February 10, 1999

Mr. J.S. Keenan, Vice President
Carolina Power & Light Company
Brunswick Steam Electric Plant
P.O. Box 10429
Southport, NC 28461-0429

SUBJECT: DRAFT BIOLOGICAL OPINION REGARDING IMPACT TO SEA TURTLES AT THE BRUNSWICK STEAM ELECTRIC PLANT (TAC NO. 99318)

Dear Mr. Keenan:

By letter dated January 26, 1998, Carolina Power & Light Company (CP&L) provided to the Nuclear Regulatory Commission (NRC) a Biological Assessment (BA) of the impact on endangered sea turtles of operation of the Brunswick Steam Electric Plant. The BA was prepared to support a Section 7 consultation under the Endangered Species Act. By letter dated March 9, 1998, the NRC provided the BA and our recommendation to the National Marine Fisheries Service (NMFS).

The NRC has received from NMFS a draft Biological Opinion (BO). The BO is enclosed for CP&L review and comment. Please note that as discussed in a telephone conference between Ms. Claudia Craig of the NRC and Mr. Glenn Thearling of your staff on February 4, 1999, the document is no longer exempt from Freedom of Information Act requests and comments on the draft BO are required to be in writing and sent to the NRC. The NRC will forward your comments along with ours to the NMFS. Due to the NMFS schedule for issuance of the final BO, we request you provide comments within 10 working days of receipt of this letter.

Please contact Ms. Craig at 301-415-1053 if you have any questions.

Sincerely,
Original signed by:
David C. Trimble, Jr., Project Manager
Project Directorate II-3
Division of Reactor Projects I/II

Docket Nos. 50-324, 50-325

Enclosure: As stated

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NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Endangered Species Act - Section 7 Consultation

Biological Opinion

Agency:	U.S. Nuclear Regulatory Commission Brunswick Steam Electric Plant Carolina Power and Light Company
Activity:	Operation of Units Numbers 1 and 2
Consultation Conducted By:	National Marine Fisheries Service, Southeast Region

Date Issued: ____________________________

I. Description of the Proposed Action

The Brunswick Steam Electric Power Plant (BSEP) is located in Brunswick County, near Southport North Carolina, on the Cape Fear River estuary. BSEP is comprised of two units: Unit 1 began commercial operation in 1975 and Unit 2 began commercial operations in 1977. BSEP operates in a once-through cooling mode by withdrawing water from the Cape Fear River through a three-mile-long intake canal. The intake canal is approximately 300 feet wide, 18 foot deep, and located approximately 6 miles north of the mouth of the Cape Fear River. The water from the intake canal passes through the plant's condensers, is sent through a six-mile-long discharge canal, is pumped 2000 feet offshore through subaqueous pipes, and is discharged into the Atlantic Ocean at a depth of 18 feet. The two units operate independently but share a common intake and discharge canal. Approximately 1.5 billion gallons of water pass through the plant each day when both units are operating. At each unit, trash racks and traveling screens collect and remove debris and aquatic organisms prior to the water entering the plant through the intake structure.

BSEP constructed a permanent diversion structure at the mouth of the intake canal in 1982. This structure is intended to reduce the numbers of large fish, shellfish and marine debris entering the canal. The diversion structure consists of 37 panels of screens made of a copper-nickel alloy with a mesh size of 3/8 x 5/8 inches. It is V-shaped to increase screen area and to reduce approach-flow velocity. The intake canal at the diversion structure varies from a depth of approximately 18 feet at its center to about 4 feet at the end bays on either side. The screen panels are designed to release from their frames under high debris load to prevent overall damage to the diversion structure. Each screen release creates an opening of about 2 x 4 to 3 x 4 feet. These screen releases have allowed turtles to enter the intake canal. BSEP has full time staff to maintain the diversion structure. The structure is inspected and maintained (cleaned) daily; blowouts are repaired during daily inspections.

BSEP conducts daily sea turtle patrols; these inspections take place at low tide, during late April through August. During the inspections at the intake structure, each trash rack and traveling screen is closely inspected for signs of sea turtle stranding and the area around the intake structure is observed for 30 to 60 minutes for sea turtle surfacing. The area around the diversion structure is observed for 30 to 60 minutes daily, year round, for turtle surfacing. If turtles get into the intake canal BSEP has a set plan to capture and return them back to the Atlantic Ocean. If a turtle is located near the plant intake structure it is captured using a 200 foot net that is 22 foot deep. The net spans the distance between the intake canal's two shorelines. If a turtle is sighted near the diversion structure a 300 foot, 22 foot deep net is deployed between the two shorelines upstream from the diversion structure. Once the net is deployed it is monitored at all times. When a turtle is snared in the net it is quickly removed from the water. It is then tagged, photographed, and the turtle stranding report is completed. The turtle is released back into the Atlantic Ocean at Yaupon Beach, NC, 6 miles south of the plant.

II. Status of Listed Species and Critical Habitat

The following endangered and threatened sea turtle and fish species are under the jurisdiction of NMFS and are known to occur in the Cape Fear River Estuary region:

Common Name	Scientific Name	Status
Sea Turtles		
Loggerhead turtle	*Caretta caretta*	T
Green turtle	*Chelonia mydas*	E/T*
Leatherback turtle	*Dermochelys coriacea*	E
Hawksbill turtle	*Eretmochelys imbricata*	E
Kemp's ridley	*Lepidochelys kempii*	E
Fish		
Shortnose sturgeon	*Acipenser brevirostrum*	E

* 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 the populations away from the nesting beaches, green turtles are considered endangered wherever they occur in U.S. waters.

Sea Turtles

Loggerhead Turtle (*Caretta caretta*)

The threatened loggerhead is the most abundant species of sea turtle in U.S. waters, commonly occurring throughout the inner continental shelf from Florida through Cape Cod, Massachusetts. The loggerhead's winter and early spring range is south of 37°00' N in estuarine rivers, coastal bays, and shelf waters of the southeastern United States. Loggerheads move northward and enter northeast coastal embayments as water temperatures approach 20°C (Burke et al. 1989, Musick et al. 1984) to feed on benthic invertebrates, leaving the northern embayments in the fall when water temperatures drop.

The activity of the loggerhead is limited by temperature. Keinath et al. (1987) observed sea turtle emigration from the Chesapeake Bay when water temperatures cooled to below 18°C, generally in November. Studies in North Carolina showed a significant movement of sea turtles into more northern waters at 11°C, (Chester et al., 1994). Loggerhead turtles, however, have been seen New York waters for extended periods at temperatures as low as 8°C (NMFS, 1995b). Surveys conducted offshore and sea turtle strandings during November and December off North Carolina suggest that sea turtles emigrating from northern waters in fall and winter months may concentrate in nearshore and southerly areas influenced by warmer Gulf stream waters (Epperly et al., 1995).

Aerial surveys of loggerhead turtles at sea, north of Cape Hatteras indicate that they are most common in waters from 22 to 49m deep, although they range from the beach to waters beyond the continental shelf (Shoop and Kenney, 1992). There is no information regarding the activity of these offshore turtles.

Pursuant to a November 1994 Biological Opinion on the continued operation of the shrimp fishery in the southeastern United States, NMFS selected an Expert Working Group (EWG) consisting of population biologists, sea turtle biologists and state and federal managers to consider the best available information to formulate population estimates for sea turtles affected by human activities in the NMFS Southeast Region. The EWG focused on determining population estimates for Kemp's ridley and loggerhead sea turtles. Draft reports by the EWG, entitled "Kemp's ridley (*Lepidochelys kempii*) Sea Turtle Status Report," dated June 28, 1996 and the "Status of the Loggerhead Turtle Population (*Caretta caretta*) in the Western North Atlantic," dated July 1, 1996, were submitted to NMFS in early July. New information or conclusions provided within these reports are summarized very briefly below, and the reports are incorporated by reference.

The EWG identified four nesting subpopulations of loggerheads in the western North Atlantic (there is a possibility that all four could be found in the consultation area): (1) the Northern Subpopulation producing approximately 6,200 nests/year from North Carolina to Northeast Florida; (2) the South Florida Subpopulation occurring from just north of Cape Hatteras on the east coast of Florida and extending up to Naples on the west coast.

Overall, the EWG determined that trends could be identified for two loggerhead subpopulations. The Northern Subpopulation appears to be stabilizing after a period of decline; the South Florida Subpopulation appears to have shown significant increases over the last 25 years suggesting the population is recovering, although the trend could not be detected over the most recent 7 years of nesting. An increase in the numbers of adult loggerheads has been reported in recent years in Florida waters without a concomitant increase in benthic immatures. These data may forecast limited recruitment to South Florida nesting beaches in the future. Since loggerheads take approximately

20-30 years to mature, the effects of decline in immature loggerheads might not be apparent on nesting beaches for decades. Therefore the EWG cautions against considering trends in nesting too optimistically.

Green Turtle (*Chelonia mydas*)

Green turtles are distributed circumglobally, mainly in waters between the northern and southern 20°C isotherms (Hirth 1971). In the western Atlantic, several major nesting assemblages have been identified and studied. Most green turtle nesting in the continental United States occurs on the Atlantic Coast of Florida (Ehrhart 1979). Green turtle nesting numbers show biennial peaks in abundance, with a generally positive trend during the six years of regular monitoring since establishment of the index beaches in 1989.

While nesting activity is obviously important in determining population distributions, the remaining portion of the green turtle's life is spent on nearshore foraging grounds. Some of the principal feeding pastures in the western Atlantic Ocean include Florida, the northwestern coast of the Yucatan Peninsula, the south coast of Cuba, the Miskito Coast of Nicaragua, the Caribbean Coast of Panama, and scattered areas along Colombia and Brazil (Hirth, 1971). Evidence provided by Mendonca and Ehrhart (1982) indicates that immature green turtles may utilize estuarine systems during periods of their lives. These authors identified a population of young green turtles (carapace length 29.5-75.4 cm) believed to be resident in Mosquito Lagoon, Florida. The Indian River system, of which Mosquito Lagoon is a part, supported a green turtle fishery during the late 1800s (Ehrhart 1983), and these turtles may be remnants of this historical colony. Additional juvenile green turtles occur north to Long Island Sound, presumably foraging in coastal embayments. In North Carolina, green turtles occur in estuarine and oceanic waters (Epperly et al. 1995), but nesting is minimal with generally less than five nests reported each year.

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 1992b). Leatherbacks are widely distributed but are predominantly pelagic, feeding primarily on jellyfish such as *Stomolophus*, *Chryaora*, and *Aurelia* (Rebel 1974).

Trends in the leatherback population are difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the U.S. In the eastern Caribbean, nesting occurs primarily in the Dominican Republic, the Virgin Islands, and on islands near Puerto Rico. Sandy Point, on the western edge of St. Croix, Virgin Islands, has been designated by the U.S. Fish and Wildlife Service as critical habitat for nesting leatherback turtles. Nesting also occurs on the Atlantic Coast of Florida on a smaller scale. The primary leatherback nesting beaches in the western Atlantic occur in French Guiana, Surinam and Mexico.

Leatherbacks are the largest of sea turtles, and are able to maintain body temperatures several degrees above ambient temperatures, likely by virtue of their size, insulating subdermal fat, and an arrangement of blood vessels in the skin and flippers that enables retention of heat generated during swimming (Paladino et al. 1990). Although their tolerance of low temperatures is greater than for other sea turtles, leatherbacks are generally absent from temperate Atlantic waters in winter and spring. Stranding patterns suggest that leatherbacks move north along the coast with increasing water temperatures.

Periodically, large numbers of leatherback strandings occur from northern Florida in January and February, through North Carolina in May. Aerial surveys conducted during stranding events confirmed the abundance of leatherback turtles. Two separate studies, one involving aerial surveys for right whales off Georgia and northern Florida (Kraus and Knowlton, pers. comm.) and the other involving public reporting of leatherback sightings off North Carolina (Braun and Epperly, unpublished), illustrate peaks of leatherback abundance in nearshore waters.

Hawksbill turtle (*Eretmochelys imbricata*)

The hawksbill turtle is relatively uncommon in the waters of the continental United States. Hawksbills prefer 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. Known important foraging habitats in U.S. waters are confined to the Caribbean. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands.

In the Atlantic, small hawksbills have stranded as far north as Cape Cod, Massachusetts (STSSN database, 1990). Many of these strandings were observed after hurricanes or offshore storms. Although there have been no reports of hawksbills in the Chesapeake Bay, one has been observed taken incidentally in a fishery just south of the Bay (Anon. 1992).

Researchers believe that hawksbills occurring in U.S. waters are from populations that are depleted but are no longer declining (NMFS 1995). Habitat loss, fisheries, and continued exploitation are all identified as factors preventing recovery.

Kemp's Ridley Turtle (*Lepidochelys kempii*)

The Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) (USFWS and NMFS, 1992a) contains a complete description of the natural history, taxonomy, and distribution of the Kemp's or Atlantic ridley turtle. Of the seven species of sea turtles of the world, the Kemp's ridley is in the greatest danger of extinction. Following is a brief summary of the information on the distribution and trends in abundance of this species.

Adult Kemp's ridleys are found primarily in the Gulf of Mexico. Adult females nest in daytime aggregations known as arribadas, primarily at Rancho Nuevo, Mexico. Most of the population of adult females nest in this single locality (Pritchard, 1969). Ridley hatchlings leave the nesting beach and are not seen again until they reach over 20 cm in length, when they are found in the northern

Gulf of Mexico and the embayments along the eastern Atlantic seaboard as far north as Cape Cod Bay. Nothing is known about the specific movements of hatchling Kemp's ridley turtles, although it is believed that they may be controlled by current patterns: either the loop current for northward transport or an eddy for southward transport with occasional transportation through the Florida Straits via the Gulf Stream system (Hildebrand, 1982). Pritchard and Marquez (1973) suggest that passive transportation via the Gulf Stream up the eastern coast of the United States may be the usual dispersal pattern of young Kemp's ridley turtles. It is widely believed that hatchlings inhabit and forage in *Sargassum* rafts that occur at fronts and eddies (Carr 1987). However, some authors have observed that *Sargassum* may be used for resting only, since ample food is available throughout the water column, where the likelihood of aggregated predators may be lower (Collard 1990).

Pritchard and Marquez (1973) speculated that ridleys feed and grow rapidly during passive transport, and by the time they reach offshore waters of New England are large enough for active swimming. However, Morreale et al. (1992) hypothesize that passive drifting would result in only sporadic occurrence of ridleys in the northeast United States and that the observed annual occurrence suggests some alternative mechanism. Regardless of the mechanism, small juvenile ridleys enter Atlantic coastal embayments in the summer, when water temperatures approach 20°C (Burke et al. 1989, Musick et al. 1984) and become benthic feeders. Ridleys leave the northern embayments in the fall, when water temperatures cool (Burke et al. 1991). Morreale et al. (1992) give evidence for directed movements of Kemp's ridleys south, out of northeastern coastal waters, as temperatures drop below 14°C, generally in late October (Morreale, pers. comm.). Keinath et al. (1987) observed sea turtle emigration from the Chesapeake Bay when waters dropped below 18°C in November. High Kemp's ridley mortality during November and December in some years associated with the summer flounder fishery off North Carolina suggest that sea turtles emigrating from northern waters in fall and winter months may concentrate in nearshore and southerly areas influenced by warmer Gulf stream waters (Epperly et al. 1995).

Kemp's ridley population estimates are imprecise due to the inaccessibility of these predominantly pelagic animals. When nesting aggregations at Rancho Nuevo were discovered in 1947, greater than 40,000 adult females were estimated to have nested in one day (Hildebrand 1963). Recent estimates by the sea turtle Expert Working Group suggest that there now may be 1500 adult females (EWG, 1995).

Ridley nest numbers continued to decline until 1987, when less than 750 nests were counted. The subsequent increase in documented nest numbers was not dramatic until 1994, when over 1,500 nests were documented in Mexico. During 1995, over 1,900 nests were observed, and greater than 2000 nests were observed during the summer of 1996. These nest counts far surpass the numbers of nests observed in any year since monitoring was initiated in 1978. However, these data need to be interpreted cautiously due to expanded monitoring since 1989. Expanded beach survey areas were established in 1989, when much of Rancho Nuevo was destroyed by Hurricane Gilbert. Approximately 25 percent of the ridley nests observed each year since 1990 have occurred on the expanded survey beaches adjacent to Rancho Nuevo despite the fact that Rancho Nuevo's beaches have returned to their original conformation (Marquez, pers. comm., 1995). Ridley nests have always been observed on the beaches north of Rancho Nuevo during the opportunistic aerial surveys frequently conducted during the decade prior to expansion of the survey area. However, significant nesting was not noted. The large number of nests now collected from those beaches may be the result of a northern expansion of the ridley population's nesting beach, or may reflect a previously undocumented group of nests. After 1994, the positive nesting trend is apparent even exclusive of the nests along the expanded survey area.

Fish

Shortnose Sturgeon (*Acipenser brevirostrum*)

The Dec 1998 Final Shortnose Sturgeon Recovery Plan (NMFS, 1998), gives the current, best available information on the distribution and abundance of shortnose sturgeon. South of the Chesapeake Bay, there is inadequate information to estimate the shortnose sturgeon population size in most rivers.

Generally in southern rivers, adult sturgeon remain in estuaries and at the interface of salt and freshwater until late winter, when they move upriver to spawn. Embryos produced tend to remain in areas of irregular bottom, where they appear to seek cover. Juveniles, like adults, occur primarily at the interface between salt and freshwater. Recent observations suggest that salinity levels greater then 7 ppt are harmful (Smith et al., 1992). In the Savannah River, shortnose sturgeon are found over sand/mud substrate in 10-14 m. depths (Hall et al., 1991). Spawning occurs in upstream channels of the Savannah, where the substrate consists of gravel, sand and logs (Hall et al., 1991). Shortnose sturgeon feed on crustaceans, insect larvae, and molluscs (NMFS, 1995).

Although genetic variation within and among shortnose sturgeon occurring in different river systems is not known, life history studies indicate that the shortnose sturgeon populations from different river systems are substantially reproductively isolated (Kynard, 1997) and, therefore, should be considered discrete. Based on the biological and ecological differences, NMFS recognizes 19 distinct population segments of the shortnose sturgeon inhabiting 25 river systems ranging from Saint Johns river in New Brunswick, Canada, to the Saint Johns River, Florida (NMFS, 1998).

Analysis of the Species Likely to be Affected

Of the above listed species occurring in the project area, NMFS believes that Kemp's ridley, loggerhead, and green sea turtles and the shortnose sturgeon are likely to be adversely affected by the proposed action. Leatherback and hawksbill sea turtles may also be adversely affected, but their occurrence in the project area is far less likely.

According to BSEP's biological assessment, Kemp's ridley, green and loggerhead have stranded in the intake canal. There are no records of leatherback or hawksbill strandings in the canal; however because they may possible occur in the action area the proposed action could also adversely affect them.

The Final Shortnose Sturgeon Recovery Plan, (NMFS, 1998), lists the Cape Fear River as having one of 19 distinct population segments. This segment is thought to consist of less than 50 fish. The loss of a single population segment may risk the permanent loss of unique genetic information that is critical to the survival and recovery of the species. Even though the diversion structure was designed to keep large fish and shellfish out of the intake canal and there is no record of shortnose sturgeon being found in the canal, it is still reasonable to expect a shortnose sturgeon could get through a blowout in the screen as do the turtles. The small size of this population segment makes it imperative that NMFS analyze even the small possibility that an activity may have an adverse impact on this segment.

The remainder of the analysis in this biological opinion will focus on the five species of sea turtles and the shortnose sturgeon.

III. Environmental Baseline

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 nearshore 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, given in section II above, most reflects the species status within the action area.

As noted above, the Final Recovery Plan for The Shortnose Sturgeon, lists the Cape Fear River as a distinct population segment with a population of less than 50 fish (NMFS, 1998). This information, combined with the information in section II above, reflects the species' status within the action area.

Factors Affecting the Species Within the Action Area

As discussed above, however, sea turtles are not strict residents of the action area and may be affected by human activities throughout their migratory range. Therefore, this section will discuss the impacts of Federal actions on sea turtles throughout the western North Atlantic and Gulf of Mexico.

Federally-regulated commercial fishing operations represent the major human source of sea turtle injury and mortality in U.S. waters. Shrimp trawlers in the southeastern U.S. are required to use TEDs, which reduce a trawler's capture rate by 97%. Even so, NMFS estimated that 4100 turtles may be captured annually by shrimp trawling, including 650 leatherbacks that cannot be released through TEDs, 1700 turtles taken in try nets, and 1750 turtles that fail to escape through the TED (NMFS, 1998). 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. The mid-

Atlantic and Northeast fishery for summer flounder, scup, and black sea bass uses otter trawl gear that also captures turtles. Summer flounder trawlers fishing south of Cape Henry, Virginia (south of Oregon Inlet, North Carolina from January 15 to March 15) are required to use TEDs. Participants in this fishery who use a type of trawl known as a flynet, however, are not required to use TEDs, as TEDs for flynets have not been researched and NMFS is collecting further observer information on turtle by catch by flynet vessels. The estimated, observed annual take rates for turtles in this multispecies fishery is 15 loggerheads and 3 leatherbacks, hawksbills, greens, or Kemp's ridley, in combination (NMFS, 1996a). The pelagic fishery for swordfish, tuna, and shark, which is prosecuted over large areas of the northwestern Atlantic and the Gulf of Mexico, including the action area, also has a fairly large by catch of sea turtles. NMFS (1997b) estimated that the longline component of this fishery would annually take, through hooking or entanglement, 690 leatherbacks, 1,541 loggerheads, 46 green, and 23 Kemp's ridley turtles, with a projected mortality rate of 30%. In the driftnet component of the fishery, estimated annual levels of injury or mortality are 40 leatherbacks, 58 loggerheads, 4 Kemp's ridleys, 4 greens, and 2 hawksbills.

Military activities, including vessel operations and ordnance detonation, also affect listed species of sea turtles. U.S. Navy aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500 and 1000-lb bombs) is estimated to injure or kill, annually, 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridley, in combination (NMFS, 1997a). The U.S. Navy will also conduct ship-shock testing for the new SEAWOLF submarine off the Atlantic coast of Florida, using 5 submerged detonations of 10,000 lb explosive charges. This testing is estimated to injure or kill 50 loggerheads, 6 leatherbacks, and 4 hawksbills, greens, or Kemp's ridleys, in combination (NMFS, 1996b). The U.S. Coast Guard's operation of their boats and cutters, meanwhile, is estimated to take no more than one individual turtle of any species per year (NMFS, 1995). Formal consultation on Coast Guard or Navy 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 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). 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).

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 (NMFS, 1997e).

Other power plants in south Florida, west Florida, and North Carolina have also reported low levels of sea turtle entrainment, but formal consultation on these plants' operations has not been completed.

Sea turtles are vulnerable to blast injury and death from the use of underwater explosives. Klima *et al.* (1988) reported a dramatic elevation in the number of sea turtle strandings along the north Texas coast, coinciding with a large number of explosive removals of offshore oil platforms in the area. Since then, protective measures implemented by NMFS, the Corps of Engineers, and the Minerals Management Service, including required observers at explosive rig-removals, have been effective in minimizing the impacts of explosive rig-removals on sea turtles. From 1987 to 1997, a total of 1013 platform removals took place with NMFS observers present. Sea turtles were observed at 112 of those sites, and two loggerhead turtles were recovered injured after blasting. Those animals were rehabilitated and released. In 1998, one loggerhead has been killed as a result of rig-removal blasting. Although some mortality may occur and go undetected, the overall number of turtles impacted by rig-removal actions has been very low since the adoption of protective measures.

The range of the shortnose sturgeon brings it into direct conflict with human activity. Activities such as commercial and recreational fishing, bridge construction, contaminants, dams, reduction of dissolved oxygen due to industry, dredging activities, reservoir operations, and cooling water intakes at power plants have had significant negative impacts to the species along its whole range.

Direct harvest of shortnose sturgeon is prohibited by the ESA; however, shortnose sturgeon are taken incidentally to commercial and recreational fishing. They are also targeted by poachers (Dadswell 1979; Dovel et al. 1992; Collins et al. 1996). Collins et al. (1996) reported that the shad gillnet fishery accounted for 83% of the shortnose sturgeon takes in the Georgia coastal fishery. In the Saint John's River estuary, shortnose sturgeon are taken incidentally in shad, salmon, striped bass, and alewife fisheries. In most cases the fish are returned to the river unharmed (NMFS, 1998). Moser and Ross (1993), found that captures of shortnose sturgeon in commercial shad nets disrupted spawning migrations in the Cape Fear River, and Weber (1996) reported that these incidental captures caused abandonment of spawning migrations in the Ogeechee River, Georgia.

Bridge construction and demolition projects may interfere with normal shortnose sturgeon migratory movements and disturb sturgeon concentration areas (NMFS, 1998). During bridge construction upstream of sturgeon spawning habitat in the Connecticut River, concerns were raised that fine sediment emanating from the construction site might build up in the downstream spawning site and impair egg survival. In that instance, concerns abated after it was demonstrated that fine sediments are cleanly dislodged from the spawning site during the high spring flood (NMFS, 1998). Bridge demolition may include plans for blasting piers with powerful explosives. Unless appropriate precautions are made to mitigate the potentially harmful effects of shock wave transmission to physostomous (i.e., air-bladder connected to the gut) fish like the shortnose sturgeon, internal damage and/or death may occur (NMFS, 1998).

Contaminants, including toxic metals, polychlorinated aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) can have substantial deleterious effects on aquatic life including production of acute lesions, growth retardation, and reproductive impairment (Cooper, 1989; Sindermann, 1994). Ultimately, toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms like sturgeon. Heavy metals and organochlorine compounds are known to accumulate in fat tissues of sturgeon, but their long term effects are not yet known (NMFS, 1998). Available data suggest that early life stages of fish are more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice. 1976).

Hydroelectric dams may affect shortnose sturgeon by restricting habitat, altering river flows or temperatures necessary for successful spawning and/or migration, and causing mortalities to fish that become entrained in turbines. In all but one of the rivers supporting sturgeon populations the first dam on the river marks the upstream limit of the shortnose sturgeon population range (Kynard, 1997). An inability to move upstream and use potentially beneficial habitats may restrict population growth (NMFS, 1998). Since sturgeon require adequate river flows and water temperatures for spawning, any alterations that dam operations pose on a river's flow pattern, including increased or decreased discharges, can be detrimental to sturgeon reproductive success (NMFS, 1998).

Maintenance dredging of federal navigational channels can adversely affect or jeopardize shortnose sturgeon populations. In particular, hydraulic dredges can lethally harm sturgeon by entraining them in dredge dragarms and impeller pumps (NMFS, 1998). In addition to direct effects, dredging operations may also impact shortnose sturgeon by destroying benthic feeding areas, disrupting spawning migrations, and filling spawning habitat with resuspended fine sediments. Other dredging methods may also adversely affect sturgeon. Atlantic sturgeon were killed in both hydraulic pipeline and bucket-and-barge operations in the Cape Fear River (NMFS, 1998). Two shortnose sturgeon carcasses were discovered in a dredge spoil near Tullytown, Pennsylvania and apparently killed by a hydraulic pipeline dredge operating in the Delaware River in March 1996 (NMFS, 1998). In early 1998, three shortnose sturgeon were killed by a hydraulic pipeline dredge operating in the Florence to Trenton section of the upper Delaware River (NMFS, 1998).

The COE's operation of reservoirs in major rivers may impact sturgeon by altering natural river flow rate and volume (NMFS, 1998). Unplanned but controlled reservoir releases can diminish or reduce sturgeon spawning success by artificially extending high flow periods during the time when water temperatures reach ideal ranges for spawning (NMFS, 1998).

Shortnose sturgeon are susceptible to impingement on cooling water intake screens. Documented mortalities of sturgeon have occurred in the Delaware, Hudson, Connecticut, Savannah and Santee rivers. Between 1969 and 1979, 39 shortnose sturgeon were impinged at power plants in the Hudson River (Hoff and Klauda, 1979). Approximately 160 shortnose sturgeon were estimated to be impinged on intake screens at the Albany Steam Generating Station between Oct., 1982 and Sept., 1983 (NMFS, 1998). Eight shortnose sturgeon were discovered on the intake trash bars of the Salem Nuclear Generating Station in the Delaware River between June, 1978 and Nov., 1992 (NMFS, 1998). The operation of power plants can have unforeseen and extremely detrimental impacts to water quality. The St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991, when large mats of aquatic vegetation entered the plant's intake canal and clogged the cooling water intake gates. Decomposing plant material in the canal coupled with the turbine shut down triggered a low dissolved oxygen water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that 20 shortnose sturgeon were killed in the die-off (NMFS, 1998).

IV. Effects Of The Action

This action has caused 80 incidental takes of sea turtles from 1992 through 1996; of these, 7 have been lethal. The breakdown of these takes are: 6 Kemp's ridley (1 dead); 11 green (2 dead); and 64 loggerhead (4 dead). The combined annual statewide sea turtle take for North Carolina for those years was 1,587 (NC Wildlife Resources Commission, 1997). The BSEP's take of sea turtles during this time frame account for 5% of the total annual sea turtle takes in North Carolina, but only .4% of mortalities.

BSEP's incidental take of sea turtles in 1996 was 49. This was the largest take for any year recorded by BSEP. Forty two of these turtles were loggerheads, 4 were Kemp's ridley, and 3 were green. There have never been leatherback nor hawksbill turtles taken at BSEP. From 1988 to 1996 there were never more than 5 lethal takes in any given year, with 5 lethal takes in 1988. The average lethal take from 1986 through 1996, at BSEP, was 2.5 per year. Based on the above numbers, the variability of the species mix in the action area, and possible increases in numbers of sea turtles due to increased conservation programs NMFS believes that the level of live take of turtles in BSEP's intake canal, will not exceed 50 loggerhead , 8 Kemp's ridley, and 5 green turtles per year. NMFS also believes the total lethal take of turtles will not exceed 6 loggerhead, 2 Kemp's ridley, or 3 green turtles per year.

As stated above no leatherback or hawksbill turtles have been taken by BSEP. The North Carolina Wildlife Resources Commission reports only 30 leatherback turtles and no hawksbill turtles have been recorded stranded from 1995 through 1996 in the State of North Carolina. Therefore, it is reasonable to expect the proposed action may take 1 leatherback or 1 hawksbill turtle as a worst case scenario.

The BSEP has no recorded of takings of shortnose sturgeon. Adult shortnose sturgeon in southern rivers forage at the interface of fresh tidal water and saline estuaries and enter the upper reaches of rivers to spawn in early spring (NMFS, 1998). They also have been known to spend time in the estuaries and the sea (NMFS, 1998). The fresh/salt water interface is approximately 12 to 18 miles from the mouth of the intake canal. Moser (1998), has recorded only one individual getting to within 2 miles of the intake canal. It is thought that a young of the year or older sturgeon could not be impinged against the diversion structure and would most likely would not leave the deep part of the river to enter a blowout in the diversion structure (M. Moser, University of North Carolina-Wilmington, personal communication). Therefore, NMFS believes the proposed action would not result in the lethal take of a shortnose sturgeon.

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. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Within the action area, major future developments in human activities, that are not part of a Federal action, are anticipated. As discussed in Section III, listed species of turtles migrate throughout their range and may be affected during their life cycles by non-Federal activities outside the action area. The Cape Fear River population of the shortnose sturgeon may be more directly affected by future development in the action area.

Throughout the coastal Southeastern Untied States, the loss of thousands of acres of wetlands is occurring due to natural subsidence and erosion, as well as reduced sediment input. Impacts caused by residential, commercial, and agricultural developments appear to be the primary causes of wetland loss in North Carolina.

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water will continue to affect water quality in the Atlantic. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the Atlantic Ocean.

Marine debris will likely persist in the action area in spite of MARPOL prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingested marine debris (Plotkin and Amos, 1990 and Bolten and Bjorndal, 1991).

Coastal runoff and river discharges carry large volumes of sediment and contaminants from agricultural activities, cities and industries into the Atlantic Ocean. Although the contaminants are not likely to affect the more pelagic waters around the action area, the species of turtles analyzed in this biological opinion travel between nearshore and offshore habitats and may be exposed to these contaminants when they are in the action area.

State-regulated commercial and recreational fishing activities in the Atlantic Ocean take endangered species. These takes are not reported and are unauthorized. 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 will issue regulations that will affect fishery activities. NMFS will continue to work with states to develop ESA section 6 agreements and section 10 permits to enhance programs to quantify and mitigate these takes. Increased recreational vessel activity in inshore waters of the coast of North Carolina will likely increase the number of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles, including Kemp's ridleys. In a study conducted by the NMFS Galveston Laboratory between 1993 through 1995, 170 ridleys were reported associated with recreational hook-and-line gear; including 18 dead stranded turtles, 51 rehabilitated turtles, 5 that died during rehabilitation, and 96 that were released by fishermen (Cannon and Flanagan, 1996). The Sea Turtle Stranding and Salvage Network (STSSN) also receives stranding reports that identify carcass anomalies that may be associated with the recreational fishery (entangled in line or net, fish line protruding, fish hook in mouth or digestive tract, fish line in digestive tract). The reports do not distinguish between commercial or recreational sources of gear, such as hook, net, and line, which may be used in both sectors. Cumulatively, fishery entanglement anomalies are noted in fewer than 4% of the stranded sea turtle carcasses reported between 1990 and 1996, and some carcasses carry more than one anomaly (e.g., fishing line in digestive tract/fishing line protruding from mouth or cloaca), therefore summing these reports may result in some double counting.

State and local activities may have a significant affect on the Cape Fear River shortnose sturgeon population. The Cape Fear River drainage basin is completely contained within the State of North Carolina. Over 1,465,451 people live in the basin within 114 municipalities.

Land uses in the basin are diverse. In addition to the large urban populations, the basin includes one of the most concentrated turkey and hog production regions in the country. Two counties in the basin, Duplin and Sampson, produce more hogs than any other county in the United States. This activity can lead to fecal coliform contamination, via runoff from the production areas.

Approximately 27% of the basin's estuarine waters are use-impaired. This is due to fecal coliform bacteria and low oxygen levels. There has been an increase in the number of shellfish bed closures because of pollution caused primarily by development (CALS NCSU WOP, 1997).

About 35% of the streams in the Cape Fear drainage basin are considered threatened and 18% impaired by pollution (College of Agriculture and Life Science (CALS), NCSU Water Quality Programs (WQP), 1997). Sediment is the major pollutant, but other types of pollution which pose significant threats to water quality include nutrients, oxygen-demanding wastes, and toxic substances (CALS NCSU WQP, 1997). Sediment disrupts spawning migrations by filling spawning habitat with resuspended fine sediment (NMFS, 1998). Oxygen-demanding wastes from agricultural sources can reduce dissolved oxygen levels. Jenkins et al. (1993), found that juvenile shortnose sturgeon experience relatively high mortality (86%) when exposed to dissolved oxygen concentrations of 2.5 mg/l or less. Heavy metals and organochlorines are known to accumulate in fat tissues of sturgeon, but their long-term effects are not yet known (Ruelle and Henry, 1992). Available data suggest that early life stages of fish are more susceptible to environmental pollution stress than older fish (Rosenthal and Alderdice, 1976).

Direct harvest of shortnose sturgeon is prohibited by the ESA. However as previously noted, shortnose sturgeon are taken incidentally in other anadromous fisheries along the east coast and are probably targeted by poachers (NMFS, 1998). Commercial and recreational shad fisheries operating in the Cape Fear River are known to incidentally capture shortnose sturgeon. Moser and Ross (1993), found that captures of shortnose sturgeon in commercial shad nets disrupted spawning migrations in the Cape Fear River.

VI. Conclusion

After reviewing the current status of the affected species of sea turtles and the shortnose sturgeon, the environmental baseline for the action area, and the effects of the action, it is NMFS's biological opinion that the operation of the water intake system of the Brunswick Steam Electric Plant as outlined in the Nuclear Regulatory Commission's Biological Assessment, dated March 9, 1998, is not likely to jeopardize the continued existence of the loggerhead, leatherback, green, hawksbill, or Kemp's ridley sea turtles. This action is also not likely to jeopardize the continued existence of the Cape Fear River shortnose sturgeon population. No critical habitat has been designated for these species in the action area, therefore none will be affected. This conclusion is based on the action's effects on these species being limited to the direct take, through death or injury, of a small number of sub-adult and adult sea turtles per year, and the continued lack of take of any kind of the shortnose sturgeon.

VII. Incidental Take Statement

Section 7 (b)(4) of the ESA requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, shall be provided that are necessary to monitor and minimize such impacts. Only incidental taking resulting from the agency action as described in the proposed action of the biological opinion, including incidental takings caused by activities approved by the agency, and that comply with the specified reasonable and prudent measures and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7(o) of the ESA.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). No take of endangered whales by the action is anticipated, and no authorization is provided in this incidental take statement.

Section 7(a)(2) of the ESA specifies that each federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such is not likely to jeopardize the continued existence of any endangered or threatened species. With the Cape Fear River shortnose sturgeon population being small (<50 individuals) and listed by NMFS as a distinct population segment with distinct genetic information, it is reasonable to expect that the take of one individual could jeopardize the existence of this population segment. No take of the shortnose sturgeon by the action is anticipated, and no authorization is provided in this incidental take statement. If a shortnose sturgeon is incidentally taken by BSEP, NMFS, Southeast Regional Office must be notified immediately, and the action which took the sturgeon stopped until a method is developed, and approved by NMFS, to insure shortnose sturgeon are not taken.

NMFS has estimated the impact of this action on listed species of sea turtles (see Assessment of Impacts above). Based on this analysis, NMFS anticipates 50 loggerhead sea turtles with 6 being lethal, 5 green sea turtles with 2 being lethal, 8 Kemp's ridley sea turtles with 2 being lethal, and 1 (lethal or live) leatherback or hawksbill sea turtle could be incidentally taken annually (January 1-December 31), as a result of this action.

The following reasonable and prudent measures and terms and conditions are specified as required by 50 CFR 402.14 (i)(l)(ii) and (iv) to monitor and minimize the impact of incidental takings associated with the operation of the water intake system at the BSEP.

1. BSEP shall conduct daily sea turtle patrols to inspect intake trash racks as near to low tide as possible during the period from late April through August. This period coincides with the historical higher-than-average occurrences of sea turtles in the area. The inspection will consist of visual observations of the entire length of the canal from the diversion structure to the plant's intake trash racks. As part of this protocol, visual examination of one-half hour to one hour of the plant's intake and diversion structures are required to note sea turtle surfacing.
2. Plant personnel will inspect the diversion structure each spring to ensure its integrity. The inspection will include a subsurface check by divers.
3. Crews that maintain the diversion structure on a year round basis will also look for signs of sea turtles inside the canal, on the diversion structure, or outside the diversion structure on the river side, while completing their duties. Plant security will report any signs of sea turtles in the canal noticed while on patrol.
4. Once a turtle is sighted, plant environmental personnel will attempt to capture the turtle. Live turtles will be photographed, tagged, and released in the surf at Yaupon Beach, NC. This beach is about 6 miles south of BSEP. Injured sea turtles will be taken to a veterinarian or, if severely injured they are taken to the North Carolina Sea Turtle Coordinator. Dead turtles will be removed from the canal, photographed, and a necropsy will be performed.
5. If any listed species are apparently injured or killed in the intake canal, or the diversion structure or the trash racks, a report, summarizing the incident, must be provided to the NMFS Southeast Regional Office by the following business day.

VIII. Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist BSEP in reducing/eliminating impacts to listed and proposed species and promoting their conservation and recovery.

1. BSEP should conduct inspections of the diversion structure, to ensure the structure's integrity, to include subsurface inspections at least twice during the time between late April through August and one time outside that time period.
2. BSEP should monitor the trash racks, canal and diversion structure for signs of shortnose sturgeon.

3. BSEP should contact the Fisheries Department of the University of North Carolina-Wilmington on at least a yearly basis to determine if shortnose sturgeon have been tracked near the area of the intake canal.
4. BSEP should continue their experimentation with blocker panels. If a successful system is found, BSEP should notify NMFS.

IX. Reinitiation of Consultation

Reinitiation of formal consultation is required if (1) the amount or extent of taking specified in the incidental take statement is 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, BSEP must immediately request reinitiation of formal consultation.

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