UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001
May 18, 2001

Mr. Thomas F. Plunkett
President, Nuclear Division
Florida Power and Light Company
Post Office Box 14000
Juno Beach, Florida 33408-0420

SUBJECT: BIOLOGICAL OPINION, ST. LUCIE PLANT, UNITS 1 AND 2
(TAC NOS. MA6374 AND MA6375)

Dear Mr. Plunkett:

Enclosed is a copy of the National Marine Fisheries Service's (NMFS) Biological Opinion, which was issued May 4, 2001. This Opinion is a reinitiation of consultation subsequent to the February 7, 1997, Opinion.

The U.S. Nuclear Regulatory Commission formally requested reinitiation on November 30, 1999, after the St. Lucie Plant exceeded NMFS' anticipated incidental take of three green turtles per year established in the Incidental Take Statement of the 1997 Opinion. The current Opinion considered new information about turtle interactions with the plant submitted by Florida Power and Light in a March 2000 report entitled "Physical and Ecological Factors Influencing Sea Turtle Entrainment Levels at the St. Lucie Nuclear Power Plant: 1976-1998."

The May 4, 2001, Opinion states NMFS' belief that the continued operation of the circulating seawater cooling system at the St. Lucie Plant is not likely to jeopardize the continued existence of the five species of sea turtles found at St. Lucie. However, it revises the Incidental Take Statement and modifies some of the Terms and Conditions of the previous Opinion. These should be evaluated for the potential need to revise the St. Lucie Plant Technical Specifications and plant procedures.

If you have any questions following review of the document, please contact me at (301) 415-3974.

Sincerely,

Brendan T. Moroney

Brendan T. Moroney, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-335, 50-389

Enclosure: NMFS Biological Opinion

cc w/enclosure: R. Hoffman, NMFS
See next page

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/RA/

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Division of Licensing Project Management
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Florida Power and Light Company

ST. LUCIE PLANT

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MAY - 4 2001

Mr. Kahtan N. Jabbour
Senior Project Manager, Section 2
Project Directorate
Division of Licensing Project Management
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Jabbour:

This document transmits the National Marine Fisheries Service's (NMFS) biological opinion (Opinion) based on our review of the document prepared by the Florida Power and Light Company (FP&L) titled "Physical and Ecological Factors Influencing Sea Turtle Entrainment Levels at the St. Lucie Nuclear Power Plant: 1976-1998" and a site visit and meeting held on November 10, 1999, among the plant, Nuclear Regulatory Commission (NRC), state of Florida, and NMFS personnel. The FP&L document was written to satisfy the terms and conditions set in the 1997 Opinion for the continued operation of the circulating seawater cooling system at the plant. The NRC's May 9, 2000, request for formal consultation was received on May 12, 2000. The NMFS consultation number for this action is F/SER/2000/01394. If you have any questions about this consultation, please refer to this number.

This Opinion is a reinitiation of consultation subsequent to the 1997 Opinion. Reinitiation is necessitated by two factors: 1) in 1999 the plant exceeded NMFS' anticipated incidental take of 3 green turtles per year established in the incidental take statement of the 1997 Opinion, and 2) the FP&L document referenced above represents new information about turtle interactions with the plant. This Opinion will analyze the plant's circulating seawater cooling system and its effects on loggerhead, Kemp's ridley, green, leatherback, and hawksbill sea turtles in accordance with section 7 of the Endangered Species Act of 1973 as amended.

The Opinion states NMFS' belief that the continued operation of the circulating seawater cooling system at the St. Lucie Nuclear Power Plant is not likely to jeopardize the continued existence of loggerhead, Kemp's ridley, green, leatherback, or hawksbill sea turtles. However, NMFS anticipates incidental take of these species and has issued an Incidental Take Statement (ITS) pursuant to section 7 of the ESA. This ITS contains reasonable and prudent measures with implementing terms and conditions to help minimize this take. A complete administrative record of this consultation is on file at NMFS, Southeast Regional Office.

We look forward to further cooperation with you on other NRC projects to ensure the conservation and recovery of our threatened and endangered marine species.

Sincerely,

Joseph E. Powers, Ph.D.
Acting Regional Administrator

Enclosure

cc: F/PR3

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Endangered Species Act - Section 7 Consultation

Agency:	United States Nuclear Regulatory Commission
Activity:	Continued Operation of the St. Lucie Nuclear Power Plant's Circulating Seawater Cooling System, Jensen Beach, Hutchinson Island, Florida (F/SER/2000/01394)
Consultation Conducted By:	National Marine Fisheries Service, Southeast Region
Date Issued:	May 4, 2001
Approved By:	Joseph E. Powers, Ph.D. Acting Regional Administrator

This document represents the National Marine Fisheries Service's (NMFS) biological opinion (Opinion) based on our review of the continued operation of the St. Lucie Nuclear Power Plant's circulating seawater cooling system and its effects on loggerhead turtles (*Caretta caretta*), Kemp's ridley turtles (*Lepidochelys kempii*), green turtles *(Chelonia mydas),* leatherback turtles (*Dermochelys coriacea*), and hawksbill turtles (*Eretmochelys imbricata*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973 as amended. The Nuclear Regulatory Commission's (NRC) May 9, 2000, request for formal consultation was received on May 12, 2000.

This Opinion is a reinitiation of consultation which resulted in NMFS' January 1997 Opinion and is based on information provided in the document prepared by the Florida Power and Light Company (FP&L) titled "Physical and Ecological Factors Influencing Sea Turtle Entrainment Levels at the St. Lucie Nuclear Power Plant: 1976-1998" and a site visit and meeting held on November 10, 1999, among the plant, NRC, state of Florida, and NMFS personnel. A complete administrative record of this consultation is on file at the NMFS Southeast Regional Office in St. Petersburg, Florida.

Consultation History

In the original evaluation of the environmental impact of St. Lucie Unit 1, sea turtle entrapment and impingement were not evaluated (U.S. Atomic Energy Commission 1974). Nevertheless, sea turtles were entrapped and impinged when St. Lucie Unit 1 began commercial operation in 1977. To facilitate the capture of entrapped turtles and to prevent turtles from moving down the canal system toward the plant, a large mesh barrier net was erected in 1978. A mesh size of 8 in (20.3 cm) by 8 in was chosen to exclude 95% of the turtles based on the size frequency of turtles captured in the canal before March 1978.

A biological assessment was completed in 1982 for the operation of St. Lucie Unit 2. This assessment was based on the entrapment history of the plant from 1976 through 1981, approximately 150 turtles per year. As part of this evaluation, the 8-in (20.3 cm) square mesh barrier net was considered adequate to exclude turtles from the plant's intake wells. Also, a research program to investigate methods to physically or behaviorally exclude turtles from the offshore intake structures was conducted as part of the Environmental Protection Plan of Unit 2 and concluded that there was no practical method to accomplish this goal (Florida Power & Light 1985). In its 1982 biological opinion on the operation of St. Lucie Unit 2, NMFS concluded that the project was not likely to jeopardize the continued existence of listed species under its jurisdiction but made no provisions for sea turtle mortality.

Since 1993, FP&L has documented significant increases in the numbers of entrapped turtles. A principal component of this increase was juvenile green turtles with carapace widths less than 12 in (30 cm). Before 1993, the maximum number of green turtles captured annually at the St. Lucie Plant was 69. In 1994, a record high of 193 green turtles was captured. In 1995, 673 green turtles were captured, mostly juveniles. With the increase in the number of turtles handled and the decrease in the average size of the turtles, significantly more green turtles have been able to penetrate the 8-in (20.3 cm) mesh barrier net and pass down the canal to be entrained in the intake structures of the plant. The entrainment level peaked in 1995, when 97 turtles (14% of the turtles captured) were removed from the intake wells of the plant.

Based on the increasing number of sea turtles captured and killed at the St. Lucie Plant, the NRC determined that reinitiation of formal section 7 consultation with NMFS was required (also in part because the 1982 Opinion did not make provisions for sea turtles) and informed the NMFS Southeast Regional Office of this determination in a May 11, 1995 letter. The NRC submitted a biological assessment to NMFS on February 7, 1996. In addition, FP&L had installed a new barrier net with 5-in (12.7 cm) bar length webbing to prevent the passage of small turtles through the existing 8-in net and into the intake wells of the plant. Installation of the new barrier net was identified as a mitigation measure early in the consultation process, when methods to reduce entrainment were first discussed. FP&L implemented this requirement before completion of the section 7 consultation.

That consultation was completed with the issuance of a biological opinion in January 1997 which concluded that the project was not likely to jeopardize the continued existence of listed species under NMFS jurisdiction. The 1997 Opinion anticipated an annual incidental lethal take of 2 loggerhead sea turtles or 1.5% of the total number of loggerheads entrapped at the intake canal, whichever was greater; 3 green sea turtles or 1.5% of the total number of greens entrapped at the intake canal, whichever was greater; 1 Kemp's ridley sea turtle or 1.5% of the total number of Kemp's ridleys entrapped at the intake canal, whichever was greater; 1 hawksbill sea turtle or 1.5% percent of the total number of hawksbills entrapped at the intake canal, whichever was greater; and 1 leatherback sea turtle or 1.5% of the total number of leatherbacks entrapped at the intake canal, whichever was greater.

On November 10, 1999, NMFS attended a meeting to discuss the reinitiation of section 7 consultation because in 1999 the plant exceeded the anticipated incidental take level of green turtles set by the 1997 Opinion. At the meeting, FP&L informed NMFS that the study report on turtle interactions with the plant (required by the terms and conditions of the 1997 Opinion) would be completed by March 2000. NMFS advised the NRC and FP&L that NMFS would wait until the report was completed and would partly base the new consultation on that report. NMFS received the report on April 19, 2000, and the NRC's letter requesting reinitiation of section 7 consultation on May 12, 2000. The document and letter contained new information about turtle interactions with the plant. NMFS consided the consultation package complete as of receipt of the May 12, 2000, letter.

This Opinion analyzes the plant's circulating seawater cooling system and its effects on loggerhead, Kemp's ridley, green, leatherback, and hawksbill sea turtles in accordance with section 7 of the ESA.

BIOLOGICAL OPINION

I. Description of Proposed Action

The NRC is the licensing and regulating authority for all nuclear power plants in the United States. The proposed action considered in this Opinion is the NRC's continued licensing of the St. Lucie Nuclear Power Plant and the plant's continued operation of the circulating seawater cooling system, including the capture-release program for sea turtles which are entrapped in the plant's intake canal, and the associated sea turtle conservation and monitoring programs conducted under that license. A description of these activities follows:

Circulating Water System

The Atlantic Ocean provides cooling and receiving waters for both units' condensers and auxiliary cooling systems. These systems share common intake and discharge canals with ocean piping. The major components of these canals and ocean piping systems are: 1) three ocean intake structures and associated velocity caps located approximately 1,200 ft (365 m) from the shore line; 2) three buried intake pipelines to transport water from the intake structure to the intake canal (one pipeline is 16 ft (4.9 m) in diameter, and two are 12 ft (3.65 m) in diameter); 3) a common intake canal to convey sea water to each unit's intake structure; 4) individual unit intake structures; 5) discharge structures for each unit; 6) a common discharge canal; 7) one discharge pipeline to convey water offshore to a "Y" diffuser (12 ft [3.65 m] diameter pipeline) approximately 1,200 ft (365 m) offshore and another pipeline to convey water offshore to a multiport diffuser 16-ft (4.9 m) diameter pipeline; solid pipeline from shoreline to approximately 1,200 ft (365 m) offshore and then the multiport diffuser segment from approximately 1,200 to 2,400 ft (365-730 m) offshore.

The design unit flow for Units 1 and 2 is 1,150 cu ft per second (32.6 m^3/sec) with maximum and

normal temperature rise across the condensers of 31°F and 25°F (17°-13°C), respectively (Bellmund *et al.* 1982).

Intake Structures and Velocity Caps

In 1991-1992, all three velocity caps were rebuilt due to the failure of several panels comprising the caps. The intake structures are located approximately 1,200 ft (365 m) offshore and about 2,400 ft (731 m) south of the discharge structures. The intake structures have a vertical section to minimize sand intake and a velocity cap to minimize fish entrapment, but no screens or grates are used to deny organisms access to the intake pipes. The tops of the intake structures are approximately 7 ft (2.1 m) below the surface at mean low water. The velocity cap for the 16-ft (4.9 m) diameter pipe is 70 ft (6.5 m) square, 5 ft (1.5) thick, and has a vertical opening of 6.25 ft (1.9 m). The velocity cap for the two 12-ft (3.65 m) diameter pipes is 52 ft (4.8 m) square, 5 ft (1.5 m) thick, and has a vertical opening of 6.5 ft (2.0 m).

The flow velocities at various locations of the velocity cap and intake structures have been calculated under various levels of biological fouling. The minimum and maximum horizontal intake velocities at the face of the ocean intake structures for the 12-ft (3.65 m) diameter pipe is calculated at 0.37-0.41 ft/sec (11.2-12.6 cm/sec) and for the 16-ft (4.9 m) diameter pipe is calculated at 0.92-1.0 ft/sec (28.3-30.5 cm/sec). As the water passes under the velocity cap, flow becomes vertical and the velocity increases to approximately 1.3 ft/sec (40.2 cm/sec) for the 12-ft (3.65 m) diameter pipe and 6.8 ft/sec (206 cm/sec) for the 16-ft (4.9 m) diameter pipe (Bellmund *et al.* 1982).

Intake Pipes

From the ocean intake structures, water flows through the three buried pipelines for approximately 1,200 ft (365 m) and empties into the open intake canal behind the dune line. The flow through these pipelines varies from 4.2-6.8 ft/sec (127-206 cm/sec), depending on the pipeline and the degree of fouling. Transit time for an object to travel the distance through the pipeline is approximately 180-285 sec (3 to 4.75 min).

Due to the differences in the diameter of the pipelines and friction of the pipeline walls, the calculated volume through the two 12-ft (3.65 m) diameter lines is approximately 20% each and approximately 60% for the 16-ft (4.9 m) diameter pipeline (Bellmund *et al.* 1982).

Head Walls and Canal System

Approximately 450 ft (138 m) behind the primary dune line, the intake pipes discharge their water at two head wall structures into the intake canal. The head wall structure for the two 12-ft (3.65 m) diameter pipes is a common vertical concrete wall. The head wall for the 16-ft (4.9 m) diameter pipe is more elaborate and consists of a guillotine gate in a concrete box open at the other end. A series of pillars parallel to the flow support a walkway above the discharge area.

The 300-ft (91 m) wide intake canal, whose maximum depth is approximately 25 ft (7.6 m), carries the cooling water 5,000 ft (1,525 m) to the intake structures. The flow rate in the canal

varies from 0.9-1.1 ft/sec (27-32 cm/sec), depending on tidal stage.

Highway Bridge and Underwater Intrusion System

The intake canal is crossed by two permanent structures. One is a bridge owned by the Florida Department of Transportation and is part of U.S. Highway A1A. The roadway is supported by a series of concrete pilings driven into the bottom of the intake canal. The other barrier is the underwater intrusion detection system (UIDS), which is required for security reasons and has a net with a 9-ft (23-m) square mesh to prevent human intrusion into the secure area of the plant.

Intake Wells, Trash Racks, and Traveling Screens

Each unit has a separate intake structure consisting of four bays. Each bay contains trash racks ("grizzlies") that are vertical bars with approximately 3-in (7.6-cm) spacings to catch large objects, such as flotsam, traveling screens with a 3/8-in (1-cm) mesh to remove smaller debris, and circulating water pumps. Approach velocities to each bay are calculated to be less than 1 ft/sec (30.5 cm/sec), but increase to approximately 5 ft/sec (150 cm/sec) at the trash racks.

The trash racks are periodically cleaned by a rake that is lowered to the bottom of the rack. The rake's teeth fit into the 3 in (7.6 cm) vertical openings of the structure. This rake is pulled vertically up and collects any debris that may have accumulated on the structures. This debris is emptied into a trough at the top of the intake bay for subsequent disposal. Any debris that is collected on the traveling screens is washed from the screen by a series of spay jets and is then also emptied into a trough at the top of the intake bay for disposal.

Condensers

After the water has passed through the trash racks, the traveling screens, and the circulating water pump, it travels through the condenser, which contains thousands of 3/8-in (1-cm) diameter tubes. Condenser water heat is transferred to this water, which is then expelled into the discharge canal.

On Unit 2, FP&L has installed a "Taprogge" cleaning system to maintain condenser cleanliness, and is in the process of installing the same system on Unit 1. The Unit 2 system has been in operation since January 23, 1996. The Taprogge system works by passing hundreds of sponge balls less than an inch in diameter through the condenser tubes to remove biological fouling and scale. This mechanical cleaning system reduces the need for chemical treatments. The sponge balls are strained and returned to the head of the condenser for re-use. Four separate water boxes and sponge circulating systems are installed on the condenser. Each water box is normally charged with 1,800 sponge balls. The sponge ball strainers periodically require backflushing to clean debris from the strainer grid. When the grids are opened, the possibility exists for sponge balls to be released into the discharge waters. FP&L has developed "best management practices" to prevent sponge ball loss.

Discharge Systems

Each unit discharges its condenser cooling water into the discharge canal that is approximately

300 ft (91 m) wide and 2,200 ft (670 m) long. The canal terminates at two headwall structures approximately 450 ft (137 m) behind the primary dune line. One structure supports a 12-ft (3.65-m) diameter pipeline that is buried under the ocean floor and runs approximately 1,500 ft (460 m) offshore where it terminates into a two-port "Y" nozzle. The other structure supports a 16-ft (4.9-m) diameter pipeline that is buried under the ocean floor and runs approximately 3,375 ft (1,030 m) offshore. The last 1,400 ft (425 m) of this pipeline contain a multiport diffuser segment with 58 discharge ports. To minimize plume interference, the ports are oriented in an offshore direction on alternating sides of the pipeline. The velocity of the water inside this pipeline averages about 5.7 ft/sec (174 cm/sec), and the jet velocity of the discharge water at each port averages approximately 13 ft/sec (400 cm/sec) to ensure quick dissipation of the thermal load (Bellmund *et al.* 1982).

Thermal Plume

FP&L had the thermal plume modeled for the two-unit operation. The results indicated that the maximum surface temperatures are strongly dependent on ambient ocean conditions. The maximum surface horizontal temperature difference is predicted to be less than 4.9°F (2.7°C) and the resulting +2°F (+1.1°C) surface isotherm is estimated to encompass 963 acres (390 ha) (Bellmund *et al.* 1982).

Sea Turtle Capture and Removal Program

The goal of the sea turtle capture program at the St. Lucie Plant is to remove entrapped turtles from the intake canal system quickly once they have entered the system. FP&L, in conjunction with Applied Biology, Inc., and Quantum Resources, Inc., former and current contractors for sea turtle conservation and monitoring activities at St. Lucie Plant, has developed procedures and methods for handling marine turtles entrapped or impinged (Applied Biology 1993; Quantum 1994).

FP&L hypothesizes that the intake structures and velocity caps serve as an artificial reef, since the structures are the only significant physical feature in this inshore environment. Turtles may encounter these structures in their normal range of activities and feed on the fouling organisms growing on the structures, or seek the structures for shelter. Based on the intake velocities of the intake structures, once a turtle passes the vertical plane of the velocity cap, it can be quickly sucked into the intake pipeline and, after a 3-5 minute ride through the pipeline, be discharged into the intake canal.

From 1976 through 1999, all five species of turtles present in the inshore waters of Florida have been entrapped. A total of 6,576 turtles have been removed from the intake canal of the St. Lucie Plant since 1976. Loggerheads are the dominant turtle in numbers, greens are next, followed by Kemp's ridleys, leatherbacks, and hawksbills.

Barrier Nets–Past Configuration

To facilitate the capture of entrapped turtles and to reduce the likelihood of turtles moving down

the intake canal toward the plant to be impinged, a large mesh barrier net (8-in [20.3 cm] square mesh) was erected at the A1A bridge in 1978. The net was suspended across the canal and was anchored at the bottom with weights and supported at the top by cables and floats. The net was hung so that it had a 1:1 slope, with the bottom anchors being positioned upstream of the surface floats. This configuration was designed to prevent bowing of the net in the center, minimizing the risk of an injured or lethargic turtle being pinned against the net and drowning. By confining most turtles to the canal area east of the A1A bridge, the net capture of turtles in this part of the canal was facilitated. Additionally, any turtle with a carapace width of 11.3 in (28.7 cm) or greater was excluded from passing through the net and moving down the canal and becoming impinged.

The net has been rehung several times (e.g., 1985, 1988, 1990) to maintain its 1:1 slope and blockage of the canal. The net is inspected approximately quarterly to ensure its integrity throughout the water column, its sides, and its bottom. Repairs are made as necessary, and sediment is removed by an air lift if the foot of the net is buried by a build-up of material. Because of deterioration over time, a new net with the same 8-in (20.3 cm) mesh was installed in 1987. In 1990, the headcable of the net was given more support by attaching a series of flotation rafts, which would keep the top of the net at or above the surface of the water under varying water levels that result from tides or operational changes of the generating units (e.g., if a unit is not operating, the water level in the canal rises about 4 ft ([1.2 m]). This reconfiguration would also keep turtles from swimming over the top of the net.

Barrier Net–New Configuration

Due to observed increases in the entrapment rate in 1993 and 1994 (Quantum 1994) for greens and loggerheads, the continuing upward trend in 1995, and the increases in impingement rates and subsequent mortality at the intake wells of the plant, construction of a new, smaller mesh barrier net east of the present barrier net was identified early in the consultation process as a necessary mitigation measure to reduce lethal takes. Specific details of the net configuration were discussed during early consultation activities, which included FP&L's solicitation of ideas from their engineers, Florida Fish and Wildlife Conservation Commission (FFWCC, formerly Department of Environmental Protection) turtle specialists, and NMFS personnel. FP&L completed construction of the new barrier net, a 5-in (12.7 cm) square mesh with a deployed diagonal measurement of 7 in (18 cm) in January 1996. FP&L selected the 5-in mesh size based on the size distribution of turtles seen in the first half of 1995. None of the 414 green turtles entrapped in the intake canal during the first half of 1995 had a straight carapace width measurement smaller than 7 in (18 cm). FP&L predicts that all turtles encountering the 5-in barrier net will be prevented from moving down the canal toward the plant if future turtle size distributions match those of 1995. The net is located approximately halfway between the old 8-in barrier net and the intake headwalls, thus entrapped sea turtles will be confined in a much smaller area. The 5-in net is anchored along the bottom of the canal and is held up by an aerial wire that is strung between tensioning towers on the sides of the canal. The net is designed to remain partially out of the water at varying water levels. Due to potential fouling situations from jellyfish or seaweed, the top of the net can be quickly released from the tensioning towers so that

it can drop to the bottom of the canal. The net is inspected quarterly to ensure its integrity and to provide necessary cleaning and maintenance as required. The old 8-in (20.3-cm) mesh barrier net will also be maintained in its existing place to serve as a backup in case there is a failure of the 5-in (12.7-cm) mesh net or the new net needs to be lowered because of fouling from jellyfish, seaweed, or flotsam.

Underwater Intruder Detection System (UIDS)
In 1986, the UIDS was installed to prevent human entry into the plant via the canal system and to provide further security for the plant. This system also provides an additional barrier for turtles that penetrate the old 8-in barrier net. The barrier is on the north-south arm of the canal and consists of a rigid net with a 9-in (22.9-cm) mesh. The net is hung at approximately a 0.9:1 slope with the bottom of the net downstream of the top. This net is inspected periodically by security personnel; and several turtles, both live and dead (the exact numbers and species were not recorded), were removed from this area in 1994 and 1995, prior to the installation of the 5-inch barrier net.

Intake Well Inspection and Removal
Since December 1994, FP&L has provided inspection of the intake wells at least once every three hours over a 24-hour period. This increase in surveillance was necessary due to increased turtle presence and mortality in the intake wells.

Plant or security personnel who see any turtle impinged or swimming in the intake well area are required to notify a plant turtle biologist through a beeper system. Sea turtle biologists are constantly on call and response time is within an hour. The responding biologist then captures the turtle with a long-handle dip net and places it in a padded box for holding and transport.

Netting Program
Sea turtles are removed from the intake canal by means of large-mesh entanglement nets fished between the intake head wall and the barrier net at the A1A bridge. From 1976 through the present, this netting program has been constantly evaluated and continuously improved to minimize trauma to turtles and to maximize capture efficiency. Nets presently used are from 100-120 ft (30-37 m) long, 9-12 ft (2.7-3.7 m) deep, and composed of 16-in (41-cm) stretch-mesh multifilament nylon. Large floats are attached to the top of the net to provide buoyancy and the bottom of the net is unweighted. Prior to April 1990, turtle nets were deployed on Monday mornings and retrieved on Friday afternoons. During periods of deployment, the nets were inspected for captures at least twice daily (e.g., mornings and afternoons). Additionally, plant and security personnel checked the net periodically, and notified biologists immediately if a capture had occurred. Sea turtle biologists were on call 24 hours/day to retrieve turtles entangled in capture nets.

Beginning in April 1990, after consultation with NMFS, net deployment was scaled back to daylight hours only. Concurrently, surveillance of the intake canal and the nets was increased to the hours the nets were being fished. This measure decreased response time for removal of

entangled turtles from the nets and decreased mortalities from accidental drowning. The presence of a biologist also provided a daily assessment of turtle numbers in the canal and an indication of when a given turtle was first sighted. Biologists were then able to estimate the residence time of the turtle from the first observation to capture and release.

Hand Capture and Dip Netting

In addition to the use of entanglement nets to capture turtles, dip nets and hand captures by snorkel and SCUBA divers are used. Long-handle dip nets used from small boats and from the canal banks and head walls are effective in capturing turtles with carapace lengths of 12 in (30.5 cm) or less. Hand nets have also been used to remove dead and floating small green turtles from various areas in the canal system.

Under good water visibility conditions, divers have proven to be very effective in capturing turtles of all sizes, particularly inactive turtles partially buried in the sediment near the barrier net or sleeping individuals throughout the canal. FP&L believes that hand captures have had a significant impact in reducing residence times for turtles in the canal.

Tagging and Health Assessment Activities

All turtles removed from the St. Lucie Plant intake canal system are identified as to species, measured, weighed, tagged, and examined for overall condition (wounds, abnormalities, parasites, missing appendages). Healthy turtles are released into the ocean on the day of capture.

Since July 1, 1994, all turtles captured are photographed dorsally and ventrally prior to release, and the photographs are retained for future reference. Inconel tags supplied by NMFS are applied to the proximal edge of the foreflippers. The tag numbers, species, and morphometrics of each turtle are reported monthly to FFWCC.

If a turtle has been previously tagged either at the St. Lucie facility or elsewhere, that fact is noted in a monthly data sheet and reported. These data are forwarded by FFWCC to NMFS for inclusion in their data base. From 1990 through 1999, recaptures of green turtles have gone from less than 1% in 1990 to 43% in 1997 and back down to 35% in 1999. Loggerhead recaptures were 10% in 1990, staying between 5% and 11% until 1999 where they reached 15% (Quantum 1999). Several other turtles with tag scars have also been recovered, suggesting that the actual number of recaptures may be higher. Occasionally, turtles are captured that have been tagged by other researchers. One such capture occurred in 1994: a female leatherback with tags from French Guiana.

Necropsy and Rehabilitation Activities

Resuscitation techniques are used on turtles that appear to be comatose. Lethargic or slightly injured turtles are treated and occasionally held for observation prior to release. If further treatment is warranted, FFWCC is notified and a decision is made about which facility would provide additional veterinarian treatment. Beginning in 1982, necropsies were conducted on dead turtles found in fresh conditions.

Sea Turtle Conservation and Monitoring Program

FP&L has been conducting nesting studies as part of the St. Lucie Unit 1 and Unit 2 reporting requirements for the U.S. Fish and Wildlife Service (FWS). In addition, FWS and FFWCC have started a long-term nesting index survey, and the data generated by FP&L since 1971 are an integral part of this program. Nesting reports are summarized on a yearly basis (Applied Biology 1976-1994; Quantum 1994). Nesting surveys run from April 15 through September 15. Biologists use small off-road motorcycles to survey the island early morning, generally completing the survey before 10 a.m. New nests, non-nesting emergences (false crawls), and nests destroyed by predators are recorded for each of the 0.62-mile (1-km) survey areas on Hutchinson Island. In addition to nesting data, data from stranded turtles found during beach nesting surveys are logged. These data are routinely provided to FFWCC and NMFS through the Sea Turtle Stranding and Salvage Network (STSSN). NMFS uses the STSSN database to monitor impacts to sea turtles from natural and human sources of mortality, as well as to infer turtle population characteristics. Also FP&L has been conducting turtle walk programs at the St. Lucie Plant since 1982 as a public service. These walks are permitted by FFWCC and have become quite popular.

Action Area

The action area consists of St. Lucie Nuclear Power Plant, Units 1 and 2, located on a 437-hectare site on Hutchinson Island, Florida, and the piping, canals, and equipment, described above, that make up the circulating seawater cooling system. The Island is bound by the Atlantic Ocean on the east side, the Indian River Lagoon on the west side, the Ft. Pierce Inlet on the north side and the St. Lucie Inlet on the south side. The plant is located approximately midway between the two inlets.

II. Status of Listed Species and Critical Habitat

The following listed species under the jurisdiction of NMFS are known to occur in the action area and may be affected by the proposed action:

Endangered

Blue whale	*Balaenoptera musculus*
Humpback whale	*Megaptera novaeangliae*
Fin whale	*Balaenoptera physalus*
Northern right whale	*Eubalaena glacialis*
Sei whale	*Balaenoptera borealis*
Sperm whale	*Physeter macrocephalus*
Leatherback sea turtle	*Dermochelys coriacea*
Hawksbill sea turtle	*Eretmochelys imbricata*
Kemp's ridley sea turtle	*Lepidochelys kempii*

Green sea turtle *Chelonia mydas**

*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.

Threatened

Loggerhead sea turtle	*Caretta caretta*
Johnson's seagrass	*Halophila johnsonii*

Species of large whales protected by the ESA are not likely to be affected by the proposed action. Species of large whales will not be affected by the intake structures and cannot be trapped in the intake canal. Therefore, species of large whales will not be discussed further in this Opinion.

The proposed action does not include any construction or dredging activities that will cause increased sedimentation or turbidity in Johnson's seagrass habitat. The intake and discharge structures are situated above the sea floor and do not affect the bottom sediments. Therefore, Johnson's seagrass and its critical habitat are not expected to be affected. Johnson's seagrass will not be discussed further in this Opinion.

Critical Habitat Designations

Johnson's seagrass *Halophila johnsonii*

Loggerhead turtle (*Caretta caretta*)

Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans and are the most abundant species of sea turtle occurring in U.S. waters. Loggerhead sea turtles concentrate their nesting in the north and south temperate zones and subtropics, but generally avoid nesting in tropical areas of Central America, northern South America, and the Old World (Magnuson *et al.* 1990). The largest known nesting aggregation of loggerhead sea turtles occurs on Masirah and Kuria Muria Islands in Oman (Ross and Barwani 1982). In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. The best scientific and commercial data available on the genetics of loggerhead sea turtles suggests there are four major subpopulations of loggerhead sea turtles in the northwest Atlantic: (1) a northern nesting subpopulation that occurs from North Carolina to northeast Florida, 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; and (4) a Yucatan nesting subpopulation, occurring on the eastern Yucatan Peninsula, Mexico (Márquez 1990). This biological opinion will focus on the northwest Atlantic subpopulations of

loggerhead sea turtles, which occur in the action area.

Although NMFS has not completed the administrative processes necessary to formally recognize populations or subpopulations of loggerhead sea turtles, these sea turtles are generally grouped by their nesting locations. Based on the most recent reviews of the best scientific and commercial data on the population genetics of loggerhead sea turtles and analyses of their population trends (TEWG 1998; TEWG in prep.), NMFS treats these loggerhead turtle nesting aggregations as distinct sub-populations whose survival and recovery is critical to the survival and recovery of the species. Further, any action that appreciably reduced the likelihood that one or more of these nesting aggregations would survive and recover would appreciably reduce the species' likelihood of survival and recovery in the wild. Consequently, this biological opinion will focus on the four nesting aggregations of loggerhead sea turtles identified in the preceding paragraph (which occur in the action area) and treat them as subpopulations for the purposes of this analysis. Natal homing to the nesting beach provides the genetic barrier between these subpopulations, preventing recolonization from turtles from other nesting beaches. The importance of maintaining these subpopulations in the wild is shown by the many examples of extirpated nesting assemblages in the world.

The loggerhead sea turtles in the action area are likely to represent differing proportions of the four western Atlantic subpopulations. Although the northern nesting subpopulation produces about 9 percent of the loggerhead nests, they comprise more of the loggerhead sea turtles found in foraging areas from the northeastern United States to Georgia: between 25% and 59% of the loggerhead sea turtles in this area are from the northern subpopulation (Bass *et al.* 1998; Norrgard 1995; Rankin-Baransky 1997; Sears 1994, Sears *et al.* 1995). In North Carolina, the northern subpopulation is estimated to make up from 28% to 32% of the loggerheads (NMFS, unpublished data; Bass *et al.* 1998). About 10% of the loggerhead sea turtles in foraging areas off the Atlantic coast of central Florida are from the northern subpopulation (Witzell *et al.* in prep.). In the Gulf of Mexico, most of the loggerhead sea turtles in foraging areas will be from the South Florida subpopulation, although the northern subpopulation may represent about 10% of the loggerhead sea turtles in the gulf (Bass pers. comm.). In the Mediterranean Sea, about 45%-47% of the pelagic loggerheads are from the South Florida subpopulation and about 2% are from the northern subpopulation, while about 51% originated from Mediterranean nesting beaches (Laurent *et al.* 1998). In the vicinity of the Azores and Madeira Archipelagoes, about 19% of the pelagic loggerheads are from the northern subpopulation, about 71% are from the South Florida subpopulation, and about 11% are from the Yucatan subpopulation (Bolten *et al.* 1998).

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. Turtles in this life history stage are called "pelagic immatures" and are best known from the eastern Atlantic near the Azores and Madeira and have been reported from the Mediterranean as well as the eastern Caribbean (Bjorndal *et al.* in press). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm SCL they recruit to coastal inshore and nearshore waters of the

continental shelf throughout the U.S. Atlantic and Gulf of Mexico.

Benthic immatures have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in northeastern Mexico (R. Márquez-M. pers. comm.). Large benthic immature loggerheads (70-91 cm) represent a larger proportion of the strandings and in-water captures (Schroeder *et al.* 1998) along the southern and western coasts of Florida as compared with the rest of the coast, but it is not known whether the larger animals actually are more abundant in these areas or just more abundant within the area relative to the smaller turtles. Benthic immature loggerheads foraging in northeastern U.S. waters are known to migrate southward in the fall as water temperatures cool (Epperly *et al.* 1995; Keinath 1993; Morreale and Standora 1999; Shoop and Kenney 1992), and migrate northward in spring. Given an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985; Frazer and Limpus 1998), the benthic immature stage must be at least 10-25 years long.

Adult loggerhead sea turtles have been reported throughout the range of this species in the United States and throughout the Caribbean Sea. As discussed in the beginning of this section, they nest primarily from North Carolina southward to Florida with additional nesting assemblages in the Florida Panhandle and on the Yucatan Peninsula. Non-nesting, adult female loggerheads are reported throughout the United States and Caribbean Sea; however, little is known about the distribution of adult males who are seasonally abundant near nesting beaches during the nesting season. Aerial surveys suggest that loggerheads (benthic immatures and adults) in U.S. waters are distributed in the following proportions: 54% in the southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

There is general agreement that the number of nesting females provides a useful index of the species' population size and stability at this life stage, even though there are doubts about the ability to estimate the overall population size. Nesting data collected on index nesting beaches in the United States from 1989-1998 represent the best dataset available to index the population size of loggerhead sea turtles. Between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,016-89,034 annually, representing, on average, an adult female population of 44,780 [(nests/4.1) * 2.5]. On average, 90.7% of the nests were from the South Florida subpopulation, 8.5% were from the northern subpopulation, and 0.8% were from the Florida Panhandle subpopulation. There is limited nesting throughout the Gulf of Mexico west of Florida, but it is not known to what subpopulation they belong. There are an estimated 3,700 nesting females in the northern loggerhead subpopulation, and the status of this population has been classified as stable at best (TEWG in prep.).

From a global perspective, the southeastern U.S. nesting aggregation is critical to the survival of this species: it is second in size only to the nesting aggregations in the Arabian Sea off Oman and represents about 35% and 40% of the nests of this species. The status of the Oman nesting beaches has not been evaluated recently, but they are located in a part of the world that is vulnerable to extremely disruptive events (*e.g.*, political upheavals, wars, and catastrophic oil

spills), the resulting risk facing this nesting aggregation and these nesting beaches is cause for considerable concern (Meylan *et al.* 1995).

Loggerhead sea turtles face a number of threats in the marine environment, including oil and gas exploration, development, and transportation; marine pollution; trawl, purse seine, hook and line, gill net, pound net, longline, and trap fisheries; underwater explosions; dredging, offshore artificial lighting; power plant entrapment; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching. On their nesting beaches in the United States, loggerhead sea turtles are threatened with beach erosion, armoring, and nourishment; artificial lighting; beach cleaning; increased human presence; poaching; recreational beach equipment; exotic dune and beach vegetation; predation by exotic species such as fire ants, raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and opossums (*Didelphus virginiana*).

Large numbers of loggerhead sea turtles from the four subpopulations that occur in the action area are captured, injured, or killed in a wide variety of fisheries. Virtually all of the pelagic immature loggerheads taken in the Portuguese longline fleet in the vicinity of the Azores and Madeira are from western North Atlantic nesting subpopulations (Bolten *et al.* 1994, 1998) and about half of those taken in both the eastern and western basins of the Mediterranean Sea are from the western North Atlantic subpopulations (Bowen *et al.* 1993; Laurent *et al.* 1998). Aguilar *et al.* (1995) estimated that the Spanish swordfish longline fleet, which is only one of the many fleets operating in the region, alone captures more than 20,000 juvenile loggerheads annually, killing as many as 10,700. Estimated bycatch of marine turtles by the U.S. Atlantic tuna and swordfish longline fisheries, based on observer data, was significantly greater than reported in logbooks through 1997 (Johnson *et al.* 1999; Witzell 1999), but was comparable by 1998 (Yeung 1999). Observer records indicate that an estimated 6,544 loggerheads were captured by the U.S. fleet between 1992-1998, of which an estimated 43 were dead (Yeung *et al.* in prep.). For 1998 an estimated 510 loggerheads (225-1250) were captured and, based on serious injury criteria developed for marine mammals (which may be inappropriate for sea turtles), all were presumed dead or were expected to die subsequent to being captured. Logbooks and observer records indicated that loggerheads readily ingest hooks (Witzell 1999). Aguilar *et al.* (1995) reported that hooks were removed from only 171 of 1,098 loggerheads captured in the Spanish longline fishery, describing that removal was possible only when the hook was found in the mouth, the tongue or, in a few cases, externally (flippers, *etc.*); the presumption is that all others had ingested the hook.

Loggerhead sea turtles also face numerous threats from natural causes. For example, there is a significant overlap between hurricane seasons in the Caribbean Sea and northwest Atlantic Ocean (June to November) and loggerhead sea turtle nesting season (March to November); hurricanes can have potentially disastrous effects on the survival of eggs in sea turtle nests. In 1992, Hurricane Andrew affected turtle nests over a 90-mile length of coastal Florida; all of the eggs were destroyed by storm surges on beaches that were closest to the eye of this hurricane (Milton *et al.* 1992). On Fisher Island near Miami, Florida, 69% of the eggs did not hatch after

Hurricane Andrew, probably because they were drowned by the storm surge. Nests from the northern subpopulation were destroyed by hurricanes which made landfall in North Carolina in the mid to late 1990s. Sand accretion and rainfall that result from these storms can appreciably reduce hatchling success. These natural phenomena probably have significant, adverse effects on the size of specific year classes; particularly given the increasing frequency and intensity of hurricanes in the Caribbean Sea and northwest Atlantic Ocean.

Status and trend of loggerhead sea turtles

Several published reports have presented the problems facing long-lived species that delay sexual maturity in a world replete with threats from a modern, human population (Congdon *et al.* 1993, Congdon and Dunham 1994, Crowder *et al.* 1994). In general, these reports concluded that animals that delay sexual maturity and reproduction must have high, annual survival as juveniles through adults to ensure that enough juveniles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes. This general rule applies to sea turtles, particularly loggerhead sea turtles, because the rule originated in studies of sea turtles (Crouse *et al.* 1987, Crowder *et al.* 1994, Crouse 1999). Heppell *et al.* (in prep.) specifically showed that the growth of the loggerhead sea turtle population was particularly sensitive to changes in the annual survival of both juvenile and adult sea turtles and that the adverse effects of the pelagic longline fishery on loggerheads from the pelagic immature phase appeared critical to the survival and recovery of the species. Crouse (1999) concluded that relatively small changes in annual survival rates of both juvenile and adult loggerhead sea turtles will adversely affect large segments of the total loggerhead sea turtle population.

The four major subpopulations of loggerhead sea turtles in the northwest Atlantic—northern, south Florida, Florida Panhandle, and Yucatan—are all subject to fluctuations in the number of young produced annually because of natural phenomena like hurricanes as well as human-related activities. Although sea turtle nesting beaches are protected along large expanses of the northwest Atlantic coast (in areas like Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection and probably cause fluctuations in sea turtle nesting success. Volusia County, Florida, for example, allows motor vehicles to drive on sea turtle nesting beaches (the County has filed suit against the USFWS to retain this right) and sea turtle nesting in Indian River, Martin, West Palm, and Broward Counties of Florida can be affected by beach armoring, beach renourishment, beach cleaning, artificial lighting, predation, and poaching.

As discussed previously, the survival of juvenile loggerhead sea turtles is threatened by a completely different set of threats from human activity once they migrate to the ocean. Pelagic immature loggerhead sea turtles from these four subpopulations circumnavigate the North Atlantic over several years (Carr 1987, Bjorndal 1994). During that period, they are exposed to a series of longline fisheries that include an Azorean longline fleet, a Spanish longline fleet, and various fleets in the Mediterranean Sea (Aguilar *et al.* 1995, Bolten *et al.* 1994, Crouse 1999). Based on their proportional distribution, the capture of immature loggerhead sea turtles in

longline fleets in the Azores and Madeira Archipelagoes and the Mediterranean Sea will have a significant, adverse effect on the annual survival rates of juvenile loggerhead sea turtles from the western Atlantic subpopulations, with a disproportionately large effect on the northern subpopulation that may be significant at the population level.

In waters off the coastal United States, the survival of juvenile loggerhead sea turtles is threatened by a suite of fisheries in Federal and State waters. Loggerhead turtles are captured, injured, or killed in shrimp fisheries off the Atlantic coast; along the southeastern Atlantic coast, loggerhead turtle populations were declining where shrimp fishing is intense off the nesting beaches, before the required use of TEDs (Magnuson *et al.* 1990). Conversely, these nesting populations did not appear to be declining where nearshore shrimping effort is low or absent. The management of shrimp harvest in the Gulf of Mexico demonstrates the correlation between shrimp trawling and impacts to sea turtles. Waters out to 200 nm are closed to shrimp fishing off Texas each year for approximately a 3-month period (mid-May through mid-July) to allow shrimp to migrate out of estuarine waters; sea turtle strandings decline dramatically during this period (NMFS, STSSN unpublished data). Loggerhead sea turtles are captured in fixed pound net gear in the Long Island Sound, in pound net gear and trawls in summer flounder and other finfish fisheries in the mid-Atlantic and Chesapeake Bay, in gill net fisheries in the mid-Atlantic and elsewhere, in fisheries for monkfish and for spiny dogfish, and in northeast sink gill net fisheries (see further discussion in the *Environmental Baseline* of this Opinion). Witzell (1999) compiled data on capture rates of loggerhead and leatherback turtles in U.S. longline fisheries in the Caribbean and northwest Atlantic; the cumulative takes of these fisheries approach those of the U.S. shrimp fishing fleet (Crouse 1999, Magnuson *et al.* 1990).

Leatherback turtle (*Dermochelys coriacea*)

The Recovery Plan for Leatherback Turtles (*Dermochelys coriacea*) contains a description of the natural history and taxonomy of this species (USFWS and NMFS 1992). Leatherbacks are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and the GOM (Ernst and Barbour 1972). They are predominantly distributed pelagically, feeding primarily on jellyfish such as *Stomolophus, Chryaora,* and *Aurelia* (Rebel 1974). Leatherbacks are deep divers, with recorded dives to depths in excess of 1000 m (Eckert *et al.* 1989), but they may come into shallow waters if there is an abundance of jellyfish nearshore. Leary (1957) reported a large group of up to 100 leatherbacks just offshore of Port Aransas, Texas, associated with a dense aggregation of *Stomolophus*. They also occur annually in places such as Cape Cod and Narragansett Bays during certain times of the year, particularly the fall.

The leatherback is the largest living turtle and it ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS and USFWS 1995). Leatherback turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas) and are often found in association with jellyfish. TDR data recorded by Eckert *et al.* (1989) indicate that leatherbacks are night feeders. Of the Atlantic turtle species, leatherback turtles seem to be the

most susceptible to entanglement in lobster gear and, along with loggerheads, to longline gear. This susceptibility may be the result of attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, and perhaps to the lightsticks used to attract target species in the longline fishery.

Although leatherbacks are a long lived species (>30 years), they are somewhat faster to mature than loggerheads, with an estimated age at sexual maturity reported as about13-14 years for females, and an estimated minimum age at sexual maturity of 5-6 years, with 9 years reported as a likely minimum (Zug 1996).

Compared to the current knowledge regarding loggerhead populations, the genetic distinctness of leatherback populations is less clear. However, genetic analyses of leatherbacks to date indicate that within the Atlantic basin significant genetic differences occur between St. Croix, U.S.V.I., and mainland Caribbean populations (Florida, Costa Rica, Suriname and French Guiana) and between Trinidad and the same mainland populations (Dutton *et al.* 1999), leading to the conclusion that there are at least three separate subpopulations of leatherbacks in the Atlantic. Much of the genetic diversity is contained in the relatively small insular subpopulations. To date, no studies have been published on the genetic make-up of pelagic or benthic foraging leatherbacks in the Atlantic and thus it is not known what populations are being impacted by particular actions.

Although populations or subpopulations of leatherback sea turtles have not been formally recognized, based on the most recent reviews of the analysis of population trends of leatherback sea turtles, and due to our limited understanding of the genetic structure of the entire species, the most conservative approach would be to treat leatherback nesting populations as distinct populations whose survival and recovery is critical to the survival and recovery of the species. Further, any action that appreciably reduced the likelihood for one or more of these nesting populations to survive and recover in the wild would appreciably reduce the species' likelihood of survival and recovery in the wild.

Nest counts are currently the only reliable indicator of population status available for leatherback turtles. Recent declines have been seen in the number of leatherbacks nesting worldwide (NMFS and USFWS 1995). The status of the leatherback population in the Atlantic is difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the United States. The nesting population within U.S. jurisdiction is presumed to be stable. Numbers at some nesting beaches (*e.g.*, St. Croix, Florida, Puerto Rico) are increasing (P. Dutton pers. comm.), although some nesting beaches in the U.S. Virgin Islands have been extirpated including nesting assemblages in other areas of the Caribbean such as St. John and St. Thomas. The nesting beach at Sandy Point, St. Croix, which has witnessed an increase in the population, has been subject to intensive conservation management efforts since 1981. However, it is not known whether the observed increase is due to improved adult survival or recruitment of new nesters, since flipper tag loss is so high in this species. Better data collection methods implemented since the late 1980s may soon help to answer these questions. Based on an expected inter-nesting

interval of one to five years, Dutton *et al.* (in press) estimate a 19- 49% mortality rate for re-migrating females at Sandy Point. Researchers are currently unable to explain the underlying mechanisms which somehow are resulting simultaneously in such high mortality levels to nesting age females, and yet exponential growth in the nesting population.

In the western Atlantic, the primary nesting beaches occur in French Guiana, Suriname, and Costa Rica. The nesting population of leatherback sea turtles in the Suriname-French Guiana trans-boundary region has been declining since 1992 (Chevalier and Girondot 1998). The current status of nesting populations in French Guiana and Suriname is difficult to interpret because these beaches are so dynamic geologically. Chevalier (pers. comm.), in a talk at the recent Annual Sea Turtle Symposium on March 2, 2000, entitled "Driftnet Fishing in the Marconi Estuary: the Major Reason for the Leatherback Turtle's Decline in the Guianas," stated that since the mid 1970s leatherback nesting has declined (1987-1992 mean = 40,950 nests and 1993-1998 mean = 18,100 nests). He states that there is very little shifting in nesting from French Guiana and Suriname to other Caribbean sites (there has only been one tag recapture elsewhere). Chevalier claims that there is no human-induced mortality on the beach in French Guiana, and natural mortality of adults should be low. There has been very low hatchling success on beaches used for the last 25 years. Chevalier believes that threats to the population include fishing (longlines, driftnets, and trawling), pollution (plastic bags and chemicals), and boat propellers. Around 90% of the nests are laid within 25 km from the Maroni estuary. Strandings in 1997, 1998, and 1999 in the estuary were 70, 60, and 100, which Chevalier considers underestimates. He questioned the fishermen and actually observed a 1 km gill net with seven dead leatherbacks. This observation, coupled with the strandings, led him to conclude that there were large numbers captured incidentally in large mesh nets. There are protected areas nearshore in French Guiana; offshore, driftnets are set. There are no such protected areas off Suriname, and fishing occurs at the beach. Offshore nets soak overnight in Suriname; many boats fish overnight. According to Chevalier, the French Guiana government is starting up a working group to deal with accidental capture and to enforce the legislation. They will work towards the management of the fishery activity and collaborate with Suriname. They plan to study the accidental capture by the fishermen, satellite track turtles, and study strandings. The main problem appears to be the close proximity of the driftnet fishery to the nesting areas.

Swinkels (pers. comm.) also gave a presentation at the symposium on March 3, 2000, entitled "The Leatherback on the Move? Promising News from Suriname." Swinkels stated that from 1995-1999 there was a large increase in leatherback nesting in Suriname. There is a nature reserve in two parts: one in Suriname and one in adjacent French Guiana. There were increasing trends observed on three beaches but poaching was 80%. Samsambo is a very dynamic beach which has been newly created (by natural events) and now is a nesting beach. In 1999, there were >4000 nests of which about 50% were poached. In 1995 very few were poached (very little poaching effort was concentrated there because at the time there wasn't much beach or nesting). Swinkels indicated that since that time, however, poaching has been increasing. The beach has naturally been renourished over this period. Swinkels' null hypothesis was that there had been a shift in nesting activity (from other nesting areas). His alternate hypothesis was that the new

nesting represented new recruitment to the population.

The status of leatherbacks in the Pacific appears more dire than the Atlantic. The East Pacific leatherback population was estimated to be over 91,000 adults in 1980 (Spotila 1996). Declines in nest abundance have been reported from primary nesting beaches. At Mexiquillo, Michoacan, Mexico, Sarti *et al.* (1996) reported an average annual decline in nesting of about 23% between 1984 and 1996. The total number of females nesting on the Pacific coast of Mexico during the 1995-1996 season was estimated at fewer than 1,000. Less than 700 females are estimated for Central America (Spotila *et al.* 2000). In the western Pacific, the decline is equally severe. Current nestings at Terengganu, Malaysia, represent 1% of the levels recorded in the 1950s (Chan and Liew 1996).

Globally, leatherback populations have been decimated worldwide. The population was estimated to number approximately 115,000 adult females in 1980 (Pritchard 1982) and only 34,500 by 1995 (Spotila *et al.* 1996). The decline can be attributed to many factors including fisheries as well as intense exploitation of the eggs (Ross 1979). On some beaches, nearly 100% of the eggs laid have been harvested (Sarti *et al.* 1996). Sarti (1996) and Spotila *et al.* (1996) record that adult mortality has also increased significantly, particularly as a result of driftnet and longline fisheries. The Pacific population appears to be in a critical state of decline, now estimated to number less than 3,000 total adult and subadult animals (Spotila 2000). The status of the Atlantic population is less clear. In 1996, it was reported to be stable, at best (Spotila 1996), but numbers in the western Atlantic at that writing were reported to be on the order of 18,800 nesting females. According to Spotila (pers. comm.), the western Atlantic population currently numbers about 15,000 nesting females, whereas current estimates for the Caribbean (4,000) and the eastern Atlantic (*i.e.*, off Africa, numbering ~ 4,700) have remained consistent with numbers reported by Spotila *et al.* in 1996. Between 1989 and 1995, marked leatherback returns to the nesting beach at St. Croix averaged only 48.5%, but that the overall nesting population grew (McDonald *et al.* 1993). This is in contrast to a Pacific nesting beach at Playa Grande, Costa Rica, where only 11.9% of turtles tagged in 1993-94 and 19.0% of turtles tagged in 1994-95 returned to nest over the next five years. Characterizations of this population suggest that it has a very low likelihood of survival and recovery in the wild under current conditions.

Spotila *et al.* (2000) states that a conservative estimate of annual leatherback fishery-related mortality (from longlines, trawls, and gill nets) in the Pacific during the 1990s is 1,500 animals. He estimates that this represented about a 23% mortality rate (or 33% if most mortality was focused on the East Pacific population). Spotila *et al.* (2000) asserts that most of the mortality associated with the Playa Grande nesting site was fishery related. As noted above, leatherbacks normally live at least 30 years, usually maturing at about 12-13 years. Such long-lived species cannot withstand such high rates of anthropogenic mortality.

Spotila *et al.* (1996) describe a hypothetical life table model based on estimated ages of sexual maturity at both ends of the species' natural range (5 and 15 years). The model concluded that leatherbacks maturing in 5 years would exhibit much greater population fluctuations in response

to external factors than would turtles that mature in 15 years. Furthermore, the simulations indicated that leatherbacks could maintain a stable population only if both juvenile and adult survivorship remained high and if other life history stages (*i.e.*, egg, hatchling, and juvenile) remained static, "stable leatherback populations could not withstand an increase in adult mortality above natural background levels without decreasing . . . Even the Atlantic populations are being exploited at a rate that cannot be sustained." Model simulations indicated that an increase in adult mortality of more than 1% above background levels in a stable population was unsustainable. Spotila *et al.* (1996) recommended not only reducing mortalities resulting from fishery interaction, but also advocated protection of eggs during the incubation period and of hatchlings during their first day, and indicated that such practices could potentially double the chance for survival and help counteract population effects resulting from adult mortality. They conclude "the Atlantic population is the most robust, but it is being exploited at a rate that cannot be sustained and if this rate of mortality continues, these populations will also decline. Leatherbacks are on the road to extinction."

Zug (1996) point out that the combination of the loss of long-lived adults in fishery related mortality and the lack of recruitment stemming from elimination of annual influxes of hatchlings because of intense egg harvesting has caused the sharp decline in leatherback populations. The authors state that "the relatively short maturation time of leatherbacks offers some hope for their survival if we can greatly reduce the harvest of their eggs and the accidental and intentional capture and killing of large juveniles and adults."

Summary

The conflicting information regarding the status of Atlantic leatherbacks makes it difficult to conclude whether or not the population is currently in decline. Numbers at some nesting sites are up, while at others they are down. At one site (St. Croix), population growth has been documented despite large apparent mortality of nesting females; where data are available, population numbers are down in the western Atlantic, but stable in the Caribbean and eastern Atlantic. It does appear, however, that the western Atlantic portion of the population is being subjected to mortality beyond sustainable levels, resulting in a continued decline in numbers of nesting females.

In the absence of any other population models, the western Atlantic population cannot withstand more than a 1% human-related mortality level which translates to 150 nesting females (Spotila *et al.* 1996; Spotila pers. comm.). As noted above, there are many anthropogenic sources of mortality to leatherbacks; a tally of all leatherback takes anticipated annually under current biological opinions yields a potential for up to 1,166 leatherback takes, although this sum includes many takes expected to be nonlethal and takes of males, juveniles, and possibly leatherbacks from the Caribbean and West African nesting assemblages. In combination with other threatening factors, such as the continued harvest of eggs and adult turtles for meat in some Caribbean and Latin nations, the effects of ocean pollution, and natural disturbances such as hurricanes (which may wipe out nesting beaches), it is clear that the endangered leatherback

populations of the Atlantic require significant conservation efforts to ensure their long-term survival and recovery in the wild.

Green turtle (*Chelonia mydas*)

Green turtles are globally distributed, mainly in waters between the northern and southern 20°C isotherms (Hirth 1971). Green turtles were traditionally (and are still) highly prized for their flesh, fat, eggs, and shell, and fisheries in the United States and throughout the Caribbean are largely to blame for the decline of the species.

In the western Atlantic, several major nesting assemblages have been identified and studied (Peters 1954, Carr and Ogren 1960, Parsons 1962, Pritchard 1969, Carr *et al.* 1978). The largest, at Tortuguero, Costa Rica, has shown a long-term increasing trend since monitoring began in 1971. The increase is from an annual fitted-estimated number of emergences of under 20,000 in 1971 to over 40,000 in 1996. Over 100,000 emergences occurred in 1995 (Bjorndal *et al.* 1999b). In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan *et al.* 1995). Most documented green turtle nesting activity occurs on Florida index beaches, which were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of the index beaches in 1989, perhaps due to increased protective legislation throughout the Caribbean (Meylan *et al.* 1995). A long-term in-water monitoring study in the Indian River Lagoon of Florida has tracked the populations of juvenile green turtles in a foraging environment and noted significant increases in catch per unit effort (more than doubling) between the years 1983-85 and 1988-90. An extreme, short-term increase in CPUE of ~300% was seen between 1995 and 1996 (Ehrhart *et al.* 1996).

While nesting activity is obviously important in identifying population trends and distribution, the majority portion of a green turtle's life is spent on the foraging grounds. Green turtles are herbivores, and appear to prefer marine grasses and algae in shallow bays, lagoons, and reefs (Rebel 1974). Some of the principal feeding pastures in the Gulf of Mexico include inshore south Texas waters, the upper west coast of Florida and the northwestern coast of the Yucatan Peninsula. Additional important foraging areas in the western Atlantic include the Indian River Lagoon System in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito coast of Nicaragua, the Caribbean coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1971). The preferred food sources in these areas are *Cymodocea, Thalassia, Zostera, Sagittaria,* and *Vallisneria* (Babcock 1937, Underwood 1951, Carr 1952, 1954).

Green turtles were once abundant enough in the shallow bays and lagoons of the Gulf to support a commercial fishery, which landed over one million pounds of green turtles in 1890 (Doughty 1984). Doughty reported the decline in the turtle fishery throughout the Gulf of Mexico by 1902.

Currently, green turtles are uncommon in offshore waters of the northern Gulf, but abundant in some inshore embayments. Shaver (1994) live-captured a number of green turtles in channels entering into Laguna Madre, in South Texas. She noted the abundance of green turtle strandings in Laguna Madre inshore waters and opined that the turtles may establish residency in the inshore foraging habitats as juveniles. Algae along the jetties at entrances to the inshore waters of South Texas was thought to be important to green turtles associated with a radio-telemetry project (Renaud *et al.* 1995). Transmitter-equipped turtles remained near jetties for most of the tracking period. This project was restricted to late summer months, and therefore may reflect seasonal influences. Coyne (1994) observed increased movements of green turtles during warm water months.

Hawksbill turtle (*Eretmochelys imbricata*)

The hawksbill turtle is relatively uncommon in the waters of the continental United States, preferring coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. NMFS has designated the coastal waters surrounding Mona and Monito Islands, off the west coast of Puerto Rico, as critical habitat for hawksbills. Mona Island supports the largest population of nesting hawksbills in the U.S. Caribbean. In the northern Gulf of Mexico, a surprising number of small hawksbills are encountered in Texas. Most of the Texas records are probably in the 1-2 year class range. Many of the individuals captured or stranded are unhealthy or injured (Hildebrand 1983). The lack of sponge covered reefs and the cold winters in the northern Gulf of Mexico probably prevent hawksbills from establishing a strong presence in that area. Of the 65 geopolitical units worldwide, where estimates of relative hawksbill nesting density exist, 38 of them have hawksbill populations that are suspected or known to be in decline and an additional 18 have experienced "well-substantiated declines" (NMFS and USFWS 1995).

Kemp's ridley turtle (*Lepidochelys kempii*)

Of the seven extant species of sea turtles of the world, the Kemp's ridley has declined to the lowest population level. The Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) (USFWS and NMFS 1992b) contains a description of the natural history, taxonomy, and distribution of the Kemp's ridley turtle. Kemp's ridleys nest in daytime aggregations known as arribadas, primarily at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nest in this single locality (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 early 1970s, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500-5,000 individuals. The population declined further through the mid-1980s. Recent observations of increased nesting suggest that the decline in the ridley population has stopped and there is cautious optimism that the population is now increasing.

The nearshore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile Kemp's ridley and loggerhead sea turtles. Ogren (1988) suggests that the Gulf coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern Gulf of Mexico. Stomach contents of Kemp's ridleys along the lower Texas coast consisted of a predominance of nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). Analyses of stomach contents from sea turtles stranded on upper Texas beaches apparently suggest similar nearshore foraging behavior (Plotkin pers. comm.).

Research being conducted by Texas A&M University has resulted in the intentional live-capture of hundreds of Kemp's ridleys at Sabine Pass and the entrance to Galveston Bay. Between 1989 and 1993, 50 of the Kemp's ridleys captured were tracked (using satellite and radio telemetry) by biologists with the NMFS Galveston Laboratory. The tracking study was designed to characterize sea turtle habitat and to identify small and large scale migration patterns. Preliminary analysis of the data collected during these studies suggests that subadult 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 pers. comm.).

In recent years, unprecedented numbers of Kemp's ridley carcasses have been reported from Texas and Louisiana beaches during periods of high levels of shrimping effort. NMFS established a team of population biologists, sea turtle scientists, and managers, known as the Turtle Expert Working Group (TEWG), to conduct a status assessment of sea turtle populations. Analyses conducted by the group have indicated that the Kemp's ridley population is in the early stages of recovery; however, strandings in some years have increased at rates higher than the rate of increase in the Kemp's population (TEWG 1998). While many of the stranded turtles observed in recent years in Texas and Louisiana are believed to have been incidentally taken in the shrimp fishery, other sources of mortality exist in these waters. These stranding events illustrate the vulnerability of Kemp's ridley and loggerhead turtles to the impacts of human activities in nearshore Gulf of Mexico waters.

The TEWG (1998) developed a population model to evaluate trends in the Kemp's ridley population through the application of empirical data and life history parameter estimates chosen by the TEWG. Model results identified three trends in benthic immature Kemp's ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the nearshore benthic environment, where they are available to nearshore mortality sources that often result in strandings. Benthic immature ridleys are estimated to be 2-9 years of age and 20-60 cm in length. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989 as hatchling production was further enhanced by the cooperative program between the U.S. Fish and Wildlife Service and Mexico's Instituto Nacional de Pesca to increase the nest protection and relocation program in 1978. A third period of steady increase, which has not leveled off to date, has occurred since 1990 and appears to be due to the greatly increased hatchling production and an

apparent increase in survival rates of immature turtles beginning in 1990 due, in part, to the introduction of turtle excluder devices (TEDs). Adult ridley numbers have now grown from a low of approximately 1,050 adults producing 702 nests in 1985, to greater than 3,000 adults producing 1,940 nests in 1995, to greater than 9,000 adults producing about 5,700 nests in 2000.

The TEWG (1998) was unable to estimate the total population size and current mortality rates for the Kemp's ridley population; however, the TEWG listed a number of preliminary conclusions. The TEWG indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Over the period 1987 to 1995, the rate of increase in the annual number of nests accelerated in a trend that would continue with enhanced hatchling production and the use of TEDs. Nesting data indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and a low of 702 nests in 1985. Thus, the trajectory of adult abundance tracks trends in nest abundance from an estimate of 9,600 in 1966 to 1,050 in 1985. The TEWG estimated that in 1995 there were 3,000 adult ridleys. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6% to 28% from 1981 to 1989 and from 23% to 41% from 1990 to 1994. The population model in the TEWG projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2020, if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. It determined that the data reviewed suggested that adult Kemp's ridley turtles were restricted somewhat to the Gulf of Mexico in shallow nearshore waters, and benthic immature turtles of 20-60 cm straight line carapace length are found in nearshore coastal waters including estuaries of the Gulf of Mexico and the Atlantic.

The TEWG (1998) identified an average Kemp's ridley population growth rate of 13% per year between 1991 and 1995. Total nest numbers have continued to increase. However, the 1996 and 1997 nest numbers reflected a slower rate of growth, while the increase in the 1998 nesting level was much higher, then decreased in 1999, and increased again strongly in 2000. The population growth rate does not appear as steady as originally forecasted by the TEWG, but annual fluctuations, due in part to irregular internesting periods, are normal for other sea turtle populations. Also, as populations increase and expand, nesting activity would be expected to be more variable.

The area surveyed for ridley nests in Mexico was expanded in 1990 due to destruction of the primary nesting beach by Hurricane Gilbert. The TEWG (1998) assumed that the increased nesting observed particularly since 1990 was a true increase, rather than the result of expanded beach coverage. Because systematic surveys of the adjacent beaches were not conducted prior to 1990, there is no way to determine what proportion of the nesting increase documented since that time is due to the increased survey effort rather than an expanding ridley nesting range. As noted by TEWG, trends in Kemp's ridley nesting even on the Rancho Nuevo beaches alone suggest that recovery of this population has begun but continued caution is necessary to ensure recovery and to meet the goals identified in the Kemp's Ridley Recovery Plan.

III. Species Likely to Be Affected

Of the above-listed species occurring in the Atlantic Ocean offshore of the southeastern United States, NMFS believes that the five sea turtle species are vulnerable to capture, injury, and death from some of the activities associated with the proposed action. However, based on stranding records and records from the plant, hawksbill and leatherback turtles are rare in this area; therefore, NMFS believes that although there is a chance that a hawksbill or leatherback sea turtle could be affected by the proposed action the chances of one of these species being affected is remote.

IV. Environmental Baseline

This section contains an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, their 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.

The environmental baseline for this biological opinion includes the effects of several activities that affect the survival and recovery of threatened and endangered species in the action area. The activities that shape the environmental baseline in the action area of this consultation are primarily fisheries and recovery activities associated with reducing fisheries impacts. Other environmental impacts include effects of discharges, dredging, military activities, oil and gas development activities, and industrial cooling water intake.

Status of the Species Within the Action Area

The five species of sea turtles that occur in the action area are all highly migratory. NMFS believes that no individual members of any of the species are likely to be year-round residents of the action area. Individual animals will make migrations into near shore waters as well as other areas of the North Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. Therefore, the range-wide status of the five species of sea turtles, given in section II above, most accurately reflects the species' status within the action area. Likewise, while the following discussion of factors affecting species reflects conditions both inside and outside of the immediate action area, this discussion most accurately reflects those factors acting on sea turtles which may occur within the action area seasonally or transiently.

Factors Affecting Species within the Action Area

Federal Actions

In recent years, NMFS has undertaken several ESA section 7 consultations to address the effects of Federally-permitted fisheries and other Federal actions on threatened and endangered species in the action area. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles. Similarly, recovery actions NMFS has undertaken under both the MMPA and the ESA are addressing the problem of take of sea turtles in the fishing and shipping industries. Incidental take levels anticipated under the incidental take statements associated with these existing biological opinions are summarized in Table 1 below, followed by a brief discussion of each action consulted on. The following summary of anticipated incidental take of turtles includes only those Federal actions which have undergone formal section 7 consultation.

Table 1. 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 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	3450(3450) [9]	650(650) [9]	3450(3450)[9]	3450(3450)[9;]	3450(3450)[9]
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]	unlimited(2)	unlimited(1)	unlimited(3)	unlimited(1)	unlimited(1)
NRC - Brunswick, NC	50 (6)[2]	50[2]	50 (3)[2]	50 (2)[2]	50[2]
NRC - Crystal River, FL	55 (1)[2]	55 (1)[2]	55 (1)[2]	55 (1)[2]	55 (1)[2]
Total [13]	**4,660(3,860)**	**1,440(767)**	**3,945(3,587)**	**3,933(3,592)**	**3,907(3,541)**

[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 (note: in most cases, it is expected that takes of turtle species other than loggerheads will be minimal).
[3] Includes Navy Operations along the Atlantic coast 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; however, the Incidental take statement cites observed take (5 loggerheads, 2 leatherbacks, or 3 Kemp's ridleys or greens or hawksbills in any combination) as a representative of the estimated take. The estimated take represents any combination of species other than the leatherback.
[10] Represents **estimated** total take and **observed** lethal take in parentheses.
[11] Represents **estimated** total and lethal take.
[12]Take levels for nonlethal were not identified because entrainment is a function of turtle abundance & environmental conditions; lethal take is also expressed as 1.5% of the total number entrained in the plant, whichever is greater.
[12] Represents a minimum number of turtles taken annually because the majority of the take is observed take and is not an estimate of true numbers that are taken; the 'unlimited' lethal take for St.Lucie Power Plant is not incorporated in the total. [13]
[13] The numbers for each species are not additive because the total anticipated take, in many cases, represents a combination of species.

Vessel Operations

Potential adverse effects from Federal vessel operations in the action area of this consultation include operations of the Navy (USN) and Coast Guard (USCG), which maintain the largest Federal vessel fleets, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the Army Corps of Engineers (COE). NMFS has conducted formal consultations with the USCG, the USN (described below) and is currently in early phases of consultation with the other Federal agencies on their vessel operations. Through the section 7 process, where applicable, NMFS 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 represent potential for some level of interaction. Refer to the biological opinions for the USCG (NMFS 1995, 1996a, and 1998b) and the USN

(NMFS 1997b) for detail on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures. Since the USN consultation only covered operations out of Mayport, Florida, potential still remains for USN vessels to adversely affect sea turtles when they are operating in other areas within the range of these species. Similarly, operations of vessels by other Federal agencies within the action area (NOAA, EPA, COE) may adversely affect sea turtles. However, the in-water activities of those agencies are limited in scope, as they operate a limited number of vessels or are engaged in research/operational activities that are unlikely to contribute a large amount of risk.

Additional military activities, including vessel operations and ordnance detonation, also affect sea turtles. U.S. Navy aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500- and 1,000-lb bombs) is estimated to have the potential to injure or kill, annually, 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridley, in combination (NMFS 1997a). The USN will also conduct ship-shock testing for the new SEAWOLF submarine and the DDG-81 WINSTON S. CHURCHILL guided missile destroyer off the Atlantic coast of Florida, using 5 submerged detonations, each of 10,000-lb explosive charge. This testing is estimated to injure or kill 50 loggerheads, 6 leatherbacks, and 4 hawksbills, greens, or Kemp's ridleys, for the SEAWOLF and 8 sea turtles in any combination of the five species found in the action area for the Winston Churchill (NMFS 1996b; NMFS 2000). The USN Mine Warfare Center in Corpus Christi, Texas, may take, annually, up to 5 loggerheads and 2 leatherbacks, hawksbills, greens, or Kemp's ridleys, in combination, during training activities in the western Gulf of Mexico. U.S. Air Force operations in the Eglin Gulf Test Range in the eastern Gulf of Mexico may also kill or injure sea turtles. Air-to-surface gunnery testing is estimated to kill a maximum of 3 loggerheads, 2 leatherbacks, and 1 green, hawksbill or Kemp's ridley. Search and rescue training operations are expected to have a low level of impacts, taking 2 turtles over a 20-year period. Operation of the USCG's boats and cutters in the U.S. Atlantic, meanwhile, is estimated to take no more than one individual turtle—of any species—per year (NMFS 1995). Formal consultation on overall USCG or USN activities in the Gulf of Mexico has not been conducted.

The construction and maintenance of Federal navigation channels has also been identified as a source of turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, 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. Along the Atlantic coast of the southeastern United States, NMFS estimates that annual, observed injury or mortality of sea turtles from hopper dredging may reach 35 loggerheads, 7 greens, 7 Kemp's ridleys, and 2 hawksbills (NMFS 1997c). A combination of hopper dredging and the use of explosives is expected to take 18 sea turtles (all species) during the deepening and widening of Wilmington Harbor, North Carolina. Along the north and west coasts of the Gulf of Mexico, channel maintenance dredging using a hopper dredge may injure or kill 30 loggerhead, 8 green, 14 Kemp's ridley, and 2 hawksbill sea turtles annually (NMFS 1997d). Additional incidental take statements for dredging of Charlotte Harbor and Tampa Bay, Florida, anticipate these projects

may incidentally take, by injury or mortality, 2 loggerheads or 1 Kemp's ridley or 1 green or 1 hawksbill sea turtle for Charlotte Harbor and 8 sea turtles, including no more than 5 documented Kemp's ridley, hawksbill, leatherback, or green turtles, in any combination, for Tampa Bay.

The COE and Minerals Management Service (MMS) (the latter is nonmilitary) rig removal activities also adversely affect sea turtles. For the COE activities, an incidental take (by injury or mortality) of one documented Kemp's ridley, green, hawksbill, leatherback, or loggerhead turtle is anticipated under a rig removal consultation for the New Orleans District (NMFS 1998c). MMS activities are anticipated to result in annual incidental take (by injury or mortality) of 25 sea turtles, including no more than 5 Kemp's ridley, green, hawksbill, or leatherback turtles and no more than 10 loggerhead turtles, due to MMS' OCS oil and gas exploration, development, production, and abandonment activities.

Federal Fishery Operations
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. Gill net, longline, trawl gear, and pot fisheries have all been documented as interacting with sea turtles. For all 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 NMFS has determined are likely to adversely affect threatened and endangered species: American Lobster, Monkfish, Dogfish, Southeastern Shrimp Trawl Fishery, Northeast Multispecies, Atlantic Pelagic Swordfish/Tuna/Shark, and Summer Flounder/Scup/ Black Sea Bass fisheries. These consultations are summarized below; for more detailed information, refer to the respective biological opinions.

The *Northeast Multispecies Sink Gill Net Fishery* is one of the other major fisheries that is known to take sea turtles. This fishery has historically occurred from the periphery of the Gulf of Maine to Rhode Island in water to 60 fathoms. In recent years, more of the effort in this fishery has occurred in offshore waters and into the Mid-Atlantic. Participation in this fishery declined from 399 to 341 permit holders in 1993 and is expected to continue to decline as further groundfish conservation measures are implemented. The fishery operates throughout the year with peaks in the spring and from October through February. Data indicate that gear used in this fishery has seriously injured loggerhead and leatherback sea turtles. It is often difficult to assess gear found on stranded animals or observed at sea and assign it to a specific fishery. Only a fraction of the takes are observed, and the catch rate represented by the majority of takes, which are reported opportunistically, *i.e.*, not as part of a random sampling program, is unknown. Consequently, the total level of interaction cannot be determined through extrapolation. The incidental take level established for this fishery in the July 5, 1989, BO estimated that 10 documented Kemp's ridley, 10 green, 10 hawksbill, 10 leatherback, and 100 loggerhead sea turtles would be killed or injured by the fishery annually.

The monkfish and dogfish fisheries are prosecuted with multispecies-type gear, and therefore have potential to interact with sea turtles. After reviewing the best available information on the status of endangered and threatened species under NMFS jurisdiction, the environmental baseline for the action area, the effects of the action, and the cumulative effects, NMFS concluded in a biological opinion issued December 21, 1998, that conduct of the monkfish fishery, with modification to reduce impacts of entanglement through the whale and porpoise TRPs, may adversely affect but is not likely to jeopardize the continued existence of endangered and threatened species under NMFS jurisdiction.

The *Monkfish Fishery Management Plan* was recently completed by the New England and Mid-Atlantic Fishery Management Councils. This fishery uses several gear types which may entangle protected species, and takes of shortnose sturgeon and sea turtles have been recorded from monkfish trips. NMFS completed a formal consultation on the Monkfish FMP on December 21, 1998, which concluded that the fishery, with modification under the take reduction plans, is not likely to jeopardize listed species or adversely modify critical habitat. The ITS provided under this Opinion anticipates up to 6 incidental takes of loggerhead turtles (no more than 3 lethal), 1 lethal or nonlethal take of a green sea turtle, 1 lethal or nonlethal take of a Kemp's ridley, and 1 lethal or nonlethal take of a leatherback. However, the implication of this fishery in the recent pulse of sea turtle strandings in North Carolina noted elsewhere in this Opinion necessitate reinitiation of consultation and likely the current incidental take levels will be revised in a new incidental take statement.

A consultation was recently concluded for *the Spiny Dogfish Fishery*. This fishery is similar to the monkfish fishery, but uses somewhat smaller mesh gear. The recent biological opinion prepared for the FMP for this fishery anticipates 6 takes (no more than 3 lethal) of loggerheads, and 1 take (lethal or nonlethal) each for Kemp's ridley, leatherbacks, and, green sea turtles.

The *Summer Flounder, Scup and Black Sea Bass fisheries* are known to interact with sea turtles. Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl (which would include fisheries for other species like scup and black sea bass) by requiring TEDs in nets in the area of greatest bycatch off the North Carolina and southern Virginia coast. NMFS is considering a more geographically inclusive regulation to require TEDs in trawl fisheries that overlap with sea turtle distribution to reduce the impact from this fishery. Developmental work is also ongoing for a TED that will work in the flynets used in the weakfish fishery. The anticipated observed annual take rates for turtles in this multispecies fishery is 15 loggerheads and 3 leatherbacks, hawksbills, greens, or Kemp's ridleys, in combination annually (NMFS 1997a).

The *Atlantic Pelagic Fisheries for Swordfish, Tuna, Shark, and Billfish* are known to incidentally capture large numbers of turtles, particularly in the pelagic longline component (NMFS 2000). Take levels from hooking or entanglement in longline gear are estimated for 2000 at 468 loggerheads, 358 leatherbacks, 46 greens, 23 Kemp's ridleys, and 46 hawksbills, with a resulting mortality rate of approximately 30%. The interactions resulting from the shark gillnet, shark

bottom longline, and other gears used in this fishery are lower. The shark gillnet component is estimated, based on limited observer data, to injure or kill 20 loggerheads, 2 leatherbacks, 2 Kemp's ridleys, 2 greens, and 2 hawksbills annually. The shark bottom longline component is similarly estimated, based on limited observer data, to injure or kill 12 loggerheads, 2 leatherbacks, 2 Kemp's ridleys, 2 greens, and 2 hawksbills annually. The other gears are anticipated to result in documented takes of no more than 3 turtles, in total, of any species.

The *Southeast U.S. Shrimp Fishery* is known to incidentally take high numbers of sea turtles. Shrimp trawlers in the southeastern United States are required to use TEDs, which reduce a trawler's capture rate by 97%. Even so, NMFS estimated that 4,100 turtles may be captured annually by shrimp trawling, including 650 leatherbacks that cannot be released through TEDs, 1,700 turtles taken in try nets, and 1,750 turtles that fail to escape through the TED (NMFS 1998d), including large loggerheads. Henwood and Stuntz (1987) reported that the mortality rate for trawl-caught turtles ranged between 21% and 38%, although Magnuson *et al.* (1990) suggested Henwood and Stuntz's estimates were very conservative and likely an underestimate of the true mortality rate.

Other Federal Actions
Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. At the St. Lucie Nuclear Power Plant at Hutchinson Island, Florida, large numbers of green and loggerhead turtles have been captured in the seawater intake canal in the past several years. Annual capture levels from 1994-1997 have ranged from almost 200 to almost 700 green turtles and from about 150 to over 350 loggerheads. Almost all of the turtles are caught and released alive; NMFS estimates the survival rate at 98.5% or greater (see NMFS 1997f). A biological opinion completed in January 2000 estimates that the operations at the Brunswick Steam Electric Plant in Brunswick, North Carolina, may take 50 sea turtles in any combination annually, that are released alive. NMFS also estimated the total lethal take of turtles at this plant may reach 6 loggerhead, 2 Kemp's ridley or 3 green turtles annually. A biological opinion completed in June 1999 on the operations at the Crystal River Energy Complex in Crystal River, Florida, estimated the level of take of sea turtles in the plant's intake canal may reach 55 sea turtles with an estimated 50 being released alive biennially.

Environmental Contaminants
An extensive review of environmental contaminants in turtles has been conducted by Meyers-Schöne and Walton (1994); however, most available information relates to freshwater species. High concentrations of chlorobiphenyls and organochlorine pesticides in the eggs of the freshwater snapping turtle, *Chelydra serpentina*, have been correlated with population effects such as decreased hatching success, increased hatchling deformities and disorientation (Bishop *et al.* 1991, 1994). Very little is known about baseline levels and physiological effects of environmental contaminants on marine turtle populations (Witkowski and Frazier 1982; Bishop *et al.* 1991). There are a few isolated studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Davenport and Wrench 1990; Aguirre *et al.* 1994). Mckenzie *et al.* (1999) measured concentrations of chlorobiphenyls and organochlorine

pesticides in marine turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles. It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. Sakai *et al.* (1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. More recently, Storelli *et al.* (1998) analyzed tissues from twelve loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises by Law *et al.* (1991). Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

State or Private Actions

Private and commercial vessels
Commercial traffic and recreational pursuits can have an adverse effect on sea turtles through prop and boat strike damage. Private vessels participate in high speed marine events concentrated in the southeastern United States and are a particular threat to sea turtles, and occasionally to marine mammals as well. The magnitude of these marine events is not currently known. NMFS and the USCG are in early consultation on these events, but a thorough analysis has not been completed. The Sea Turtle Stranding and Salvage Network (STSSN) also reports many records of vessel interaction (propeller injury) with sea turtles off coastal states such as New Jersey and Florida, where there are high levels of vessel traffic.

State fishery operations.
A biological opinion on the NMFS/ASMFC interjurisdictional FMP for weakfish was conducted in June 1997. Weakfish are caught in the summer flounder fishery and are also fished with fly nets. Analyses of the NMFS' observer data showed 36 incidental captures of sea turtles for trawl and gill net vessels operating south of Cape May, New Jersey, from April 1994 through December 1996. Of those turtles taken, 28 loggerheads were taken in trawls that also caught weakfish, and resulted in two deaths. Most of the sea turtle takes occurred in late fall. In all cases, weakfish landings were second in poundage behind Atlantic croaker and summer flounder (NEFSC unpub. data).

The North Carolina observer program documented 33 fly net trips from November through April of 1991-1994 and recorded no turtles caught in 218 hours of trawl effort. However, a NMFS observed vessel fished for summer flounder for 27 tows with an otter trawl equipped with a TED and then fished for weakfish and Atlantic croaker with a fly net that was not equipped with a TED. They caught one loggerhead in 27 TED equipped tows and seven loggerheads in nine fly net tows without TEDs. In addition, the same vessel using the fly net in a previous trip took 12 loggerheads in 11 out of 13 observed tows targeting Atlantic croaker. Weakfish landings from

these fly net tows were second in poundage (NEFSC unpub.data).

Georgia and South Carolina prohibit gill nets for all but the shad fishery. This fishery was observed in South Carolina for one season by the NMFS Southeast Fisheries Science Center (McFee *et al.* 1996). No takes of protected species were observed. Florida has banned all but very small nets in state waters, as has the state of Texas. Louisiana, Mississippi, and Alabama have also placed restrictions on gill net fisheries within state waters such that very little commercial gillnetting takes place in southeast waters, with the exception of North Carolina. Most pot fisheries in the southeast are prosecuted in areas frequented by sea turtles.

Pulses of greatly elevated sea turtle strandings occur with regularity in the mid-Atlantic area, particularly along North Carolina through southern Virginia in the late fall/early spring, coincident with their migrations. For example, in the last weeks of April through early May 2000, approximately 300 turtles, mostly loggerheads, stranded north of Oregon Inlet, North Carolina. Gill nets were found with four of the carcasses. These strandings are likely caused by state fisheries as well as Federal fisheries, although not any one fishery has been identified as the major cause. Fishing effort data indicate that fisheries targeting monkfish, dogfish, and bluefish were operating in the area of the strandings. Strandings in this area represent at best, 7%-13% of the actual nearshore mortality (Epperly *et al.* 1996). Studies by Bass *et al.* (1998), Norrgard (1995), and Rankin-Baransky (1997) indicate that the percentage of northern loggerheads in this area is highly over-represented in the strandings when compared to the approximately 9% representation from this subpopulation in the overall U.S. sea turtle nesting populations. Specifically, the genetic composition of sea turtles in this area is 25%-54% from the northern subpopulation, 46%-64% from the South Florida subpopulation, and 3%-16% from the Yucatan subpopulation. The cumulative removal of these turtles on an annual basis would severely impact the recovery of this species.

Conservation and Recovery Actions Shaping the Environmental Baseline

NMFS implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NMFS has required the use of TEDs in southeast 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 exclude 97% of the 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 (1999) indicate that the minimum requirements for the escape opening dimensions are too small, and that as much as 47% of the loggerheads stranding annually along the Atlantic seaboard and Gulf of Mexico were too large to fit through existing openings. On April 5, 2000, NMFS published an Announcement of Proposed Rulemaking to require larger escape openings (65 FR 17852).

In 1993 (with a final rule implemented 1995), NMFS established a Leatherback Conservation

Zone to restrict shrimp trawl activities from off the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border. This provides for short-term closures when high concentrations of normally pelagically distributed leatherbacks are recorded in more coastal waters where the shrimp fleet operates. This measure is necessary because, due to their size, adult leatherbacks are larger than the escape openings of most NMFS-approved TEDs. This rule was originally established because of coastal concentrations of leatherbacks which sometimes appear during their spring northward migration, but the rule was also recently implemented in the fall of 1999 off the coast of northern Florida due to unseasonable concentrations there, and leatherback TEDs were also required off the coast of Texas in the spring of 2000 due to unusual numbers of leatherback strandings there.

NMFS 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 northeast 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, but testing under commercial conditions is still necessary.

In addition, NMFS has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. As well as making this information widely available to all fishermen, NMFS 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. NMFS intends to continue these outreach efforts and hopes to reach all fishermen participating in the pelagic longline fishery over the next 1 to 2 years.

Sea Turtle Stranding and Salvage Network Activities
There is an extensive network of sea turtle stranding and salvage network (STSSN) participants along the Atlantic and Gulf of Mexico which not only collects data on dead sea turtles, but also rescues and rehabilitates any live stranded turtles. In most states, the STSSN is coordinated by state wildlife agency staff, although some state stranding coordinators are associated with academic institutions. Data collected by the STSSN are used to monitor stranding levels and compare them with fishing activity in order to determine whether additional restrictions on fishing activities are needed. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. All of the states that participate in the STSSN are collecting tissue for and/or conducting genetic and ageing studies to better understand the population dynamics of the small subpopulation of northern nesting loggerheads. These states also tag turtles as live ones are encountered (either via the stranding network through incidental takes or in-water studies). Tagging studies help provide an understanding of sea turtle movements, longevity, reproductive patterns, *etc.*

Other Potential Sources of Impacts in the Environmental Baseline

A number of activities that may indirectly affect listed species 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 are being implemented to monitor or study impacts from these elusive sources. For example, extensive monitoring is being required for a major discharge in Massachusetts Bay (Massachusetts Water Resources Authority) in order to detect any changes in habitat parameters associated with this discharge. Close coordination is occurring through the section 7 process on both dredging and disposal sites to develop monitoring programs and ensure that vessel operators do not contribute to vessel-related impacts.

NMFS and the U.S. Navy have been working cooperatively to establish a policy for monitoring and managing acoustic impacts from anthropogenic sound sources in the marine environment. Acoustic impacts can include temporary or permanent injury, habitat exclusion, habituation, and disruption of other normal behavior patterns. It is expected that the policy on managing anthropogenic sound in the oceans will provide guidance for programs such as the use of acoustic deterrent devices in reducing marine mammal-fishery interactions and review of Federal activities and permits for research involving acoustic activities. The Office of Naval Research hosted a meeting in March 1997 to develop scientific and technical background for use in policy preparation. NMFS hosted a workshop in September 1998 to gather technical information which will support development of new acoustic criteria.

Summary and Synthesis of the Status of Species and Environmental Baseline

In summary, the potential for dredging, military activities, fisheries, *etc.*, to adversely affect sea turtles exists for the sea turtles considered in this consultation. However, recovery actions have been undertaken as described and continue to evolve. Those actions have started to produce positive changes in the nesting numbers of Kemp's ridley and loggerhead turtles (south Florida subpopulation) that are expected to continue. The other listed species are not likely to have benefitted to the same degree from the recovery actions taken: *e.g.*, green, leatherback, and hawksbill turtle nesting is mostly outside the United States and Mexico and likely has received less beachside protection efforts, and loggerheads and Kemp's ridleys are the major shrimp bycatch species that have benefitted the most from TED use. Still, those actions are expected to benefit the listed species in the foreseeable future. These actions should not only improve the conditions of sea turtles, but are expected to reduce sources of human-induced mortality as well.

However, factors in the existing baseline for loggerhead sea turtles and leatherback sea turtles leave cause for considerable concern regarding the status of these populations and the current impacts upon these populations:

a. The leatherback sea turtle is declining worldwide. Overall sources of mortality, including the NMFS HMS fisheries, incurred by this population exceed the 1% sustainable level proposed by Spotila *et al.* (1996).

b. The nesting numbers for the northern subpopulation of loggerhead sea turtles are stable or declining, and the nesting females currently number only about 3,700. The percent of

northern loggerheads represented in sea turtle strandings in northern U.S. Atlantic states is over-representative of their total numbers in the overall loggerhead population. Current take levels from other sources, particularly fisheries (especially longline, trawl, and gill net fisheries), are high.

IV. Effects of the Action

Summary of FP&L's Report on the Physical and Ecological Factors Influencing Sea Turtle Entrainment at the St. Lucie Nuclear Power Plant

The terms and conditions of the incidental take statement of NMFS' January 1997 Opinion required FP&L to conduct a study of the physical and ecological factors influencing sea turtle interactions with the plant. This report was completed in March 2000 and the results are summarized below. For further information please refer to the report titled "Physical and Ecological Factors Influencing Sea Turtle Entrainment Levels at the St. Lucie Nuclear Power Plant: 1976-1998" (Florida Power and Light, 2000).

Immature loggerhead and green turtles apparently use the near shore ocean environment in the vicinity of the St. Lucie Plant as developmental/foraging habitat. This appears to be related to the water depth in the area, the presence of hard bottom substrates and worm reefs, and the occurrence of preferred food items. Based on recapture data, it appears that some turtles reside in the area throughout the year, while others transmigrate seasonally. The area is apparently also used as internesting habitat by large numbers of female loggerhead turtles that nest on Hutchinson Island every year.

Turtles migrating along the coast and/or utilizing hard bottom substrates and worm reefs in the vicinity of the plant would be brought into close proximity with the plant's intake structures. Turtles may enter the intake structures to rest or avoid attack from predators and/or competition from other turtles. Green and loggerhead turtles may also be attracted to the intakes for the purpose of foraging, since the structures resemble reefs, important foraging habitat for both species.

The majority of the loggerhead and green turtles entrained into the St. Lucie Plant intake canal between 1977 and 1998 were juveniles. However, loggerhead captures included a higher proportion of subadults and adults than green turtle captures. This probably reflects the fact that the loggerhead nesting population is considerably larger than the green turtle nesting population in the Hutchinson Island area.

There were significant increases in the numbers of juvenile and adult loggerhead captures and juvenile green turtle captures at the St. Lucie Plant from 1977 through 1998. The increase in adult loggerhead captures was more or less continuous and was significantly correlated with increases in nesting on Hutchinson Island. The upward trends in juvenile loggerhead and green turtle captures were primarily due to increases that occurred in the 1990s.

On average, more turtles were captured each year after Unit 2 was placed on line than before, suggesting that the addition of a second unit affected capture rates to some extent. However, this change could not account for the dramatic increases in capture rates of juvenile loggerhead and green turtles that only occurred after Unit 2 had been operating for ten years.

Changes in the physical appearance of the intake structure velocity caps following their repair coincided with substantial increases in juvenile green turtle captures at the plant. However, the extent to which the two are causally related is unclear.

Power plant outages over the life of the plant, at times, appeared to affect short term trends in juvenile loggerhead and green turtle captures. However, plant outages could not explain the substantial increases in captures of either species that occurred during the 1990s. Flow rates from 1988 through 1998 appeared to have a weak but significant effect on short-term juvenile loggerhead entrainment rates. Again, however, flow rates were not responsible for the long-term increases in juvenile loggerhead captures occurring during this period. Flow rates had no effect on either short- or long-term captures of juvenile green turtles.

Changes in the nearshore environment near the St. Lucie Plant might be expected to affect long-term trends in the turtle entrainment. Unfortunately, data relating to the relative size and relief of nearby worm reefs and hard bottom or to changes in the abundance of food items in the area were lacking. One environmental factor that was shown to be significantly correlated with monthly captures of juvenile green and loggerhead turtles was water temperature. However, no relationship between local water temperatures and long-term trends in capture rates could be demonstrated. The frequency of high, wave producing winds also did not appear to affect entrainment of turtles. Seasonal increases in the number of juvenile loggerhead and green turtles in the vicinity of the plant may be more closely related to the migration patterns of turtles from more northern areas than to local conditions.

There is evidence (mainly from nesting beach surveys) that the adult populations of both green and loggerhead turtles that provide juveniles to the Hutchinson Island area increased during the study period. It would logically follow that the juvenile component of those populations also increased. The number of juvenile green turtles captured at the St. Lucie Plant increased dramatically in the 1990s. A similar increase was documented in the central Indian River Lagoon in an area well beyond the influence of the St. Lucie Plant. Unfortunately, there are relatively few other study sites for which long-term quantitative data are available for juvenile loggerheads. However, the strong correlation between adult loggerhead captures at the St. Lucie Plant and nesting on Hutchinson Island elucidates the relationship between canal rates and the relative numbers of individuals in the nearshore environment.

Even though changes in physical plant design and operating characteristics have occurred over the life of the plant, these changes do not appear to be responsible for the long-term increases in the numbers of juvenile and adult loggerhead and juvenile green turtles captured at the St. Lucie Plant. The most logical explanation for these increases is that there are more individuals of these

life history stages present in the vicinity of the plant.

Direct Effects

At least 6,576 sea turtles have become entrapped at the St. Lucie intake canal between 1976 through 1999. One hundred ninety-seven of those have died, for a total mortality rate of 3.0%. Loggerheads have been the species most frequently taken over this period, although green turtles have been the dominant species encountered since 1993.

Entrapment at the St. Lucie intake canal can result in direct negative impacts on turtles in a number of ways: drowning in the intake pipes, injury sustained in the pipes and the canal, injury sustained during canal dredging, debilitation of condition due to long entrapment, exposure to predators in the intake canal, injury and stress sustained during capture, entanglement and drowning in fish gillnets and turtle capture nets, and impingement and drowning on barrier nets and in the intake wells. The Taprogge condenser cleaning system may also have an effect on sea turtles if discharged sponge balls are ingested.

Drowning and injury in the intake pipes are unlikely to be a major direct impact. With both generating units operating, the transit time through the intake pipes (5 minutes through the 12-ft pipes and 3 minutes through the 16-ft pipes) is likely too short to drown a sea turtle, and there are no known instances of turtle mortalities from forced submergence in the intake pipes. Some captured turtles have shown recent superficial scrapes, usually to the anterior carapace or plastron, which may have resulted from contact with encrusting organisms in the pipeline.

NMFS has conducted several formal consultations with the COE on the effects of channel maintenance dredging on sea turtles, generally concluding that the operation of hopper dredges may adversely affect sea turtles, but not hydraulic or clam shell dredges. This latter conclusion does not apply, however, to dredging conducted in the narrow confines of the St. Lucie intake canal where turtles have limited ability to evade a dredge. All types of dredging may affect sea turtles there. In fact, from 1976 to 1990, 7 loggerheads were killed during maintenance dredging in the St. Lucie intake canal. In 1994, however, hydraulic dredging was accomplished without any sea turtle mortality by isolating the dredging area with a temporary 4-in square barrier net. FP&L engineers expect that future maintenance dredging in the intake canal will generally only be necessary west of the 5-in barrier net. Impacts to sea turtles from dredging west of the barrier net are considered unlikely. In the rare instances where dredging may be required to the east of the 5-in barrier net, FP&L will contact NMFS and initiate consultation on the particular project, in conjunction with NRC or COE. Dredging associated with the construction of the 5-in barrier net was the subject of a separate informal consultation with NMFS (concluded October 26, 1995); and the work was accomplished without any impacts to turtles.

The extent of impacts resulting from loss of condition and exposure to predation is largely dependent on the species and the total residence time of individual animals in the intake canal. Green turtles, in particular, would not have access to their normal food sources of sea grasses or

algae in the canal. Loggerheads may be able to find some of their prey species that have also become entrapped in the canal. In 1994, FP&L reported residence times based on visual observations for turtles entrapped east of the Highway A1A barrier net. Average residence times were 1.5 days for loggerheads and 2 days for green turtles, and 100% percent of the loggerheads and 97% percent of the greens were captured within one week of first sighting. Loss of condition from lack of adequate food sources should not have serious negative impacts on turtles over these relatively short periods of time. Predatory fish, including barracuda, sharks, and jewfish, occur in the intake canal and may pose a threat to the smaller turtles in the canal. The level of predation on turtles entrapped in the intake canal has not been quantified, but can be mitigated by minimizing the residence time for individuals entrapped at the St. Lucie Plant. The contribution of predation to the overall turtle mortality rate at the St. Lucie Plant is probably small.

Drowning in capture nets has occurred occasionally throughout the history of the St. Lucie Plant's capture program during the period from 1976 through 1999. Since the capture-release program began, 7 loggerheads and 13 green turtles have drowned in capture nets (0.3% of the total number of turtles captured). Turtles can drown when they become tightly entangled, when the net becomes fouled on the bottom, or when a small turtle becomes tangled with a large turtle and is held underwater. Since April 1990, the nets have been set only during daylight hours and constantly tended, resulting in 4 greens drowned in capture nets but no loggerheads. The last green turtle to drown in a capture net was on February 7, 1999.

Injuries sustained during capture are all reported to be superficial. Typically they involve small cuts from net strands and abrasions sustained during handling. Efforts can be made to reduce effects from stress by minimizing handling time (reported to be generally under one-half hour to obtain biological information and to tag the animal) and by keeping turtles cool and shaded prior to release.

Impingement of turtles on the barrier nets has been implicated in only one mortality since improvements to the 8-in barrier net were completed in 1990. Since then, one loggerhead has become entangled in the 8-in barrier net and drowned. Six other loggerheads and 5 green turtles have been recovered dead at the barrier net, but their cause of death is unknown and the carcasses would naturally accumulate at the barrier net. The UIDS barrier is believed by FP&L to pose a greater threat to turtles than the other barrier nets because of its downward slope relative to the current flow. One UIDS-associated mortality has been reported since 1990. Generally, however, small turtles capable of penetrating the 8-in barrier net can presumably penetrate the UIDS barrier without impingement and end up in the intake wells. The large number of small turtles removed from the intake wells between 1990 and 1995 bears this out. However, with the installation of the 5-in barrier net in 1996, fewer turtles have been getting through to the intake wells.

Since 1992, the number of small green turtles entrapped in the St. Lucie intake canal has been rising. Correspondingly, until the installation of the 5-in barrier net, more small turtles were penetrating the barrier nets and eventually reaching the intake wells. In 1995, 673 green turtles

were entrapped in the St. Lucie intake canal, and 97 of those had to be removed from the intake wells, where 7 died. Since 1990, a total of 16 green turtles have been recovered dead from the intake wells. FP&L has reported that 3 of the 16 died as the result of injury inflicted by the mechanical debris-removing rakes. The other 13 are reported by FP&L as dying of unknown causes. However, as stated previously, turtles reaching the intake wells have decreased due to the installation of the 5-in barrier net in 1996, with only 55 turtles making it through to the intake wells from 1996 through 2000 and only 3 of these being found dead. This has helped to decrease total turtle mortalities at the plant.

Possible impacts of the Taprogge condenser cleaning system have been examined. Release of the system's sponge balls in the plant's discharge waters would introduce persistent marine debris offshore of the plant. The cleaning balls, made of vulcanized natural rubber, could be mistaken for prey items by turtles and consumed, with unknown health effects. To address this and other concerns relating to the Taprogge system's operation, FP&L instituted operational procedures for the system to prevent sponge ball release into the environment. FP&L has been making operational reports to FFWCC since March 1996 on the Taprogge system. Based on these reports, sponge ball loss is quite low, with the maximum estimated at three balls/day. These sponge balls would most likely have been lost as a result of deterioration to a small enough size to pass through the strainer grid. FP&L has increased controls on sponge ball inventories and has added key lock controls on the ball strainers. The sponge ball loss rate is quite low, and probably consists of very small sponge parts. No impacts to sea turtles are expected from this normal operational loss rate. Single, large losses of sponge balls should be preventable through proper management controls, which FP&L has implemented. No impacts from the Taprogge system are anticipated as long as effective operational and management measures are maintained. FP&L should continue to generate the yearly reports on the operation of the Taprogge system, which have been required by the FFWCC Bureau of Protected Species Management, and a copy should also be provided to the NMFS Southeast Regional Office to allow NMFS to evaluate whether impacts from sponge ball loss are greater than presently anticipated.

In addition to the impacts to sea turtles already discussed, entrapment at the St. Lucie intake canal can have several other negative effects on sea turtles, through interruption of migration, loss of mating opportunities, and loss of nesting opportunities. Leatherbacks are probably more sensitive to interruption of migration than the other species of sea turtle because their spring migrations seem to be closely synchronized with the presence of prey species. The problem of loss of mating opportunities is impossible to quantify but would affect adults prior to and during the nesting season. Loss of nesting opportunities is a documented problem, with several instances of females nesting on the canal bank reported by FP&L. The severity of any of these impacts can be reduced by minimizing residence time of individual turtles in the canal.

Since reporting of sea turtle entrapment and mortality at St. Lucie Plant began in 1976, two general trends in the impacts on sea turtles are clear. The total number of turtles entrapped has increased, particularly in the last five years, and the mortality rate of the entrapped turtles has decreased. With the exception of the activation of Unit 2 in 1982, the operating characteristics of

the circulating water system have not changed over time. From 1976 through 1994, there was an average of 181 turtles entrapped per year. From 1995 through 1999, the average has gone up to 676 turtles entrapped per year. From 1976 to 1990, an average of 11 turtles per year were found dead in some part of the circulating seawater cooling system. This number has decreased from 1991 through 1999 to 4.8 turtles per year.

The TEWG (1998) found that loggerhead nesting on Hutchinson Island was a good predictor of nesting trends on other Florida index beaches and may well reflect nesting trends for the total South Florida loggerhead nesting population. FP&L (2000) found that loggerhead nesting on Hutchinson Island has increased significantly from 1981 through 1998. If trends on Hutchinson Island do accurately reflect nesting trends for the whole South Florida loggerhead nesting population, then nesting for this population also has increased from 1981 through 1998. Based on results of genetic testing by Bass (1999) the majority of loggerheads captured at the plant are from the South Florida nesting population. Provancha (1997, 1998) found green turtle catch per unit effort (CPUE) in nearby Mosquito Lagoon to be greater than the CPUE's recorded for the same area for the years 1977 through 1979. Therefore, the increased number of entrapments of turtles could be a result of increased local abundances. The decreasing mortality rates are due to incremental improvements in the turtle program executed at FP&L, including the construction of barrier nets, improved monitoring, and fine-tuning capture methods. Since 1990, turtle mortalities have resulted from drowning in the capture or barrier nets, entrapment in the intake wells, and unknown, presumably natural, causes. Small green turtles from the intake wells constitute half of these mortalities.

From 1976 to 1990, an average of 11 turtles per year were found dead out of an average of 183 total turtles captured in some part of the circulating seawater cooling system. Due to improvements in the turtle detection and capture methods, discussed above, the number of dead turtles has decreased from 1991 through 1999 to 4.8 turtles per year even though the total number of turtles captured has increased to a average of 487 turtles per year during that time period. Future levels of impacts to marine turtles at the St. Lucie Plant are difficult to assess in absolute terms due to fluctuating capture rates. If the years 1995 through 1999 are broken out from the averages above, those years give an average of 722 turtles captured per year with a high of 933 in 1995 and a low of 382 in 1997. Therefore, NMFS believes that there is a possibility that 1,000 turtles, in any combination of the five species found in the action area, could be captured during any given year at the plant. The majority of these turtles will be green turtles, followed by loggerhead turtles, and to a much lesser extent Kemp's ridley, leatherback, and hawksbill sea turtles. Based on this and past mortality information NMFS, believes that 10 or 1% of the total number of green and loggerhead turtles (combined) captured (which ever is less) in any combination of green and loggerhead turtles may be incidentally taken by injury or mortality, per year, as a result of the proposed action. NMFS believes that one Kemp's ridley turtle, per year, and one hawksbill or leatherback turtle, every two years, may be incidentally taken by injury or mortality, per year, as a result of the proposed action.

V. Cumulative Effects

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area considered in this biological opinion. 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 -- commercial and recreational fishing and recreational beach use and boating -- are expected to continue at the present levels of intensity in the near future. As discussed in Section III, however, listed species of turtles and whales 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.

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, more and more coastal counties are adopting more stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting. Some of these measures are being drafted in response to ongoing law suits brought against the counties by concerned citizens who charged the counties with failing to uphold the ESA by allowing unregulated beach lighting which resulted in takes of hatchlings.

State-regulated commercial and recreational fishing activities in the Gulf of Mexico waters currently result in the incidental take of threatened and endangered species. Other recreational activities, such as whale watch cruises, have also resulted in the incidental take of endangered whales. 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 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 and whales taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles. Future cooperation between NMFS and the states on these issues should help decrease take of sea turtles and whales caused by recreational activities. NMFS 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.

VI. Conclusion

After reviewing the current status of the endangered green, leatherback, hawksbill, and Kemp's ridley sea turtles and the threatened loggerhead sea turtle in the action area, the environmental baseline, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the continued use of St. Lucie Nuclear Power Plant's circulating seawater cooling

system is not likely to jeopardize the continued existence of the endangered green, leatherback, hawksbill, and Kemp's ridley sea turtles, or the threatened loggerhead sea turtle. No critical habitat has been designated for these species in the action area; therefore, none will be affected.

VII. Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act 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, 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), 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 this incidental take statement.

The measures described below are nondiscretionary and must be undertaken by the NRC 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. NRC has a continuing duty to regulate the activity covered by this incidental take statement. If NRC fails to assume and implement the terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, NRC must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement.

Amount or Extent of Anticipated Take

The lethal take levels below are based on the historical observed lethal takes, but provide for increased total numbers of lethal takings as entrapment levels increase.

Based on stranding records and historical data, five species of sea turtles are known to occur in the action area. Currently available information on the relationship between sea turtle capture and mortality and the St. Lucie Nuclear Power Plant's circulating seawater cooling system indicates that injury and/or death of sea turtles is likely to occur from entrapment in the system's intake canal associated with the proposed action. In recent years turtle entrapment has increased, especially green turtles, and will likely continue to increase, as the green turtle population, and other species' populations, continue to increase and recover. Therefore, pursuant to section 7(b)(4) of the ESA, NMFS anticipates an **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 also as a result of this incidental capture. NMFS anticipates that the turtles most likely to be entrapped and taken will be green turtles, followed by loggerhead turtles, and to a much lesser extent, Kemp's ridley, leatherback, and hawksbill sea turtles. If the actual incidental captures, injuries or mortalities meets or exceeds this level, NRC must immediately request reinitiation of formal consultation. NMFS Southeast Region will cooperate with NRC in the review of the incident.

Effect of the Take

NMFS believes that the aforementioned level of anticipated take (lethal, injury or non-lethal) over the next 10 years is not likely to appreciably reduce either the survival or recovery of Kemp's ridley, green, loggerhead, leatherback, and hawksbill sea turtles in the wild by reducing their reproduction, numbers, or distribution. In particular, NMFS determined that it does not expect activities associated with the St. Lucie Nuclear Power Plant's circulating seawater cooling system, when added to ongoing activities affecting these species in the action area and cumulative effects, to affect sea turtles in a way that reduces the number of animals born in a particular year (i.e., a specific age-class), the reproductive success of adult sea turtles, or the number of young sea turtles that annually recruit into the adult breeding population.

Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the Kemp's ridley, green, loggerhead, leatherback, and hawksbill sea turtles.

1. FP&L shall have a program in place to monitor, protect, and capture turtles entrapped in the intake canal.

2. FP&L shall report all turtle captures and subsequent mortalities per permit conditions.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, NRC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are nondiscretionary.

1) FP&L shall maintain a 5-in bar mesh barrier net across the intake canal, east of the existing 8-in mesh barrier net. The 5-in net must receive regular inspection, maintenance, and repair on at least a quarterly basis. The regular maintenance schedule notwithstanding, any holes or damage to the net that are discovered must be promptly repaired to prevent the passage of turtles through the barrier net.

2) The existing 8-in mesh barrier net must be retained to serve as a backup to the 5-in mesh barrier net, which may be lowered occasionally because of fouling and water flow problems. The 8-in mesh net must receive regular inspection, maintenance, and repair on at least a quarterly basis. The regular maintenance schedule notwithstanding, any holes or damage to the net that are discovered must be promptly repaired to prevent the passage of turtles through the barrier net.

3) FP&L shall continue its current program to capture and release turtles from the intake canals.

> a) Turtles that have been flipper tagged by the plant have experienced a 19% loss rate of the tags and some turtles have experienced severe flipper scaring (Gorhan *et al.* 1998). Therefore all turtles released shall be PIT tagged. However, in order to continue to gain data on flipper tag loss rates turtles not exhibiting flipper scaring and damage shall also be flipper tagged. The handling and tagging of captured turtles, treatment, and rehabilitation of sick and injured turtles, and disposition of dead turtle carcasses shall be in accordance with permits granted through the state of Florida. FP&L biologists shall immediately (within 30 minutes) notify the Florida STSSN staff of any sick or injured turtle so the turtle can receive proper attention at the earliest possible time. The Florida STSSN beeper number is: 1-800-241-4653, the ID number is: 274-4867.

4) Capture netting in the intake canal shall be conducted with a surface floating tangle net with an unweighted lead line. The net must be closely and thoroughly inspected via boat at least once per hour. Netting shall be conducted whenever sea turtles are present in the intake canal according to the following schedule:

a) 8 hours per day, 5 days per week, under normal circumstances;
b) 12 hours per day or during daylight hours, whichever is less, 7 days per week, under any of the following circumstances:
   i) an adult turtle occurs in the canal during mating or nesting season (March 1 through September 30),
   ii) an individual turtle has remained in the canal for 7 days or more,
   iii) a leatherback turtle occurs in the canal,
   iv) an apparently sick or injured turtle occurs in the canal.

Reasonable deviations from this schedule due to human safety considerations (i.e., severe weather) are expected.

5) If a turtle is observed in the intake canal west of the 8-in barrier net, directed capture efforts shall be undertaken to capture the turtle and to prevent it from entering the intake wells.

6) The gratings at each of the intake wells shall be visually checked for turtles at least eight times each 24-hour period. If a turtle is sighted in an intake well, dip nets, or other non-injurious methods should be used to remove the turtle.

7) FP&L shall continue to participate in the STSSN, under proper permits and authority, in order to assess any possible delayed lethal impacts of capture as well as to provide background data on the mortality sources and health of local sea turtles. As a point of clarification, stranded sea turtles will generally not be counted against the authorized level of lethal incidental take in this incidental take statement, but information from strandings may be the basis for the determination that unanticipated impacts or levels of impacts are occurring.

8) FP&L should continue to conduct, under proper permits and authority, the ongoing sea turtle nesting programs and public service turtle walks.

9) Monthly reports covering sea turtle entrapment, capture efforts, turtle mortalities, available information on barrier net inspections and maintenance shall be furnished to NMFS. In addition, an annual report discussing these same topics and the Taprogge cleaning system operation, and any sponge ball loss at St. Lucie Plant shall be furnished to NMFS. All reports shall be sent to the National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, 9721 Executive Center Drive North, St. Petersburg, Florida 33702.

NMFS anticipates that no more than 1% of the total number of green and loggerhead turtles and two Kemp's ridleys entrapped in the canal will be taken by injury or mortality annually for each of the next 10 years of the proposed action. NMFS also anticipates that no more than one hawksbill or leatherback turtle entrapped in the canal will be taken by injury or mortality every two years for the next 10 years. These 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. NRC must immediately request initiation of formal consultation, provide an explanation of the causes of the taking, and review with NMFS the need for possible modification of the reasonable and prudent measures.

IX. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authority to further the purposes of the ESA 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 NRC should promote FP&L's continued research to determine the subsequent dispersal of captured and released turtles through its tagging program and through cooperation with properly permitted scientists.

(2) Current procedures for determining turtle residence times in the intake canal tend to underestimate actual residence times. The NRC should direct FP&L to continue efforts to improve residence time estimates. These efforts may include directed studies of residence time, so long as research permits are obtained from the proper authority.

(3) NRC should encourage FP&L to gain the proper permits to conduct tissue sampling to determine the genetic identity of turtles interacting with the plant's cooling water intake system.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

X. Reinitiation of Consultation

This concludes formal consultation on the actions outlined in NRC's letter dated May 9, 2000. 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 taking specified in the incidental take statement is met or exceeded, (2) 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, (3) 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 biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, NRC must immediately request reinitiation of formal consultation.

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