beach Sand Bypass Project	5
Figure 2: Loggerhead sea turtle nesting in NW Florida, 1993 to 2000	9
Figure 3: Green Sea turtle nesting in NW Florida, 1993 to 2000.....	9
Figure 4: NW Florida Loggerhead Sea Turtle Nest Density 1993-2000	13
Figure 5: Loggerhead Sea turtle Nests within the Mexico Beach Survey Area 1993-2000	13
Figure 6: Loggerhead sea turtle nesting density in the Action Area 1996-2000	14



United States Department of the Interior

FISH AND WILDLIFE SERVICE

1601 Balboa Avenue
Panama City, Florida 32405

Tel: (850) 769-0552
Fax: (850) 763-2177

September 7, 2001

Colonel James G. May
U.S. Army Corps of Engineers
Jacksonville District Office
475 Harrison Avenue
Panama City, Florida 32401

Attn: Diane Bateman

Re: FWS 4-P-01-178
Public Notice 200100140 (IP-DHB)
Mexico Beach Canal Sand Bypass
Gulf of Mexico, Bay County, Florida

Dear Colonel May:

The U.S. Fish and Wildlife Service (Service) has evaluated the permit application 200100140 (IP-DHB) that proposes to dredge material from the west side of the mouth of the Mexico Beach canal in Bay County, Florida. Your May 16, 2001 request for formal consultation was received on May 24, 2001. This document represents the Service's biological opinion on the effects of that action on loggerhead, green, leatherback, and Kemp's ridley sea turtles. We concur with your determination that the proposed action would not likely adversely affect the St. Andrew beach mouse, piping plover, or Gulf sturgeon. The consultation is provided in accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended, (16 U.S.C. 1531 et seq.). We have assigned log number FWS 4-P-01-178 to this consultation.

This biological opinion is based on information provided in the Public Notice, and by the applicant's consultant, Baskerville Donovan, Inc., Mexico Beach's public works director, John Grantland, your agency, the Florida Fish and Wildlife Conservation Commission, and Ms. Barbara Eells, sea turtle permit holder, and other sources of information and numerous telephone discussions and onsite observations. A complete administrative record of this consultation is on file in this office.

CONSULTATION HISTORY

- April 9, 2001 The Service receives a copy of the draft public notice for the proposed project from the U.S. Army Corps of Engineers, Panama City Regulatory office (Corps).
- April 10, 2001 The Service provides comments by e-mail, on the draft public notice regarding threatened and endangered species and requests additional information.
- April 24, 2001 The Service receives by e-mail, sea turtle nesting information from Ms. Barbara Eells, sea turtle permit holder for the Mexico Beach Survey area for the years 1998, 1999, and 2000. The Service responds by e-mail for clarification of information.
- April 27, 2001 The Service receives by mail, sea turtle nesting information from Ms. Barbara Eells, sea turtle permit holder for the Mexico Beach Survey area for the years 1998, 1999, and 2000.
- May 15, 2001 The Service receives by mail, sea turtle nesting information from Ms. Barbara Eells, sea turtle permit holder for the Mexico Beach Survey area for the years 1996, 1997, 1998, 1999, and 2000.
- May 16, 2001 The Service receives a copy of the public notice dated May 16, 2001, from the Corps on the proposed project. In the public notice, the Corps requests initiation of formal section 7 consultation concerning endangered species.
- May 21, 2001 The Service receives by fax, from the City of Mexico Beach, sea turtle nesting information for the years 1996, 1997, 1998, 1999, and 2000.
- June 13, 2001 The Service provides a letter to the Corps on the proposed project concerning comments under the Fish and Wildlife Coordination Act and the Endangered Species Act. We concurred with the determination of the Corps to undergo formal consultation in accordance with section 7 of the Endangered Species Act regarding potential impacts to nesting sea turtles from the proposed action.
- July 10, 2001 The Service receives additional information from the City of Mexico Beach concerning the 8th Street canal project and sea turtle surveys.

July 11, 2001 The Service receives additional information from the City of Mexico Beach's consultant, Baskerville-Donovan, Inc. concerning the project schedule.

July 11, 2001 The Service receives additional information from Ms. Barbara Eells, sea turtle permit holder for the Mexico Beach Survey area concerning sea turtle nesting for the years 1996, 1997, 1998, 1999, 2000, and 2001, to date.

July 16, 2001 The Service faxes information to the City of Mexico Beach for review regarding project schedule.

July 17, 2001 The City of Mexico Beach calls and informs the Service they may revise the project schedule and will notify the Service.

July 25, 2001 The Service receives by mail a letter dated July 24, 2001, from the City of Mexico Beach's consultant that confirms the project schedule outside the sea turtle nesting season.

July 31, 2001 The Service transmits a draft biological opinion to the Corps for review.

August 9, 2001 The Service receives comments on the draft biological opinion from the Florida Fish and Wildlife Conservation Commission Bureau of Protected Species.

August 28, 2001 The Service attends a meeting with the Corps, City of Mexico Beach, their consultant, Baskerville and Donovan, Inc., and the Florida Fish and Wildlife Fish Conservation Commission-Bureau of Protected Species. Following the meeting, the Service, FWC, and the Corps conducted an onsite inspection of the dredge area.

August 29, 2001 The Service met with City of Mexico Beach's, consultant, Baskerville and Donovan, Inc (BDI) to discuss the landward boundary of the dredging area. BDI proceeded to mark a revised landward boundary onsite and the Service made an onsite visit and concurred with the line.

BIOLOGICAL OPINION

Description of the Proposed Action

The applicant proposes to hydraulically dredge approximately 11,500 cubic yards of material on the west side of the Mexico beach canal (canal). The dredge area will begin at the water's edge and extend landward along the west concrete jetty for about 130 feet and then will turn west and taper toward the water's edge for 1,100 to 1,200 feet forming a triangular wedge. The sand will be hydraulically pumped to an area beginning 1,100 feet east of the canal and extending for 2,500 feet. The sand will be discharged along the shoreline below mean low water elevation and will enter the offshore current by natural processes. A five-year renewal permit is requested. The proposed activity is to remove sand from the western side of the canal and deposit it on the eastern side to alleviate the near continuous dredging within the mouth of the canal due to wind and water deposition of sand moving in an easterly direction. Deposition of sand on the eastern side of the canal is proposed to help prevent loss of beach property within the city limits of Mexico Beach.

The dredging is to be conducted on a Monday through Friday work schedule. No work at night is scheduled. The project is proposed to be constructed between November 1 and April 30. Dredging and sand disposal may involve 2 to 4 weeks of work. All work will be conducted from the water. No vehicles or equipment are planned to be used on the beach for this project. A five-year permit is requested, thus maintenance dredging and spoil disposal may occur once a year within the five-year period.

Conservation Measures

1. Incorporation of the Manatee Special Conservation Conditions.
 - a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s).
 - b. 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 of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuary act of 1978. The permittee and/or contractor may be held responsible for any manatee harmed, harassed, or killed as a result of construction activities.
 - c. All vessels associated with the project shall operate at "no wake/idle" speeds at all times while in water where the draft of the vessel provides less than four feet clearance from the bottom and that vessels shall follow routes of deep water whenever possible.
 - d. If a manatee is sighted within 100 yards of the project area, all appropriate precautions shall be implemented by the permittee/contractor to ensure protection of the manatee. These precautions shall include the operation of all moving equipment closer than 50 feet of a manatee. Operation of any equipment closer than 50 feet of a manatee shall

necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area its own volition.

e. Any collision with and/or injury to a manatee shall be reported immediately to the “Manatee Hotline” at 1-800-DIAL-FMP (1-800-342-5367). Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Panama City (1-850-769-0552) for northwest Florida.

The Action Area under this consultation includes the beach from mean low water (MLW) to the crest of the primary dune or structure between the Tyndall Air Force Base (AFB) eastern boundary and Toucan’s restaurant (figure 1). The Action Area was selected based on the direct and indirect impacts on sea turtle nesting within the Mexico Beach survey area. The action area consists of suitable nesting habitat for sea turtles, thus activity in this area could impact nesting females, their nests and eggs, and any hatchlings, either in the nest or upon emergence from the nest and crawling to the Gulf of Mexico.



Status of the Species/Critical Habitat

Sea Turtles

Loggerhead Sea Turtle

Green Sea Turtle

Leatherback Sea Turtle

Kemp's ridley Sea Turtle

The U.S. Fish and Wildlife Service has responsibility for implementing recovery of sea turtles when they come ashore to nest. The National Marine Fisheries Service has jurisdiction over sea turtles in the marine environment.

Species/critical habitat description

Sea Turtles

Four species of sea turtles, the loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), the leatherback sea turtle (*Dermochelys coriacea*), and the Kemp's Ridley sea turtle (*Lepidochelys kempii*) are considered in this biological opinion.

The loggerhead sea turtle (*Caretta caretta*) was federally listed as a threatened species on July 28, 1978 (43 FR 32800). This species inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian oceans. Loggerhead sea turtles nest within the continental U.S. from Louisiana to Virginia (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Critical habitat has not been designated for loggerhead sea turtles along the Gulf Coast of Florida.

From a global perspective, the southeastern U.S. loggerhead sea turtle nesting aggregation is important to the survival of the species, and is second in size only to the nesting on islands in the Arabian Sea (Ross 1982, Ehrhart 1989, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Nesting by loggerhead sea turtles has been documented in all northwest Florida counties from Franklin through Escambia County (Brost 2001).

The green sea turtle (*Chelonia mydas*) was federally listed on July 28, 1978 (43 FR 32808). Breeding populations of the green sea 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 is a circumglobal species in tropical and subtropical waters. Within the U.S., green sea turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). Nesting also has been documented along the northwest and southwest Gulf coasts of Florida and as far north as North Carolina (Meylan *et al.* 1995, Brost 2001). Critical habitat has not been designated for green sea turtles along the Gulf coast of Florida.

The leatherback sea turtle (*Dermochelys coriacea*) was federally listed as an endangered species on June 2, 1970 (35 FR 8491). Nesting grounds are distributed circumglobally, with the Pacific coast of Mexico supporting the world's largest known concentration of nesting leatherbacks (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992, National Research Council 1990). The leatherback regularly nests in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Sporadic leatherback nesting also has been documented in northwest Florida and North Carolina (LeBuff 1976, Longieliere *et al.* 1997, Brost 2001,

Boettcher 1998). Critical habitat has not been designated for leatherback sea turtles along the Gulf coast of Florida.

The Kemp's ridley sea turtle (*Lepidochelys kempii*) has received protection in Mexico since the 1960's and was federally listed as an endangered species throughout its range on December 2, 1970. They occur in the Gulf of Mexico and the northern Atlantic Ocean (Pritchard 1989, Marquez 1994 as cited in Turtle Expert Working Group 1997 and 1998) and are assumed to constitute a single stock. The range of the species includes the Gulf Coasts of Mexico, the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. They also have been reported from Bermuda, European Atlantic waters, the Mediterranean Sea, Madeira, the Azores and Nicaragua (Marquez 1994 as cited in Turtle Expert Working Group 1997 and 1998, U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992).

Life history (growth, life span, survivorship, and mortality)

Extensive research has been conducted on sea turtles. The recovery plans for the loggerhead, green, leatherback, and ridley sea turtles (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a, 1991b, 1992, U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992) provide a summary and references for detailed information on the species. In brief, the greatest portion of a sea turtle's life is spent in ocean and estuarine waters where it breeds, feeds, migrates, and brumates. A short portion of the female's life is spent on the beaches where she digs a nest and lays her eggs. The eggs then hatch and the hatchlings crawl to the sea to become part of the marine ecosystem again (Nelson 1988).

The reproductive strategy of sea turtles involves producing many offspring to compensate for the high natural mortality through their first several years of life. Some mortality factors include disease, predation of the nest by raccoons, fox, coyote, hogs, and ghost crabs, loss of the nest from inundation or erosion due to wave action, storms, beach erosion or rain, predation of hatchlings on the beach by birds, fox, and ghost crabs, and predation in the aquatic environment by fish or other marine species. However, increased unnatural mortality is now occurring due to increased human-caused pressures on sea turtle populations. One such pressure is the loss and degradation of nesting habitat because of coastal development. Activities that affect the behavior and/or survivability of turtles on their nesting beaches could significantly reduce our ability to conserve sea turtles. The recovery of sea turtles is based on the protection of all nesting beaches through habitat conservation, minimizing effects of beachfront lighting, and minimization of the incidental catch of sea turtles in marine commercial fisheries.

Loggerhead sea turtle nesting has been documented on all beaches in northwest Florida from Franklin to Escambia counties. Loggerhead turtles are the most common nesting sea turtle and account for over 99 percent of the nests in this area. The loggerhead sea turtle nesting and hatching season for northwest Florida beaches generally extends from about May 1 through October 31. The earliest nest was documented on April 29 (St. Joseph Peninsula State Park) and the latest nest on November 1 (Cape San Blas). Nest incubation ranges from about 49 to 95 days.

Recent genetic analyses have been employed to identify management units among loggerhead nesting cohorts of the southeastern United States. Assays of nest samples from North Carolina to northwest Florida have identified three genetically distinct nesting sub-populations: (1) north nesting sub-population - Cape Hatteras, North Carolina, to Cape Canaveral, Florida; (2) South Florida nesting sub-population - Cape Canaveral to Naples, Florida; and (3) Northwest Florida nesting sub-population - Eglin Air Force Base and the beaches around Panama City, Florida. These data indicate that gene flow among the three regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting population (Enclada *et al.* 1998, Bowen *et al.* 1993).

Green sea turtle nesting has been documented in all counties (but not on all beaches) in northwest Florida from Franklin to Escambia counties. The green sea turtle nesting and hatching season for northwest Florida beaches extends from May 1 through October 31, the earliest nest was documented on May 22 (Dog Island) and the latest nest was documented on August 23 (Gulf Islands National Seashore). Nest incubation ranges from about 60 to 90 days. Nesting in northwest Florida has been consistently documented at least every other year since 1990 (Brost 2001).

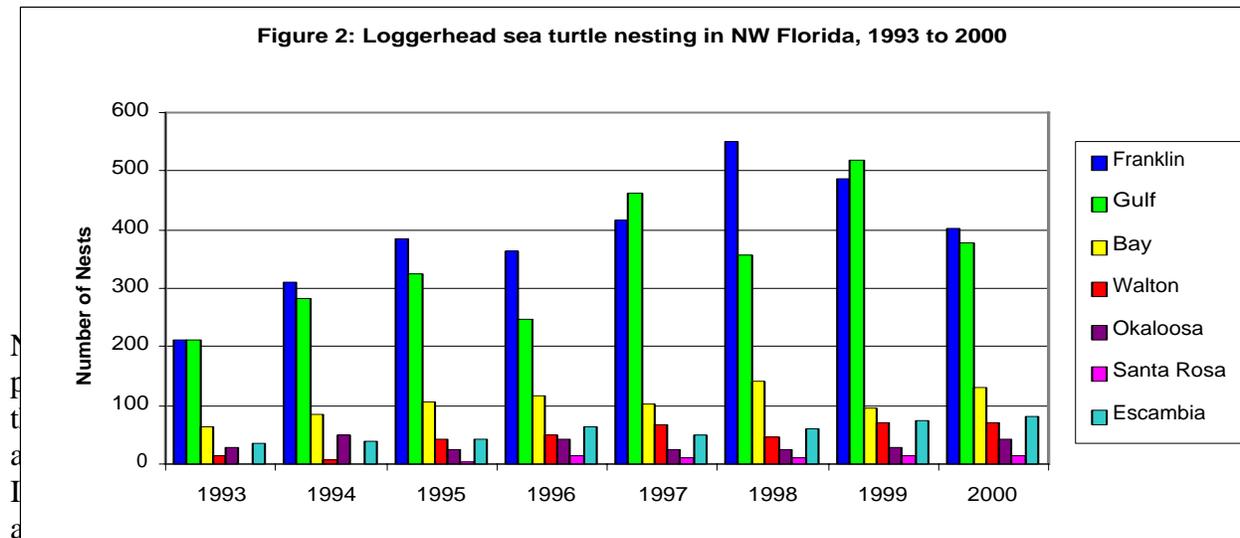
Documented leatherback nests are rare in northwest Florida. From 1993 to 2000, only fifteen have been reported for northwest Florida beaches, ten in Franklin County, three in Okaloosa County, and one each in Gulf and Escambia counties (Brost 2001). The first recorded leatherback nest was in 1974 on St. Vincent Island, Franklin County. The greatest number of successful nests in any one season occurred in 2000, when leatherback nesting was confirmed for one nest on Gulf Islands National Seashore, Ft. Pickens Unit, Escambia County and for two nests on Eglin Air Force Base, Okaloosa Island, Okaloosa County. The leatherback sea turtle nesting and hatching season for northwest Florida beaches extends from May 1 through October 31. For confirmed nesting, the earliest nest was documented on April 29 (St. George Island) and the latest nest documented on June 19 (Eglin AFB). Documented nest incubation in northwest Florida ranges from about 63 to 84 days (Brost 2001, Miller 2001, Nicholas 2001).

Documented Kemp's ridley nests are rare in northwest Florida. Until 1998, no nests had been reported in the area. Then one new nesting location was confirmed on Gulf Islands National Seashore- Perdido Key Area, Escambia County, Florida (Nicholas 2000). The ridley sea turtle nesting and hatching season for northwest Florida beaches extends from May 1 through October 31. For the 1998 nest on GINS, the nest was laid on May 31 and hatched on August 3, with an incubation period of 64 days (Nicholas 2000).

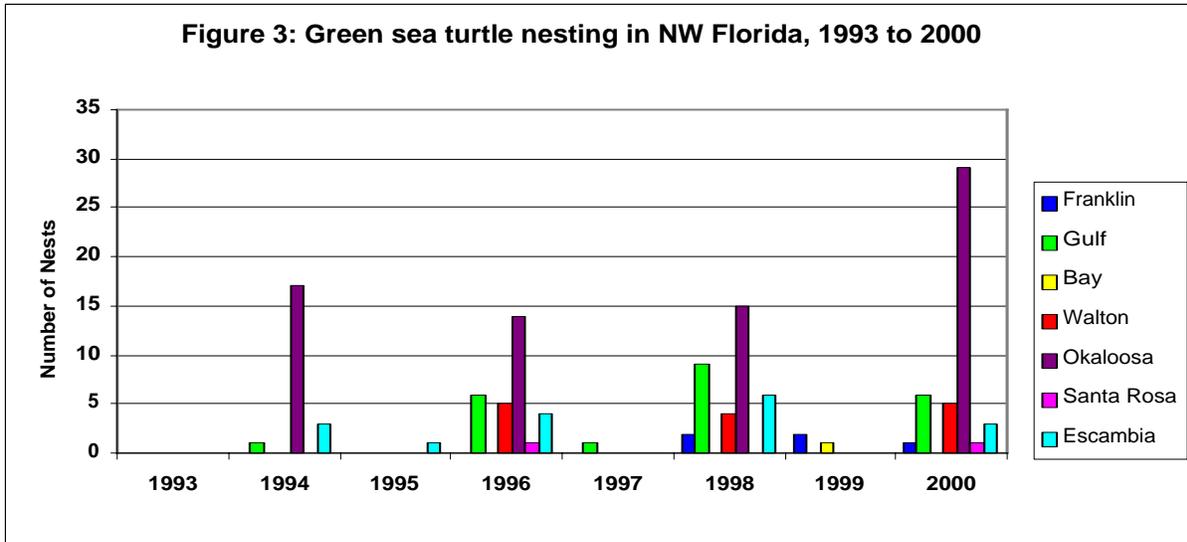
Population dynamics (population size, population variability, population stability)

At present, it is only feasible to estimate the size of the nesting female loggerhead population in U.S. territorial waters. There is general agreement with Meylan (1982) that enumeration of nesting females provides a useful index to population size and stability (Turtle Expert Working Group 2000). Through aerial and ground surveys, it is estimated that approximately 50,000 to 70,000 nests are laid per year on southeast U.S. beaches. In 2000, there were over 84,000 nests

laid in Florida alone. Since 1993, when consistent nest reporting began in northwest Florida, the annual nest numbers have ranged between 560 and 1,300 nests (figure 2) (Brost 2001). The number of nests has increased each year, but it is unknown whether this is because of increased surveying, more experienced surveyors, or an increase in nests. Franklin and Gulf counties have always reported the greatest number of loggerhead sea turtle nests (figure 2). Based on the average of approximately 4.1 nests per female, (Turtle Expert Working Group 2000), the female nesting population for northwest Florida could be around 250 females.



for about 30 to 40 of the total nests laid in the Southeast U.S. At least half of those nests are usually laid on Santa Rosa Island on Eglin Air Force Base (figure 3) (Brost 2001).



Pritchard (1982) estimated that 115,000 adult female leatherbacks remained worldwide. The largest U.S. nesting assemblages of leatherback turtles occur in the U.S. Virgin Islands and Puerto Rico. Small numbers (300 nests) of leatherback turtles nest in the southeast U.S., primarily along the Florida Atlantic Coast. In any one year, only seven leatherback nests have been documented in northwest Florida (Brost 2001). The U.S. Atlantic and Caribbean nesting population appears to be increasing.

The Kemp's ridley sea turtle exhibits an aggregated nesting behavior and very restricted breeding range. The major nesting beach is near Rancho Nuevo in southern Tamaulipas (northeastern coast of Mexico). In the U.S., nesting has been documented on the Gulf Coast of Texas. Kemp's ridley nesting is rare in Florida and until recently only eight nests have been reported in Volusia, Lee, Sarasota, and Pinellas counties (Brost 2001).

Status and distribution (reasons for listing, rangewide trend, new threats)

Sea turtles are threatened by many factors when onshore or in the aquatic environment. Threats in the nesting environment include coastal development, beach erosion, beach armoring, beach nourishment, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, beach driving, exotic beach and dune vegetation, nest depredation, inundation, sand accretion over incubating nests, and poaching. Threats in the aquatic environment include oil and gas exploration and development, dredging, marina and dock development, pollution, seagrass bed degradation, trawl fisheries, purse seine fisheries, hook and line fisheries, gill net fisheries, pound net fisheries, longline fisheries, trap fisheries, boat collisions, power plant entrapment, underwater explosions, offshore artificial lighting, marine debris (ingestion and entanglement), poaching, predation, disease and parasites (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a, 1991b, 1992, U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992).

Coastal Development

Loss of nesting habitat related to development of the coastline has had the greatest impact on nesting sea turtles in Florida. Beachfront development along the Gulf coast of Florida began in the 1950's. Development of beachfront along the City of Mexico Beach did not reach the fervor as it did on Panama City Beach in the 1960's. However, by the 1970's the majority of the shoreline along the City of Mexico Beach beachfront was developed between the canal and what is now the site of Toucan's restaurant. After Hurricanes Erin and Opal in 1995, most of destroyed structures were rebuilt by 2000. The beachfront between Toucan's and the Bay/Gulf County boundary remains undeveloped except for dune walkovers.

Beachfront Lighting

A consequence associated with coastal development is beachfront lighting. Beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual cues 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 well documented cause of hatchling disorientation and misorientation on nesting beaches (Philbosian 1976; Mann 1977; Meghan Conti 2001). 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 and birds, or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings and lead them away from their destination to the sea. Conversely, adult female sea turtles have a tendency to avoid stretches of brightly illuminated beach. Research has also documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights. Highly developed beaches with excessive lighting are devoid of nests relative to adjacent areas (Witherington 1992).

During the 2000 sea turtle nesting season, 1,319 disorientation events were documented throughout Florida. Of these, condominiums had the greatest impact, accounting for approximately 243 disorientation events. Disorientation events attributed to unknown factors followed closely with 241 disorientation events, and street lights with 190 disorientations events (Meghan Conti 2001).

Hurricanes Erin, Opal, Earl, and Georges

A predominant threat to sea turtle nests is tropical storms and hurricanes. In general, hurricanes result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes can negatively impact sea turtle nesting either directly (e.g., washing out or burying nests) or indirectly (loss of nesting habitat). Depending on their frequency, hurricanes can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of 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 eye crosses land (side of hurricane-clockwise or counterclockwise).

Because of the limited remaining nesting habitat, frequent or successive severe weather events could compromise the ability of certain sea turtle populations to survive and recover. Hurricanes are a natural coastal environmental phenomenon to which sea turtles have evolved. Hurricanes were probably responsible for maintaining coastal beach and dune nesting habitat through repeated cycles of destruction, alteration, and recovery. The extensive amount of pre-development 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 have increased the threat to their survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after episodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their pre-storm locations can result in significant loss of suitable nesting habitat.

Predation

Depredation by a variety of predators can significantly decrease sea turtle nest hatching success. Depredation and/or harassment of nesting turtles, eggs, nests and hatchlings by native and non-native species, such as raccoon, coyote, fox, feral hog, birds, and ghost crab, has been documented on the Atlantic and Gulf coasts of Florida. As nesting habitat dwindles, it is essential that nest production be maximized as naturally as possible.

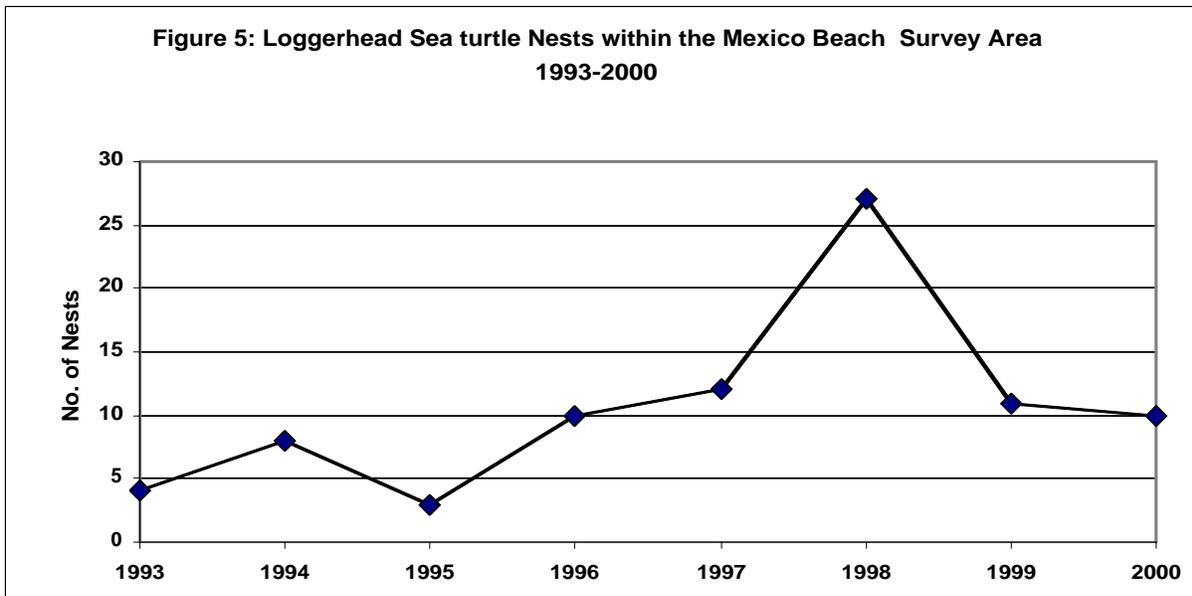
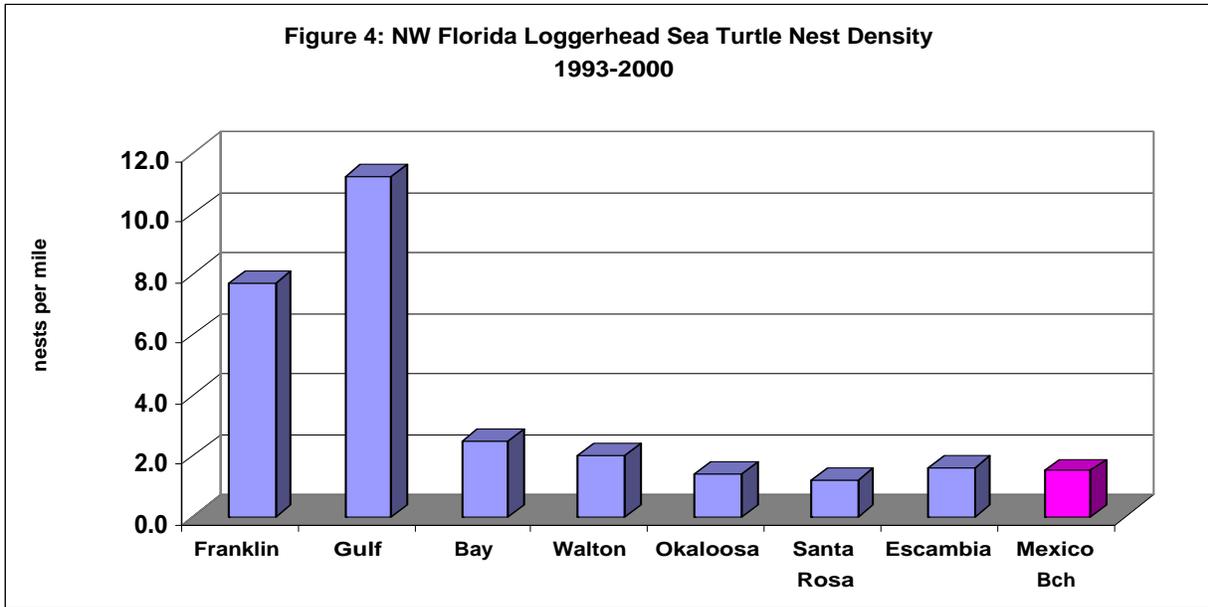
Depredation of loggerhead sea turtle nests in northwest Florida by non-native coyote became a concern in the early 1990's. At St. Joseph Peninsula State Park depredation rates reached 52.8 percent in 1996. In a cooperative effort in 1997, the State Park and the Service funded the U.S. Department of Agriculture-Wildlife Services to institute an integrated wildlife damage management strategy to reduce nest depredation. Implementation of the strategy resulted in depredation losses being reduced to 6.3 percent in 1997, an 88 percent reduction from 1996 losses (Leland 1997). Because of the program's success, the Florida Park Service and other Federal land managers asked for similar assistance in northwest Florida. A cooperative partnership was formed and the support of the predator control program continues into 2001.

Sea Turtle Nesting

Sea turtle nest monitoring from the eastern boundary of Tyndall Air Force Base to the Bay/Gulf County line (Mexico Beach survey area) is conducted by the Gulf County Turtle Patrol. Ms. Barbara Eells is the permit holder - State of Florida Sea Turtle Permit no. 057. Surveys have been conducted since 1991. Approximately 7 miles of beach are surveyed in the early morning using 4-wheel drive vehicles, all terrain vehicles (ATVs) and/or by walking. Turtle crawls are identified as a true nesting crawl or false crawl, or non-nesting emergence. Nests are marked with stakes and surrounded with survey or flagging tape. The marked nests are monitored throughout the incubation period for storm damage, hatching activity and predation and evaluated for hatch success. Nests are relocated within the first 12 hours of being deposited, or before 9 a.m. the morning following deposition, if threatened by erosion or inundation. The

average range for incubation period for sea turtle nests west of the Mexico Beach canal is 63 to 69 days.

Loggerhead nesting within the Mexico Beach survey area is considered a medium density beach compared to other northwest Florida beaches (figure 4). Average annual nesting density for the survey area from 1993 to 2000 was 1.5 nests per mile. During that time, 85 loggerhead nests and 62 false crawls were documented. No nesting trends are apparent within this area (figure 5).



According to State of Florida nesting records, there have been no documented nests of green, leatherback, or Kemp's ridley sea turtles on the beaches within the Mexico Beach survey area (Brost 2001).

Analysis of the species/critical habitat likely to be affected

Your letter dated May 16, 2001, indicated that you had determined that the proposed action would not likely adversely affect the St. Andrew beach mouse, piping plover, or Gulf sturgeon, we concur with that determination.

Since the proposed action will be removing sea turtle nesting habitat, placing sand directly offshore of the nesting beach, and performing maintenance dredging annually during the duration of the five-year permit, it could adversely affect nesting females, eggs, and hatchling sea turtles. The effect of this impact on sea turtle survival and recovery will be considered in this biological opinion. Direct effects from the elimination of nesting habitat could reduce the area available for nesting. Indirectly, it could affect the behavior of adult turtles approaching the beach to nest by escarpment formation at the dredge site or by creating a barrier at the disposal site.

ENVIRONMENTAL BASELINE

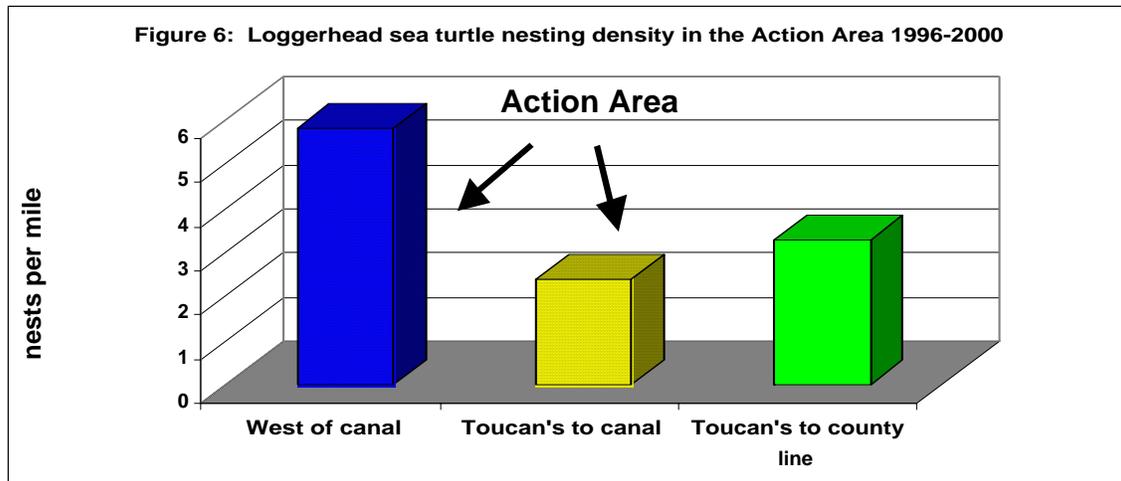
This section describes the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem, within the Action Area. The environmental baseline is a "snapshot" of a species health at a specified point in time. It does not include the effects of the action under review in the consultation.

Sea Turtles

Status of the species within the Action Area

Nesting

From 1996 to 2000, 70 loggerhead sea turtle nests have been documented in the Mexico Beach survey area. Of the total nests, approximately 52 nests were within the Action Area. Twenty-nine (29) nests were found from the Mexico Beach canal to the Tyndall AFB boundary, 23 nests were found from the canal to Toucan's restaurant, and 18 were found from Toucan's to the Bay/Gulf county line (figure 6). For the 2001 to date, (July 11, 2001) nesting season, 11 nests have been documented, 5 of those nests are west of the canal. One nest is within area to be dredged. This nest, laid on June 4, 2001, is 100 feet west of the canal. The nest is expected to hatch around the first week in September, which is prior to the projected start date of November 1, 2001.



The area from the canal west to the Tyndall AFB boundary supports the highest density of loggerhead sea turtle nesting within the Mexico Beach survey area. The density of loggerhead sea turtle nesting west of the canal is over 100 percent greater than the area between the canal and Toucan’s restaurant.

Factors affecting the species environment within the action area

Coastal Development

The development along the coastline east of the canal has resulted in a reduction of the width and quality of beach and dune habitats for sea turtle nesting. This could be the primary reason for the lower nesting density along this section of the Action Area. Coastal beachfront lighting may also deter female turtles from approaching the shore to nest in this area. The section of the Action Area between the canal and Tyndall AFB is privately owned and currently undeveloped.

Hurricanes

Hurricanes Erin’s and Opal’s (1995) storm surge and wave energy inflicted severe erosion along the beaches and dunes of the Mexico Beach survey area. In Bay County, the average beach recession was 31 feet with a maximum of 153 feet and dune recession averaged 38 feet with a maximum of 120 feet. Hurricanes Earl and Georges in 1998 caused setback of the post-Hurricane Opal recovering coastal habitats. The lost nests were attributed to the direct and indirect effects of the 1995 hurricanes. The nests were either totally washed away and destroyed or were inundated for long periods of time during critical development periods. Until recently, the beaches in the Mexico Beach survey area did not fully recover from the loss of sand due to Hurricane Opal. The beaches remained narrow. FEMA provided funding to construct beach berms in areas of critical erosion. These berms were to protect upland areas from a five-year storm (Bowen 2001). The berms were not planted with sea oats (Eells 2001).

Beachfront Lighting

Currently, lighting impacts to nesting turtles and their hatchlings are greatest within the Mexico Beach survey area east of the canal. This may be due, in part, to loss of habitat from several hurricanes, particularly in those areas where the dunes were destroyed. Taller dunes can shield much of the light from beachfront development from the nesting beach. Once these dunes are removed, either from storms or development, nests on adjacent beaches are more susceptible to lights from landward development. The negative effects of beachfront lighting increase if the berm elevation is elevated due to beach nourishment or sand by passing. During the 2000 sea turtle nesting season, three lighting disorientation were documented. These disorientations occurred in the vicinity of 6th Street (2 incidents) and 31st Street (1 incident). Disorientation from the urban glow of Panama City and Tyndall AFB has also been documented in previous years (Eells 2001).

Coastal Erosion

The State of Florida has designated two miles of coastline within the City of Mexico Beach as critically eroding shoreline (FDEP, Office of Beaches and Coastal Systems 1999). The two miles are between reference monument R-127.8 and R-137.75 within the action area of the project.

Predation of Sea Turtle Nests

Predators of sea turtle nests and hatchlings on the beaches within the Mexico Beach survey area have been primarily ghost crabs. One incident concerning predation of a nest by a coyote was documented in 1999 (Eells 2001).

Effects of the Action

This section is an analysis of the direct and indirect effects of the proposed action 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 project will occur within habitat that is used by sea turtles for nesting. Long-term and permanent impacts from the dredging will include elimination of nesting habitat. Short-term and temporary impacts to sea turtle nesting activities will be a result of the dredging configuration and sand disposal placement that could affect adult sea turtles approaching the beach to nest. The permit request is for five years and maintenance dredging and disposal may occur at least once each year.

Analysis for effects of the action

Direct impacts of the proposed action will result from: 1) the loss of available beach for nesting by sea turtles, 2) the possibility that some nests will be missed, 3) nests in the dredge area having to be relocated, and 4) equipment and vehicles on the beach.

1. Loss of nesting habitat - The beach above mean high water to 30 feet seaward of the dune vegetation will be dredged on the west side of the canal. This would result in the permanent loss of 2.0 acres of nesting habitat for sea turtles.

The beach west of the canal provides optimal nesting habitat for sea turtles in the Mexico Beach survey area because it is undeveloped and few impacts from adjacent developed areas to the east are documented. This beach is also adjacent to undeveloped beaches on Tyndall AFB. According to the sea turtle nesting data (1996 - 2001) provided by the sea turtle permit holder, Ms. Eells, 8 of the 32 nests (25 percent) that have been laid west of the canal occurred within the length of the beach to be dredged. One nest in 1998 was noted to be "at the west jetty." Thus, it can be estimated that 1.3 turtles have nested each year (for the last 6 years) in the area to be dredged. The applicant has requested to maintenance dredge this area at least once each year of the five-year permit life. The area to be dredged is triangle-shaped so that at least 50 to 140 feet of beach width will remain along the western 700 feet of the dredge area.

There is currently one nest confirmed in the area to be dredged. The proposed work is projected to start November 1, 2001 and be completed within 2 to 4 weeks. This nest is expected to hatch before the start of the project. However, if any other nests are deposited in the area to be dredged after August 20, 2001, these nests could be lost. Relocation of any nests that are laid 70 days before the start of the project would reduce the risk of impacting sea turtle nests in the area to be dredged.

Relocation of nests laid in a project area is usually recommended to minimize the risk of impacting sea turtle nests. However, 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 and overall fitness 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).

Comparisons of hatching and nest emergence success between relocated nests and nests left in place (*in situ* nests) from nests on Atlantic and Gulf coast beaches indicated that there may not be a difference in the percentage of eggs that hatch in a relocated and an *in situ* nest; however, fewer hatchlings emerged from the relocated nests (Moody 1998).

A final concern about nest relocation is that it may concentrate eggs in an area resulting in a greater susceptibility to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater depredation rates from both land and marine predators because the predators learn where to concentrate their efforts.

2. Missed nests - Although a nesting survey and nest marking program reduce the potential for nests to be impacted by the proposed project and associated activities, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, and/or tides) or misidentified as false crawls during daily patrols. Even under the best of conditions, about 7 percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

The Gulf County Turtle Patrol has been conducting daily sea turtle surveys since May 15, 2001. They will continue to conduct the daily nest and/or hatching surveys in the Action Area. The project start day is projected to be November 1, 2001. The one nest that has been laid within the area to be dredged should be hatched before September 1, 2001. Relocation of nests that are laid in the area to be dredged beginning August 20, 2001, and during the years 2002, 2003, 2004, 2005, and 2006, would help assure minimal loss of nests.

3. Artificial lighting - Construction lights on the dredging vessel may deter females from coming ashore to nest, disorient females trying to return to the surf after a nesting event, and disorient or misorient emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low pressure sodium lighting during project construction.

No night work is proposed for the project.

4. Equipment - The use or storage of machinery or equipment on the beach during the project work may also have adverse effects on sea turtles. The equipment 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 equipment can also create impediments to hatchling sea turtles as they crawl to the ocean.

No equipment or vehicles are proposed to be used on the beach for the project within or outside the sea turtle nesting season.

Indirect Effects

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. These effects consist of the following.

1. Escarpment formation - Escarpment formation may occur at the dredge site. 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 adult female turtles access to nesting sites. Researchers have shown that female 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 ensuring the beach remaining after excavation has a relatively natural profile and by leveling any escarpments prior to the nesting season.

The proposed work is projected to start November 1, 2001, and be completed within 2 to 4 weeks. The dredge site should be inspected prior to the 2002, 2003, 2004, 2005, and 2006, sea turtle nesting seasons for escarpment formation. If escarpments have formed, they should be leveled.

2. Downdrift Erosion - Placement of the spoil material can be described as creating a nearshore berm. Typically nearshore berms could result in impoundment of material on the up drift side of the berm and erosion on the down drift side. However, the berm when initially created could be considered as an “anomaly” in the wave and sediment transport climate and the natural system would quickly try and “straighten” the anomaly. It should erode quickly. In addition, it is a relatively small amount of material to be placed, about 4.4 cubic yards per linear foot.

Thus, it is expected that the placement of the sand below MLW will not cause excessive down drift erosion and be quickly incorporated into the long shore drift. Monitoring of the material would be needed to confirm the movement of the material

3. Barrier to nesting - The spoil material if not properly placed could act as a barrier to female sea turtles approaching the beach or to hatchlings trying to exit the beach from landward nests. Female turtles generally select steeply sloped beaches to approach the shoreline for nesting. The material is to be placed below mean low water but the slope of the discharge and the width are unknown. To minimize the chances of interfering with any sea turtles approaching the shore to nest, the sand should be placed below the water line with at least 3-feet of water depth at low tide.

However, the project will be completed outside the sea turtle nesting season and fairly soon after the 2001 nesting is over so it would not be expected to create a barrier because the material would be incorporated into the longshore drift quickly. In subsequent years, the project should be completed outside the nesting season but in time for the material to be incorporated into the longshore transport system. Remediation prior to the sea turtle nesting season should be accomplished if the placed sand has accumulated and may cause impede access to landward nesting habitat.

Species response to a proposed action

This biological opinion is based on effects that are anticipated to loggerhead sea turtles (nesting females or hatchlings) because: 1) the project and subsequent project maintenance will be conducted outside the sea turtle nesting season, and 2) it is possible that one to two nests could be laid in the area that will receive maintenance dredging or on the beach landward of the area to be dredged each year of the five-year permit (2002, 2003, 2004, 2005 and 2006).

In the context of sea turtle nesting, one to two loggerhead sea turtle nests each year from 2001 to 2006 could be impacted by the proposed action. Following the 2001 nesting season, impacts could include escarpment formation at the dredge site and a barrier to nesting or hatchlings at the spoil site (2002 to 2006).

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the proposed 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. West of the Mexico Beach canal, the property landward of the area to be dredged is owned by The St. Joe Company. The Service has had preliminary discussions with the Company concerning future development of the land and conservation of federally protected species. We would anticipate development of the land within the next three to five years. The property owned between The St. Joe Company land and Tyndall AFB is privately owned but the Service has no knowledge of any proposed development or other activities on this property. East of the canal in the Action Area is mostly privately owned, and the Service anticipates continued development of the beachfront property until it is built out. The City of Mexico Beach is part of a State of Florida Beach Restoration Plan.

CONCLUSION

After reviewing the current status of the loggerhead, green, leatherback, and Kemp's ridley sea turtles, the environmental baseline for the Action Area, the effects of the proposed dredging and sand disposal, and the cumulative effects, it is the Service's biological opinion that the sand bypass project, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, or Kemp's Ridley sea turtles. No critical habitat has been designated for any of the species in the continental United States; therefore, none will be affected.

The proposed project will directly affect approximately 2.0 acres of sea turtle nesting habitat along approximately 1,100 to 1,200 feet of Gulf of Mexico beachfront from dredging and will indirectly affect sea turtles approaching the beach to nesting along 3,700 feet (1,100 + 2,500 feet) of beachfront. Together, these beaches support an average of 14 sea turtle nests annually. By conducting the project outside the nesting season and from the water, impacts to the nesting beach are minimized. Further, appropriate placement of the dredged sand and leveling of any

escarpments will reduce the risk of creating barriers to nesting females and hatchlings from landward nests.

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 must be included in the issued permit by the Corps so that they become binding special conditions of the permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. If the Corps and/or the permittee (1) fail to assume and implement the terms and conditions or (2) fail to require the applicant 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 impact of incidental take, the Corps and/or the permittee 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

Incidental take is anticipated from permanent destruction of sea turtle nesting habitat and effects to nesting sea turtles and hatchlings during subsequent nesting seasons from the initial project and future maintenance activities. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) sea turtles nest primarily at night and all nests are not found 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) hatchling sea turtles typically emerge from the nest at night and all hatchlings affected may not be found as a result of predation, dessication or being washed away, (4) the reduction in percent hatching and emergence success per relocated nest over the natural nest site is unknown; (5) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (6) escarpments may form and cause an unknown number of females from

accessing a suitable nesting site; and (7) the sand disposal may interfere with female sea turtles approaching or leaving the beach during the nesting process.

However, the level of take of these species can be anticipated by the permanent destruction and disturbance of suitable turtle nesting beach habitat because turtles nest within the project site and the dredging and sand disposal will potentially modify the beach profile, form escarpments, and form barriers. The Service anticipates adverse effects to 2.0 acres along approximately 1,100 to 1,200 feet of sea turtle nesting beach on the west side of the Mexico Beach canal from dredging and 2,500 feet on the east side of the Mexico Beach canal from the disposal of the dredged sand. The take is expected to be in the form of: (1) loss of all potential sea turtle nests that may have been laid and eggs that may have been deposited within the original dredging area in the years 2002, 2003, 2004, and 2005; (2) destruction of all nests that may be laid and eggs that may be deposited and missed by a nest survey and marking program in the dredge area during the 2001, 2002, 2003, 2004, and 2005 nesting seasons, (3) destruction of all nests deposited during the period when a nest survey and marking program in the dredge area, is not required to be in place from November 1 through April 30 for the years 2001, 2002, 2003, 2004, and 2005; (3) lower egg hatching success and hatchling emergence from nests that are relocated from the area to be dredged beginning on August 20 in the years 2002, 2003, 2004, and 2005, (4) harassment in the form of disturbing or interfering with female turtles attempting to nest on the beaches landward of the sand disposal area during the 2002, 2003, 2004, 2005, and 2006 nesting seasons; (5) behavior modification of nesting females or hatchlings during the 2002, 2003, 2004, 2005, and 2006 nesting seasons due to the presence of the sands deposited below mean low water which may act as barriers to movement; (6) behavior modification of nesting females due to escarpment formation within the dredge area during the 2002, 2003, 2004, 2005, and 2006 nesting seasons, 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 Fish and Wildlife Service.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to loggerhead, green, leatherback, or ridley sea turtles. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat for loggerhead, green, leatherback, or ridley sea turtles.

Incidental take of nesting and hatchling sea turtles is anticipated to occur during five nesting seasons when the proposed action takes place and for one nesting season following the final year five of the project. The take will occur on nesting habitat consisting of the length of the beach where dredging will occur and where the dredged sand will be deposited. However, measures to protect remaining nesting habitat and potentially affected sea turtle nests are proposed.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of sea turtles as a result of the dredging and disposal of the dredged sand.

1. The quantity of material of the dredged sand, and the location, length, acreage, and shape of the area to be dredged in the years 2002, 2003, 2004, and 2005, must not exceed the initial quantity or be located outside the original dredge area.
2. The dredged sand must be appropriately placed below mean low water to assure transport in to the littoral process and passage of sea turtles approaching or leaving the beach during the nesting process.
3. The quantity of material of the dredged sand and the final location, length, and shape of the disposal site must not exceed the initial quantity or be located outside the original disposal area so that the potential for additional impacts to sea turtles are minimized.
4. A sea turtle nesting survey and monitoring program must be in place for the Mexico Beach survey area, so that potential impacts to nesting sea turtles, their nests, deposited eggs within the nests, developing embryos and hatchlings, and hatchlings emerging from the nests are minimized.
5. Dredging must not occur during the period from May 1 through October 31.
6. Monitoring for escarpment formation at the dredge area and potential barrier formation at the disposal site must be conducted prior to the 2002, 2003, 2004, 2005, and 2006, nesting seasons to determine if escarpments or barriers are present within the area and if present, must be leveled to reduce the likelihood of impacting sea turtle nesting and hatching activities.
7. City of Mexico Beach staff or contractors constructing the project or conducting any monitoring must be informed and understand the protection of nesting sea turtles, their nests, and hatchlings in accordance with the Endangered Species Act, and the specific requirements contained herein for the proposed action.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act, the Corps must require that the permittee comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Proposed Work

1. The area to be dredged must be clearly identified, delineated, surveyed and documented in certified engineering drawings. This should include, but is not limited to, the waterward, landward and jetty location(s). The dredge area shall be sufficiently marked for identification by the sea turtle nesting surveyors and dredging operators/contractors during the life of the five-year permit.
2. The area to receive the dredged sand shall be clearly identified, delineated, and documented in certified engineering drawings. The area of deposition shall be sufficiently identified for use by the sea turtle nesting surveyors and dredging operators/contractors during the life of the five-year permit.
3. The quantity of the dredged material must not exceed 11,500 cubic yards in the years 2001, 2002, 2003, 2004, and 2005. The location, length, acreage, and shape of the area to be dredged shall not be located outside the original dredge area in the years 2001, 2002, 2003, 2004, and 2005 (130 feet back from waterward edge of beach at the west jetty then turning west for about 1,100 feet tapering to the waters edge forming a triangle).
4. The final location, length, and shape of the dredged sand that is disposed shall not be outside the area original designated disposal area (between 1,100 and 2,500 feet east of the canal).
5. Annual maintenance dredging shall be conducted only once a year and outside the sea turtle nesting season in 2002, 2003, 2004, and 2005. If the maintenance dredging in the years 2002, 2003, 2004, and 2005 have been conducted and excess of the original amount of material dredged is accreted due to a major weather event occurs, additional dredging may be authorized but only after written authorization from the Fish and Wildlife Service is received.

Protection of Sea Turtles

1. Daily early morning sea turtle nesting surveys shall be conducted from May 1 through October 31. Nesting surveys shall continue through September 30. Hatching and emerging success monitoring may involve checking nests beyond the completion date of the daily early morning nesting surveys.
 - 1a. Nesting surveys and nest marking shall only be conducted by personnel with prior experience and training in nesting survey and nest marking procedures. Surveyors must have a valid Florida Fish and Wildlife Conservation Commission (FWC) permit. Nesting surveys must be conducted daily between sunrise and 9 a.m.
 - 1b. Between May 1 and August 19, of each year of the five-year permit, nests deposited within the area to be dredged must be left in place and marked for

avoidance unless other factors threaten the success of the nest (beach erosion or continual tidal inundation). The actual location of the clutch does not have to be determined to mark the nest. The “nest area” is to be marked by stake and survey tape or string.

- 1c. From August 20 through October 31, of each year of the five-year permit, sea turtle nests deposited within the area to be dredged and the drowndrift beach shall be left in place and marked for avoidance unless other factors threaten the success of the nest (beach erosion or continual tidal inundation). Construction activities should commence only in those areas where such activities will not disturb existing nests. In event that the permittee determines and the Fish and Wildlife Service agrees that leaving the nests in place is not possible, those nests that cannot be avoided shall be relocated. Nests approved for relocation shall be moved no later than 9 a.m. the morning following deposition. The nests shall be moved to the west of the dredge site where they can be self-releasing and in a secure setting where artificial lighting will not interfere with hatchling orientation.
2. Visual surveys for escarpments along the dredged area and barriers formed by sand disposal shall be completed prior to April 1, for each year after dredging is completed within the life of the five year permit. Results of the surveys shall be submitted to the Fish and Wildlife Service prior to any action being taken. Escarpments that exceed 18 inches in height for a distance of 100 feet and disposal sand piles that could interfere with sea turtle movement to and from the beach shall be leveled to the natural beach contour by April 15.

The Fish and Wildlife Service shall be contacted immediately if subsequent reformation of escarpments that could interfere with sea turtle nesting as determined by the nesting surveyors 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 that escarpment leveling is required during the nesting or hatching season, the Fish and Wildlife Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. To ensure compliance with this condition, turtle nesting surveys must be conducted for one year following the final dredging conducted under the permit.

3. Heavy equipment, such as trucks or earth moving equipment, shall be prohibited from the nesting beach during the sea turtle nesting season from May 1 through October 31. If it is determined that vehicles or equipment are needed on the beach, prior approval must be obtained from the Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission Office of Protected Species Management. If approval is obtained, all vehicles/equipment used shall be equal to or less than 10 psi based on ground loading characteristics. All vehicles/equipment shall be driven at speeds less than 10 miles per hour.

4. From May 1 through October 31, staging areas for construction equipment shall be located off the beach. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. No temporary lighting of the construction area is authorized at anytime during the sea turtle nesting season (May 1 through October 31). No additional permanent exterior lighting is authorized.
5. From May 1 through October 31, all project lighting shall be limited to the immediate area of active construction only and shall be the minimal lighting necessary to comply with U.S. Coast Guard and /or OSHA requirements. Stationary lighting on the beach and all lighting on the dredge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the nesting beach and water. Lighting on offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast guard and OSHA requirements.
6. It is the responsibility of the permittee to ensure that the project area and access sites are surveyed for sea turtle nesting activity. All sea turtle stranding, salvage work, nesting surveys, nest relocations, and nest marking shall be conducted by personnel with prior experience and training in nesting survey, nest marking, and nighttime monitoring who has a valid permit from the Florida Fish and Wildlife Conservation Commission.
7. The permittee shall arrange a meeting between representatives of the contractor, the Army Corps of Engineers, the Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission Office of Protected Species Management, the Florida Department of Environmental Protection Beaches and Coastal Systems, and the permitted sea turtle surveyor at least 14 days prior to the commencement of work on this project. At least 10 days advance notice shall be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

Reporting

1. For each year of the permit in which dredging is performed, an annual report that describes the quantity and location of the material dredged and deposited and evaluates the movement of the deposited sand and the success of alleviating the need to continuously dredge and control down stream shoreline erosion. The reports shall be submitted to the Fish and Wildlife Service by July 31 of 2002, 2003, 2004, 2005, and 2006. Reports (negative activity) are also required even when no work is accomplished.
2. Reports on all the nesting activity within the Mexico Beach survey area including the data as required by the FWC permit and an assessment of the project work on sea turtles shall be provided for the 2001, 2002, 2003, 2004, 2005, and 2006 nesting seasons. The

reports shall be submitted to the Fish and Wildlife Service by January 31 of the year, following the sea turtle nesting season. The mailing address for the report submission is: U.S. Fish and Wildlife Service, 1601 Balboa Avenue, Panama City, Florida 32405.

3. An annual summary of escarpment surveys and actions taken shall be submitted to the Fish and Wildlife Service with the annual dredging reports along with post construction profile drawings for the dredge area and the sand disposal placement. Post construction profile drawings should show the beach morphology from the dune crest or landward edge of the sandy beach down to the depth of closure for the sand disposal or the seaward extent of the excavated area.
4. Upon locating a sea turtle adult, hatchling, or egg harmed or destroyed as a direct or indirect result of the project, notification must be made to the U.S. Fish and Wildlife Service, Panama City Field Office at (850) 769-0552 and Florida Fish and Wildlife Conservation Commission Law Enforcement at 1-800-DIAL-FMP (1-800-342-5367). Care should be taken in handling injured 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.

The Service believes that within the Action Area, 2.0 acres along 1,100 to 1,200 feet of sea turtle nesting habitat on the west side of the Mexico Beach canal and 2,500 feet on the east side of the canal will be incidentally taken as a result of the sand bypass project implemented between November 1 and April 30 during the years of 2001, 2002, 2003, 2004, and 2005, and for one year following. 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.

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. A sea turtle-friendly lighting ordinance should be adopted and implemented for the City of Mexico Beach.
2. Dune restoration and protection should be continued as needed.

3. Dune walkovers and parking areas should be constructed where appropriate to protect dune habitats at beach access points.
4. Informational signs about sea turtles should be placed at beach access points where appropriate to increase public awareness. The signs should describe the importance of the beach to sea turtles and/or the life history of sea turtle species that nest in the area.

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 - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the your request for consultation. 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. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Sincerely yours,

Gail A. Carmody
Project Leader

cc:

FWS, Habitat Conservation/section 7, Atlanta, GA (e-mail copy to Joe Johnston)
FWS, Jacksonville Field Office, FL (Sandy MacPherson)
NMFS, Protected Species, St. Petersburg, FL
FWC, Office of Protected Species, Tallahassee, FL (Robbin Trindell/Karen Moody)
FWC, Office of Environmental Services, Tallahassee, FL
FDEP, Beaches and Coastal Systems, Tallahassee, FL (Michael Corrigan)

LITERATURE CITED

- Ackerman, R.A. 1980. Physiological and ecological aspects of gas exchange by sea turtle eggs. *Amer. Zool.* 20:575-583.
- Boettcher, Ruth. 1998. North Carolina Wildlife Resources Commission, personal communication about leatherback sea turtle nesting in North Carolina to Sandy MacPherson, Fish and Wildlife Service National Sea Turtle Coordinator, Jacksonville, FL.
- Bowen, B., 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. *Cons. Biol.* 7(4):834-844.
- Bowen, Brett. 2001. Personal communication about Federal Emergency Management Agency disaster response, Hurricanes Erin, Opal, Earl, and Georges at Mexico Beach, Bay County, Florida, to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, Florida.
- Brost, Beth. 2001. Personal communication about sea turtle nesting in Florida 1993 - 2000. Biologist, Florida Fish and Wildlife Conservation Commission - Florida Marine Research Institute, St. Petersburg, Florida, to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, Florida.
- Coastal Engineering Research Center. 1984. Shore protection manual, Vol. I and II. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
- Conti, Meghan. 2001. Personal communication about beachfront lighting disorientations of sea turtle nesting in Florida. Biologist, Florida Fish and Wildlife Conservation Commission - Office of Protected Species, Tequesta, Florida, to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, Florida
- 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-SEFC-232.
- Eells, Barbara. 2001. Personal communication about sea turtle nesting in the Mexico Beach, Bay County survey area, Gulf County Turtle Patrol, permit holder #57, to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, 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 (eds.). *Proceedings of the 2nd Western Atlantic Turtle Symposium*. NOAA Technical Memorandum NMFS-SEFC-226.

- Encalada, S.E., K.A. Bjorndal, J.C. Zurita, B. Schroeder, E. Possardt, C.J. Sears, and B.W. Bowen. 1998. Population structure of loggerhead turtle (*Caretta caretta*) nesting colonies in the Atlantic and Mediterranean as inferred from mitochondrial DNA control region sequences. In Press. *Marine Biology*. 9 pp.
- Kaufman, W. and O. Pilkey. 1979. *The beaches are moving*. Anchor Press/Doubleday; Garden City, New York.
- 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.
- LeBuff, C.R., Jr. 1976. Tourist turtle. *Florida Wildlife Magazine*. July 1976.
- Leland, B. 1997. Final report on the management of predation losses to sea turtle nests caused by coyote at Saint Joseph Peninsula State Park. U.S. Dept. Of Agriculture, Wildlife Services. 2 pp.
- Limpus, C.J., V. Baker, and J.D. Miller. 1979. Movement induced mortality of loggerhead eggs. *Herpetologica* 35(4):335-338.
- Longieliere, T.J., G.O. Bailey, and H.L. Edmiston. 1997. Rare nesting occurrence of the leatherback sea turtle, *Demochelys coriacea*, in northwest Florida. Poster paper presented at the 1997 annual symposium on sea turtle conservation and biology. March 4-8. Orlando, FL.
- 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.
- McGehee, M.A. 1990. Effects of moisture on eggs and hatchlings of loggerhead sea turtles (*Caretta caretta*). *Herpetologica* 46(3):251-258.
- 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, FL. 51pp.
- Meylan, A. 1982. Sea turtle migration--evidence from tag returns. P. 91-100. In K. Bjornal (ed.), *Biology and conservation of sea turtles*. Smithsonian Institution Press, Washington, D.C.
- Miller, Bob 2001. Personal communication about leatherback nesting at Eglin Air Force Base, Santa Rosa Island. Biologist, Eglin AFB, Natural Resources Branch, Niceville, FL to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, Florida.

- Miller, K., G.C. Packard, and M.J. Packard. 1987. Hydric conditions during incubation influence locomotor performance of hatchling snapping turtles. *J. Exp. Biol.* 127:401-412.
- Moody, K. 1998. The effects of nest relocation on hatching success and emergence success of the loggerhead turtle *Caretta caretta* in Florida. In: Proceedings of the sixteenth annual symposium on sea turtle biology and conservation. February 28 - March 1, 1996. Hilton Head, SC. pp. 107-108. Compilers: Richard Byles and Yvonne Fernandez. NOAA Tech. Mem. NMFS-SEFSC-412.
- 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.
- National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991a. Recovery plan for U.S. population of loggerhead turtle (*Caretta caretta*). National Marine Fisheries Service, Washington, D.C.
- National Marine Fisheries Service and U.S. Fish and Wildlife Service. 1991b. Recovery plan for U.S. population of Atlantic green turtle (*Chelonia mydas*). National Marine Fisheries Service, Washington, D.C.
- National Marine Fisheries Service and U.S. Fish and Wildlife 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 Research Council. 1987. Responding to changes in sea level. Committee on Engineering Implications of Changes in Relative Mean Sea Level, Marine Board, Commission on Engineering and Technical Systems. National Academy Press; Washington, D.C.
- National Research Council. 1990. Decline of the sea turtles: causes and prevention. National Academy Press, Washington, D.C. 259pp
- 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.). 34pp.
- 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.

- Nicholas, Mark. 2000. Personal communication about leatherback nesting at Gulf Islands National Seashore. Biologist, National Park Service-GINS, Gulf Breeze, FL to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, Florida.
- Nicholas, Mark. 2001. Personal communication about ridley sea turtle nesting at Gulf Islands National Seashore. Biologist, National Park Service-GINS, Gulf Breeze, FL to Lorna Patrick, Biologist, U.S. Fish and Wildlife Service, Panama City, Florida.
- 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*). *J. Comp. Physiol. B.* 158:117-125.
- Packard, M.J., and G.C. Packard. 1986. Effect of water balance on growth and calcium mobilization of embryonic painted turtles (*Chrysemys picta*). *Physiol. Zool.* 59(4):398-405.
- 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*). *J. Exp. Biol.* 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*. *Physiol. Zool.* 58(5):564-575.
- 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.
- 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. *Aust. Wildl. Res.* 7:487-491.
- Philbosian, R. 1976. Disorientation of hawksbill turtle hatchlings (*Eretmochelys imbricata*) by stadium lights. *Copeia* 1976:824.
- Pritchard, P. and J. Mortimer. 1999. Taxonomy, External morphology, and species identification. In: Research and management techniques for the conservation of sea turtles. K. Eckert, K. Bjorndal, F. Abre-Grobois, M. Donnelly (Editors). IUCN/SSC Marine Turtle Specialist Group Publication No. 4.
- Pritchard, P. 1989. Evolutionary relationships, osteology, morphology, and zoogeography of Kemp's ridley sea turtle, pp 157-164. In: Caillouet, C. W. and A.M. Landry (eds), First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation, and Management. Texas A&M University, Galveston, TX, Oct. 1-4, 1985., TAMU-SG-89-105.

- Pritchard, P. 1982. Nesting of the leatherback turtle *Dermochelys coriacea*, in Pacific Mexico, with a new estimate of the world population status. *Copeia* 1982:741-747.
- Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. Pages 189-195 in Bjorndal, K.A. (ed.). *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, D.C.
- 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.
- 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. U.S. Fish and Wildlife Service Endangered Species Report 11. 51pp.
- Turtle Expert Working Group. 2000. Assessment update for the Kemp's Ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Dept. of Commerce. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.
- 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-409.96. 96 pp.
- Turtle Expert Working Group (TEWG). 1997 revised. An assessment of the Kemp's Ridley (*Lepidochelys kempii*) in the western north Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409.96. 96 pp.
- U.S. Army Corps of Engineers. 1992. Preliminary draft feasibility report/environmental impact statement. Glynn County beaches, Georgia. Hurricane and storm damage reduction study. Unpublished manuscript.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1992. Recovery Plan for the Kemp's Ridley Sea turtle (*Lepidochelys kempii*). National Marine Fisheries Service, St. Petersburg, Florida. 40 pp.
- Witherington, B.E. 1992. Behavioral responses of nesting sea turtles to artificial lighting. *Herpetologica* 48:31-39.
- 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.