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Coastal Protection of Sea Turtles in Florida

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Coastal Protection of Sea Turtles in Florida

Cover Page Footnote

A shorter version of this article won the 1998 Southeastern Association of Fish and Wildlife Agencies environmental writing competition.

COASTAL PROTECTION OF SEA TURTLES IN FLORIDA

KATHERINE R. BUTLER*

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I. INTRODUCTION

Although sea turtles have survived for some 175 million years,¹ like many animals, these seagoing reptiles compete with an ever-increasing human population for habitat. Many areas once inhabited

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1. See JACK RUDLOE, *TIME OF THE TURTLE* 17 (1979). But see VICTORIA B. VAN METER, *FLORIDA'S SEA TURTLES* 3 (1992) (stating 150 million years); ROBERT BUSTARD, *SEA TURTLES: NATURAL HISTORY AND CONSERVATION* 9 (1973) (estimating 90 million years).

by sea turtles are now lost or have been permanently altered by humans.² This is especially true in Florida, which hosts the highest number of nesting sea turtles in the continental United States.³ Florida's permanent and vacationing human population is attracted to the sandy beaches in the summer, the season in which sea turtles must come ashore to nest. In addition, most coastal construction and erosion control projects take place during the summer months because of winter weather conditions and associated wind and tide impacts.

As a result of animal, bird, and fish predation⁴ in their early years of life, sea turtles' reproductive strategy involves producing numerous offspring to compensate for high natural mortality during that time.⁵ Today, the most successful predators of sea turtles are humans. Sea turtle populations have been decimated by humans who harvest them for meat and commercial products, as incidental catch in commercial fisheries, and as victims of pollution and non-degradable debris.⁶ Along the coast, habitat degradation caused by development impedes sea turtle nesting and results in high hatchling mortality.⁷ Because sea turtles are dangerously close to extinction,⁸ they are protected in Florida under federal and state laws, administrative regulations, and local ordinances.⁹

This Comment concentrates on the coastal threats to sea turtle survival in Florida and the laws the state has enacted to protect sea turtles against the detrimental effects of human coastal activities, including operating vehicles on the beaches, artificial beachfront lighting, and interference in nesting behavior associated with coastal construction and erosion control projects. After providing background information on sea turtle behavior in Part II and describing the dangers sea turtles face in Florida in Part III, this Comment examines federal and state laws designed to protect sea turtles in Part IV through Part VI. Part VII analyzes the success of these laws

2. See LINDA COSTON-CLEMENTS & DONALD E. HOSS, SYNOPSIS OF DATA ON THE IMPACT OF HABITAT ALTERATION ON SEA TURTLES AROUND THE SOUTHEASTERN UNITED STATES 1 (NOAA Technical Memorandum NMFS-SEFC-117, 1983) [hereinafter NOAA].

3. See VAN METER, *supra* note 1, at 5. 79,969 sea turtle nests were reported in Florida in 1996. See Florida Marine Research Institute 1996 Florida Nesting Summary (visited Nov. 1997) <<http://www.fmri.usf.edu/fmri/programs/ecosystems/endthrsp/turtles/nest/index.html>>.

4. See *infra* notes 62-63, 72 and accompanying text.

5. U.S. Fish and Wildlife Service, *Biological Opinion: Volusia County, Florida, Incidental Take Permit (PRT-811813)*, at 8, Nov. 21, 1996 [hereinafter *Biological Opinion*].

6. See *infra* notes 64-71 and accompanying text.

7. See *infra* notes 82-135 and accompanying text.

8. See BLAIR E. WITHERINGTON & R. ERIK MARTIN, UNDERSTANDING, ASSESSING, AND RESOLVING LIGHT-POLLUTION PROBLEMS ON SEA TURTLE NESTING BEACHES 1 (Florida Marine Research Institute Technical Report TR-2, 1996).

9. See *infra* notes 152-263 and accompanying text.

and additional efforts to protect Florida's sea turtles. Part VIII concludes that even though laws now exist to protect sea turtles, the full effect of the laws remains unknown until long-term studies are completed. For the present, the increased public awareness has resulted in at least a higher hatchling survival rate.

II. BACKGROUND ON SEA TURTLES

A. Behavior of Sea Turtles

Sea turtles are air-breathing reptiles that spend most of their lives in the ocean. After hatching, male sea turtles spend their entire lives at sea.¹⁰ Female sea turtles must periodically return to sandy beaches to lay eggs.¹¹ With a streamlined shell and large, paddle-like flippers, sea turtles are well-adapted to life at sea. However, these characteristics hinder the heavy females on land during the laborious nesting process.¹² When the females awkwardly lumber ashore to nest, they are near-sighted and virtually defenseless.¹³ Depending upon the species, adult sea turtles can weigh between seventy-five and 2000 pounds, and the largest can reach a length of over eight feet.¹⁴ Sea turtles grow slowly and are believed to have a long life span.¹⁵

Reproductive behavior is similar among the different species of sea turtles.¹⁶ With slight variations, the nesting season of each species begins in late spring and ends in late summer.¹⁷ After male and female sea turtles gather near the nesting beaches early in the season to mate, the females travel to the beach to deposit up to ten clutches of eggs during one season.¹⁸ During the nesting process,

10. See ARCHIE CARR, *SO EXCELLENT A FISHE: A NATURAL HISTORY OF SEA TURTLES* 13 (1984).

11. See *id.*

12. See BUSTARD, *supra* note 1, at 16-17. Unlike land tortoises, sea turtles do not normally lift their bodies clear of the ground when walking and must drag their shells through the sand. See *id.* at 17.

13. See CARR, *supra* note 10, at 13. By contrast, in the ocean, sea turtles' great size makes them "almost immune to predation." *Id.*

14. See VAN METER, *supra* note 1, at 2.

15. See *id.* Sea turtles may live up to 100 years. See Telephone Interview with Anne Meylan, Research Scientist in charge of the Marine Turtle Research Program, Florida Marine Research Institute (Nov. 12, 1997). One reason for the lack of exact knowledge on this subject is that not much is known about sea turtles' lives in the ocean. See NOAA, *supra* note 2, at 4.

16. See NATIONAL RESEARCH COUNCIL, *DECLINE OF THE SEA TURTLES: CAUSES AND PREVENTION* 21 (1990) [hereinafter NRC].

17. See WITHERINGTON & MARTIN, *supra* note 8, at 2.

18. See NRC, *supra* note 16, at 2. Females may mate only once and then lay several clutches of fertile eggs during the nesting season. See NATIONAL MARINE FISHERIES SERVICE AND U.S. FISH AND WILDLIFE SERVICE, *RECOVERY PLAN FOR U.S. POPULATION OF LOGGERHEAD TURTLE* 4 (1991) [hereinafter *LOGGERHEAD RECOVERY PLAN*].

which can last up to three hours, the female drags herself ashore¹⁹ and crawls to a point above the high-tide line.²⁰ With her front flippers, she pushes sand away to form a "body pit," digs an "egg cavity" inside the pit with her rear flippers, lays approximately one hundred eggs in the cavity, and then pushes sand back into the cavity with her rear flippers.²¹ Before returning to the surf, she throws sand around the area with her front flippers to conceal the nest site.²² Leaving the eggs to incubate in the warm sand, the female never returns to the nest.²³ Sea turtles nest only every two to three years, although some may nest more frequently.²⁴ Most sea turtle nesting in the United States takes place in the southeastern states, especially the Atlantic coast of Florida.²⁵

After an incubation period of about two months, the sea turtles hatch.²⁶ One to seven days later the hatchlings burst from the nest during the night and, naturally attracted to the brighter sky over the water, make a mad dash to the sea.²⁷ Where the hatchlings go once they reach the sea is a mystery, until they appear again in coastal feeding grounds.²⁸ Once they reach maturity, the hatchlings move to

19. See VAN METER, *supra* note 1, at 2.

20. See WITHERINGTON & MARTIN, *supra* note 8, at 2. The nest site is carefully chosen by the female, many of whom stop several times on the way up the beach to check with their snouts the temperature, smell, texture, or water content of the sand. See VAN METER, *supra* note 1, at 28.

The temperature of the nest affects egg development and influences the sex of the embryos. See *id.* at 33. Higher incubation temperatures produce mostly females and lower temperatures produce mostly males. See *id.* at 33-34. Change in incubation temperature as a result of rain or shading can affect the length of the incubation period. See *id.* "[E]ven small changes [in nest temperature] could cause increased mortality, delays in hatching, or sex ratio imbalance." NOAA, *supra* note 2, at 11.

Sand particle size is also crucial: "[i]f the sand is too fine, gas diffusion necessary for the eggs to hatch is inhibited and respiratory gas exchange and embryonic development is affected," and if the sand is too coarse, the nest can collapse. *Id.* at 5.

21. See WITHERINGTON & MARTIN, *supra* note 8, at 2.

22. See CARR, *supra* note 10, at 22.

23. See VAN METER, *supra* note 1, at 2.

24. See *id.*

25. See *id.* at 4.

26. See *id.* at 3.

27. See WITHERINGTON & MARTIN, *supra* note 8, at 5. When the hatchlings begin to emerge, if those on the top sense sunlight, they will stop and remain in place until the evening comes. See RUDLOE, *supra* note 1, at 24.

28. See VAN METER, *supra* note 1, at 4. Scientists call this gap the "lost year." See RUDLOE, *supra* note 1, at 241. Some believe the young turtles live in floating rafts of sargasso weed. See CARR, *supra* note 10, at 99.

permanent feeding grounds.²⁹ Many sea turtles migrate long distances from their feeding grounds to mate and nest.³⁰

B. Species of Sea Turtles in Florida

The five species of sea turtles in Florida are the green (*Chelonia mydas*), loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempî*).³¹

Adult female green turtles weigh about 300 pounds and average a little over three feet in length.³² These herbivores feed on seagrasses and algae in shallow waters and are known for their navigational abilities.³³ It is believed that they return to nest on the beach where they were born.³⁴ Between sixty and 800 green turtle nests are found yearly on Florida's east coast, and infrequently on the Panhandle coast.³⁵ The green turtle population in the Caribbean and south Florida was severely decimated by intense hunting during the last 300 years.³⁶

Loggerhead turtles, at 200 to 350 pounds and three feet long, are the most common sea turtles in Florida.³⁷ They eat mollusks and crustaceans.³⁸ This species has been found as far north as Newfoundland and as far south as Argentina, but nests primarily in the southeastern United States.³⁹ Eighty percent of the loggerhead turtles in the western Atlantic nest along 200 miles of Florida's east coast.⁴⁰ It has been estimated that approximately 50,000 to 70,000

29. See VAN METER, *supra* note 1, at 5. Feeding grounds in the continental United States include the Gulf of Mexico and the east coast from Florida to Canada. See *id.* at 4. Worldwide feeding grounds are located in the Atlantic, Pacific, and Indian Oceans and the Caribbean Sea, in tropical, subtropical, and temperate waters. See *id.* at 6-8, 14-15, 18-19.

30. See *id.* at 12. One population of green turtles feeds along the coast of Brazil and nests on Ascension Island, 1400 miles away. *Id.*

31. See *id.* at 3.

32. See *id.* at 11.

33. See NATIONAL MARINE FISHERIES SERVICE AND U.S. FISH AND WILDLIFE SERVICE, RECOVERY PLAN FOR U.S. POPULATION OF ATLANTIC GREEN TURTLE 2-3 (1991) [hereinafter GREEN TURTLE RECOVERY PLAN]. For an example of these navigational abilities, see *supra* note 30.

34. See *id.* at 3.

35. See VAN METER, *supra* note 1, at 8. However, the Green Turtle Recovery Plan lists a range of 350 to 2288 green turtle nests found each year in Florida from 1986 to 1990. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 1.

36. See Van Meter, *supra* note 1, at 9-10. Until recently, these turtles were considered a delicacy and are the main ingredient in turtle soup. See *id.* at 9. Green turtles are named for the color of their body fat. See *id.* at 8.

37. See *id.* at 7.

38. See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 3.

39. See *id.* at 1-2.

40. See Anne Rudloe & Jack Rudloe, *Sea Turtles: In a Race for Survival*, NAT'L GEOGRAPHIC, Feb. 1994, at 94, 108-12 [hereinafter NAT'L GEOGRAPHIC].

loggerhead turtle nests are deposited every year in the southeastern U.S.⁴¹

Leatherback turtles are so called because their carapace is covered with a rubbery, oily material instead of a hard shell like other sea turtles.⁴² The largest of the sea turtles, they weigh 700 to 2000 pounds and reach four to eight feet in length.⁴³ Their size, texture, and barrel-like shape enable them to dive deeper (3000 feet), travel farther (3000 miles), and swim in colder water than any other sea turtle.⁴⁴ These unique creatures are also the only sea turtles that subsist on a diet of jellyfish.⁴⁵ Between 1981 and 1990, the annual number of leatherback turtle nests on the east coast of Florida increased from thirty-eight to 125.⁴⁶

Hawksbill turtles are one of the smallest sea turtles⁴⁷ and the only ones that predominantly eat sponges.⁴⁸ They have a beak-like mouth and a beautiful, richly patterned shell⁴⁹ highly prized for use in tortoiseshell products.⁵⁰ Because of their small body and agility, hawksbill turtles can nest on isolated, reefed, and rocky beaches, and they usually locate their nests under vegetation.⁵¹ In Florida, hawksbill turtles nest on the southeastern coast between Volusia and Dade Counties and into the Keys.⁵² Between 1979 and 1990, the annual number of reported nests ranged between zero and two.⁵³

The Kemp's ridley turtle is the smallest and rarest sea turtle.⁵⁴ The crab-eating adults weigh eighty-five to 100 pounds and measure twenty-four to thirty inches long.⁵⁵ Not only do these sea turtles nest

41. See *LOGGERHEAD RECOVERY PLAN*, *supra* note 18, at 2.

42. See *NATIONAL MARINE FISHERIES SERVICE AND U.S. FISH AND WILDLIFE SERVICE, RECOVERY PLAN FOR LEATHERBACK TURTLES IN THE U.S. CARIBBEAN, ATLANTIC, AND GULF OF MEXICO 1*, (1992) [hereinafter *LEATHERBACK RECOVERY PLAN*].

43. See *VAN METER*, *supra* note 1, at 16.

44. See *id.* at 13-16. A heat exchanging mechanism that permits leatherbacks to maintain a body temperature up to seventeen degrees centigrade above the water temperature enables them to swim in frigid water. See *RUDLOE*, *supra* note 1, at 171.

45. See *VAN METER*, *supra* note 1, at 14. Leatherbacks have back-pointing spines in their throats to hold jellyfish prey in when water is expelled. See *RUDLOE*, *supra* note 1, at 172.

46. *LEATHERBACK RECOVERY PLAN*, *supra* note 42, at 3.

47. See *NRC*, *supra* note 16, at 35.

48. See *VAN METER*, *supra* note 1, at 17.

49. See *NATIONAL MARINE FISHERIES SERVICE AND U.S. FISH AND WILDLIFE SERVICE, RECOVERY PLAN FOR THE HAWKSBILL TURTLE IN THE U.S. CARIBBEAN, ATLANTIC, AND GULF OF MEXICO 1* (1993) [hereinafter *HAWKSBILL RECOVERY PLAN*].

50. See *NRC*, *supra* note 16, at 39 ("Additional killing of juvenile[s] . . . for trade in stuffed specimens raises mortality to catastrophic levels.") *Id.*

51. See *VAN METER*, *supra* note 1, at 18; see also *HAWKSBILL RECOVERY PLAN*, *supra* note 49, at 4.

52. See *HAWKSBILL RECOVERY PLAN*, *supra* note 49, at 2.

53. See *id.* at 3.

54. See *VAN METER*, *supra* note 1, at 18.

55. See *id.* at 20.

during the daytime, but they do so almost exclusively in one area on the east coast of Mexico.⁵⁶ Before nesting, the turtles mass offshore to mate, and the females then emerge together to nest within a few hours of each other in a process called an *arribada*.⁵⁷ This behavior has rendered Kemp's ridley turtles vulnerable to exploitation by humans.⁵⁸ Adult Kemp's ridley turtles swim in the waters surrounding Florida, and although the literature claims Kemp's ridley turtles do not nest in Florida,⁵⁹ at least two Kemp's ridley turtle nests were deposited on Florida's east coast in 1996⁶⁰ and four were verified in Florida during the 1997 nesting season.⁶¹

III. DANGERS TO SEA TURTLES ON FLORIDA'S COAST

A. Dangers in the Marine Environment

Sea turtles face threats both in the ocean and on shore. During sea turtles' adult lives in the sea, their large size makes them immune to almost all natural predators except sharks.⁶² However, hatchlings in the sea often fall prey to fish and birds.⁶³ Humans still pose the largest oceanic threat to sea turtles. In some parts of the world, sea turtles are harvested for their meat and eggs and for products such as tortoiseshell, leather, oil, and cartilage for soup.⁶⁴ Sea turtles are endangered at sea by incidental capture or entanglement in

56. See NRC, *supra* note 16, at 26.

57. See VAN METER, *supra* note 1, at 20-21. *Arribada* means "arrival" in Spanish. See CASSILL'S SPANISH-ENGLISH ENGLISH-SPANISH DICTIONARY 69 (1997).

58. A film taken in 1947 shows approximately 40,000 females nesting in one day at Rancho Nuevo, the main Kemp's ridley nesting beach in Mexico. See U.S. FISH AND WILDLIFE SERVICE AND NATIONAL MARINE FISHERIES SERVICE, RECOVERY PLAN FOR THE KEMP'S RIDLEY SEA TURTLE 5 (1992) [hereinafter KEMP'S RIDLEY RECOVERY PLAN]. In 1968, 5000 females nested there in a single *arribada*, while between 1978 and 1990, "a single *arribada* rarely reached 200 females." *Id.* The Kemp's ridley sea turtles fell prey to egg traders in the early years, but now shrimp trawlers are their main danger. See VAN METER, *supra* note 1, at 21-22.

59. See KEMP'S RIDLEY RECOVERY PLAN, *supra* note 58, at 3; NRC, *supra* note 16, at 25; VAN METER, *supra* note 1, at 19-21.

60. See Carol B. Cole, *Excavation of Kemp's Ridley Nest Hatches Disappointment* (visited Nov. 1997) <<http://www.n-jcenter.com/enviro/en815a.htm>>. The two nests in Volusia County were the first recorded Kemp's ridley turtle nestings on Florida's east coast. See *id.*

61. See letter from Robbin Trindell, Ph.D., Biological Administrator, Marine Turtle Program, Bureau of Protected Species Management, Department of Environmental Protection, to author (May 14, 1998) (on file with author).

62. See VAN METER, *supra* note 1, at 37. "[M]any turtles bear the wounds of sharks." RUDLOE, *supra* note 1, at 29.

63. See BUSTARD, *supra* note 1, at 111-12.

64. See VAN METER, *supra* note 1, at 38. The international tortoise shell trade "may be the most significant factor endangering hawksbill populations worldwide." HAWKSBILL RECOVERY PLAN, *supra* note 49, at 15.

commercial and recreational fishing equipment,⁶⁵ especially as a result of shrimp trawling,⁶⁶ dredging of harbors and shipping channels,⁶⁷ collisions with boats,⁶⁸ underwater explosives used in oil rig removal, illegal fishing,⁶⁹ entrapment in intake pipes of coastal power plants,⁷⁰ and the ingestion of non-degradable debris.⁷¹

B. Natural Dangers in the Coastal Environment

Nesting female sea turtles, eggs, and hatchlings face a myriad of natural dangers on the beach. Eggs and hatchlings fall victim to predators such as raccoons, ants, ghost crabs, foxes, feral hogs, fish crows, herons, coyotes, buzzards, dogs, and armadillos.⁷² Nest

65. See NRC *supra* note 16, at 74. Turtles drown in trawls, drift nets, seines, gill nets, long lines, and other types of fishing equipment, including lost or discarded fishing gear. See *id.* at 101; see also VAN METER, *supra* note 1, at 39. Sea turtles can also become entangled in fish and crab trap ropes, buoy anchor lines, and other ropes and cables. See LEATHERBACK RECOVERY PLAN, *supra* note 42, at 14.

66. See NRC *supra* note 16, at 75. Incidental capture in shrimp trawls is the most significant cause of mortality for loggerhead and Kemp's ridley turtles in the ocean. See *id.*

67. See NRC, *supra* note 16, at 107-09; see also NAT'L GEOGRAPHIC, *supra* note 40, at 108. Sea turtles can be crushed by dredges. See *id.* The National Marine Fisheries Service issued a biological opinion in 1991 under Section 7 of the Endangered Species Act, 16 U.S.C. §§ 1531 et seq. (1998), finding that the unrestricted operation of hopper dredges off the southeast coast of the United States jeopardized the existence of sea turtles. See KEMP'S RIDLEY RECOVERY PLAN, *supra* note 58, at 10.

68. See VAN METER, *supra* note 1, at 42. Many injured and dead turtles are found with propeller wounds, and jet skis may stress turtles near shore during the nesting season. See *id.* Nesting females are especially vulnerable to accidents involving boats and shrimp trawlers because they remain close to shore between nesting intervals. See NOAA, *supra* note 2, at 11, "The potential impact from these . . . disasters . . . on the survival of a colony is greatly increased since it is the reproductive contingent that is affected." *Id.*

69. See NRC, *supra* note 16, at 110-12; HAWKSBILL RECOVERY PLAN, *supra* note 49, at 17. Sea turtles are also endangered by oil and gas exploration, development, and transportation. Oil spills harm turtles at sea or nesting grounds, exploration may disrupt feeding grounds, and turtles can ingest tar balls released from bilge pumping. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 7.

70. See NRC, *supra* note 16, at 112-13; GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 9.

71. See NRC, *supra* note 16, at 114; GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 12. Ingestion of plastics, cellophane, balloons, styrofoam, rubber, wax, charcoal, aluminum cans, cigarette filters, rope and string, monofilament fishing line, and hooks can have fatal impacts on sea turtles. See NRC, *supra* note 16, at 114; KEMP'S RIDLEY RECOVERY PLAN, *supra* note 58, at 10. Sea turtles are near-sighted and can mistake plastic bags and balloons for jellyfish, a common food of leatherbacks. See RUDLOE, *supra* note 1, at 49; VAN METER, *supra* note 1, at 43.

72. See VAN METER, *supra* note 1, at 36 ("Today, active nest protection and raccoon control programs on many beaches have greatly increased hatchling production."); NRC, *supra* note 16, at 62-63 (stating that raccoons destroyed nearly all sea turtle nests at Canaveral National Seashore, Florida, before protective measures were taken); LEATHERBACK RECOVERY PLAN, *supra* note 42, at 14; see also RUDLOE, *supra* note 1, at 19-20 (describing raccoons patiently waiting nearby for a mother turtle to lay her eggs and snatching the eggs from the nest chamber as the mother laid them). These natural predators are sometimes indirectly assisted by humans. For example, large raccoon populations are augmented by habitat alteration, human garbage as a food supplement, and removal of natural predators such as panthers and wolves from the coastal zone. See NRC, *supra* note 16, at 63; RUDLOE, *supra* note 1, at 19.

destruction can be caused by flooding from heavy rains,⁷³ tidal inundation as a result of nesting below the high-tide line,⁷⁴ and flooding and accretion⁷⁵ of sand above incubating nests.⁷⁶ Storms may also cause trees to fall on the beach, which can become obstacles to nesting females and hatchlings.⁷⁷ Additionally, nesting females can become fatally caught in driftwood, vegetation, and rocks on the beach because they are unable to crawl backwards to escape.⁷⁸ Hatchlings can be prevented from exiting the nest by beach vine roots that grow into or over the nest after the nest is laid.⁷⁹ A relatively recent disease threat noted in Florida's green sea turtles is "fibropapilloma," tumorous growths thought to be viral in origin.⁸⁰ Scientists at the University of Florida's Archie Carr Center for Sea Turtle Research suggest the tumors are caused by chemical runoff that affects sea turtles' habitat and damages their immune systems.⁸¹

73. See VAN METER, *supra* note 1, at 36; NRC, *supra* note 16, at 66.

74. See NRC, *supra* note 16, at 66.

75. Accretion is the deposition of beach sediments. See *id.* at 77.

76. See *id.* at 66; LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 9. Severe storms in the southeastern United States usually occur after the height of the nesting season. See *id.* at 9. However, storms can cause problems long after the bad weather has ended. When Hurricane Opal struck Florida's panhandle in 1995, the storm flattened dunes and narrowed and lowered beaches. See AP Wire Service, *Sea Turtles Still Haunted by Hurricane Opal* (visited Nov. 1997) <<http://www.n-jcenter.com/enviro/en1111a.htm>>. A year later, a United States Fish and Wildlife Service biologist estimated that eighty to ninety percent of the turtle nests in the area may have failed due to erosion-caused tidal inundation and water table seepage into nests. See *id.* Also, the flattened dunes exposed street and building lights to hatchlings, misorienting them away from the ocean. See *id.*

Leatherback nests are particularly vulnerable to erosion because the turtles' great size and tender skin force them to choose high energy, accessible beaches with a steep slope, which prevents them from traveling far inland to lay their eggs. See LEATHERBACK RECOVERY PLAN, *supra* note 42, at 10; NRC, *supra* note 16, at 41.

Nests can also be destroyed when dug into by another nesting female, but this is not a serious cause of mortality because most nesting populations have relatively low densities. See NOAA, *supra* note 2, at 65.

77. See HAWKBILL RECOVERY PLAN, *supra* note 49, at 7.

78. See VAN METER, *supra* note 1, at 37.

79. See LEATHERBACK RECOVERY PLAN, *supra* note 42, at 14.

80. See VAN METER, *supra* note 1, at 37. The tumors were first described in 1938 and are now commonly observed on green turtles in the Indian River area, Florida Bay, and the Florida Keys. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 11. Loggerhead and hawksbill turtles have also been reported to have the tumors. See Robert H. George, *Health Problems and Diseases of Sea Turtles*, in *THE BIOLOGY OF SEA TURTLES* 363, 371 (Peter L. Lutz & John A. Musick eds., 1997). The tumors can cause disorientation, blindness, and physical obstruction adversely affecting normal swimming and feeding. See *id.*

81. See AP Wire Service, *Tumor Biggest Threat for Endangered Green Turtles* (visited Nov. 1997) <<http://www.n-jcenter.com/enviro/en203a.htm>>. The tumors are more common in sea turtles in near-shore waters, areas near large human populations, and areas with low water turnover, as opposed to turtles in deeper, more remote areas. See George, *supra* note 79, at 372. Current treatment includes surgical removal of tumors. See *id.* at 374.

C. Human Presence on the Coast

In addition to posing the greatest oceanic threat, humans also pose the most serious coastal threat to sea turtles. Although poaching of nesting females and eggs by humans is substantially lower in the continental United States,⁸² these activities continue to severely deplete sea turtle populations in other parts of the world.⁸³ Human presence on beaches during the nesting season can negatively impact sea turtles.⁸⁴ Human activity, noise, and use of flashlights on the beach at night can cause nesting females to halt nesting attempts, resulting in what is called a "false crawl."⁸⁵ The nesting female may then shift to other nesting beaches, delay nesting, or choose poor nesting sites.⁸⁶ Beach construction can significantly deter nesting females from coming ashore.⁸⁷ Additionally, ordinary pedestrian traffic can cause compaction of sand above nests, crushing the hatchlings within, and may create tracks that interfere with the hatchlings' ability to reach the ocean.⁸⁸

Evidence of human presence may also harm sea turtle nesting habitats. Beach campfires can deter nesting females and disorient hatchlings, and if placed over a nest, can kill the embryos below.⁸⁹ Litter left by humans can obstruct both nesting females and

82. See *LOGGERHEAD RECOVERY PLAN*, *supra* note 18, at 16; *NRC*, *supra* note 16, at 113. But see *GREEN TURTLE RECOVERY PLAN*, *supra* note 33, at 7 (stating that Florida Marine Patrol made twenty-nine arrests for illegal possession of eggs from 1983 to 1989).

83. See *VAN METER*, *supra* note 1, at 37-39. Sea turtle eggs are prized in Latin America as an aphrodisiac and the eggs are sold for raw consumption in bars. See *NAT'L GEOGRAPHIC*, *supra* note 40, at 101. In the past, human exploitation of green turtles caused the extinction of entire populations which once nested in Bermuda and the Cayman Islands. See *GREEN TURTLE RECOVERY PLAN*, *supra* note 33, at 2. Prior to the institution of protection efforts in 1966, Kemp's ridley "eggs were taken out in mule trains, by truck and by horseback" from nesting beaches in Rancho Nuevo, Mexico. See *KEMP'S RIDLEY RECOVERY PLAN*, *supra* note 58, at 7. Mexican and United States conservationist and agency collaboration has resulted in a significant decrease in poaching in that area. See *id.* at 11.

84. See *NRC*, *supra* note 16, at 80; *WITHERINGTON & MARTIN*, *supra* note 8, at 4.

85. A "false crawl" occurs when a female ascends the beach but returns to the sea without nesting. See *VAN METER*, *supra* note 1, at 29. Once the egg-laying process has begun, nesting females are not easily disturbed, but they may turn back if bothered by beach activity or lights when exiting the water, ascending the beach, or digging the nest, or if they encounter an obstacle on the beach. See *id.* Disturbances may also result in the abbreviation of the post-egg-laying behavior of covering eggs and camouflaging the site. See *WITHERINGTON & MARTIN*, *supra* note 8, at 4. False crawls are exhausting exercises for nesting sea turtles because the turtles are so heavy, slow and awkward on land. See *VAN METER*, *supra* note 1, at 27. Turtles prevented from nesting may shed their eggs at sea. See *WITHERINGTON & MARTIN*, *supra* note 8, at 4.

86. See *HAWKBILL RECOVERY PLAN*, *supra* note 49, at 10. Flashlights can also misorient hatchlings away from the ocean. See *id.* at 11.

87. See *NOAA*, *supra* note 2, at 11.

88. See *GREEN TURTLE RECOVERY PLAN*, *supra* note 33, at 5. Horse traffic can also cause these problems. See *VAN METER*, *supra* note 1, at 42.

89. See *HAWKBILL RECOVERY PLAN*, *supra* note 49, at 11.

hatchlings and food may attract predators to the nest area.⁹⁰ Recreational beach equipment left on the beach at night, including beach furniture, cabanas, umbrellas, small boats, and beach cycles, can cause false crawls in nesting females, damage nests by crushing or protruding into the nest, and hamper hatchlings' progress towards the sea.⁹¹

In areas where motor vehicles are allowed on the beach or where illegal beach driving occurs, the use of headlights during night driving can disrupt the nesting process and disorient hatchlings.⁹² Tire ruts can interfere with the hatchlings' ability to reach the sea,⁹³ and vehicles can damage nests and run over hatchlings.⁹⁴ Beach cleaning equipment causes similar problems.⁹⁵ In addition to the creation of ruts and compaction of nests by heavy machinery, beach cleaning rakes can penetrate or uncover nests.⁹⁶

The invasion or intentional planting of non-native vegetation on the beach also poses a threat to sea turtle nests.⁹⁷ These species often displace native plants and can lead to dune destabilization and increased beach erosion.⁹⁸ Some non-native plants can form impenetrable root mats which interfere with the nesting process, invade nests, or trap hatchlings.⁹⁹

Florida's extensive coastal development progressively threatens sea turtle nesting habitat and populations. Tall buildings cast shade

90. See NOAA, *supra* note 2, at 14.

91. See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 8. Nesting females can become trapped under heavy furniture. See *id.* If a sea turtle purposefully places a nest in the shade cast by beach furniture, the nest may become too hot if the furniture is removed and the nest site is exposed to direct sunlight. See HAWKSBILL RECOVERY PLAN, *supra* note 49, at 11.

92. See LEATHERBACK RECOVERY PLAN, *supra* note 42, at 14.

93. See NRC, *supra* note 16, at 81. "The extended period of travel required to negotiate tire tracks . . . may increase the susceptibility of hatchlings to stress and depredation during transit to the ocean." See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 6.

94. See NRC, *supra* note 16, at 81. Driving directly over a nest can kill the incubating sea turtles within the nest, or it may compact the sand above the nest to the extent that it interferes with hatchling emergence. See *id.* Driving on beaches during high tides or on narrow beaches also contributes to erosion of nesting habitats. See *id.*

95. See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 7.

96. See NRC, *supra* note 16, at 79-80. Disposal or burial of debris on the beach can harm nests and impede hatchlings. See *id.* at 80. Beach cleaning also exacerbates erosion because the removal of leaf litter and vegetation allows wind to move sand out of the nesting area. See HAWKSBILL RECOVERY PLAN, *supra* note 49, at 10.

97. See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 8.

98. See *id.*

99. See *id.* The Australian Pine has engulfed many coastal areas in Florida and can shade the beach, significantly affecting nest temperatures and nest-site selection. See NRC, *supra* note 16, at 81-82. But see GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 6 (reporting that dense stands of the trees can create a barrier to beach lighting which may result in concentrated nesting). Similarly, nesting sea turtles are often attracted to beaches in front of unoccupied or darkened buildings, which can look like a row of trees. See NAT'L GEOGRAPHIC, *supra* note 40, at 112.

on the beach and human removal of vegetation from the beach reduces shade, affecting crucial nest temperatures.¹⁰⁰ Increased artificial light from development may discourage females from nesting and cause hatchling disorientation.¹⁰¹ Coastal development also interferes with natural coastal processes, accelerating erosion and necessitating erosion control measures, both of which negatively affect the nesting process.¹⁰²

D. Erosion Control Measures

Sandy coastlines and barrier islands in their natural state are constantly moving.¹⁰³ During storms, beaches erode and are later rebuilt, while islands disappear and reform throughout various coastal regions.¹⁰⁴ When coastlines and islands became developed for human use, artificial inlets and buildings along the beach interfered with this natural coastal migration, causing a need for coastal armoring to fortify the beach against erosion.¹⁰⁵ However, these structures actually accelerate erosion by intensifying wave action and currents along the shore, and prevent the natural return, or accretion, of sand to the shore.¹⁰⁶ To preserve beachfront development, erosion control measures must continue, along with repeated beach renourishment projects to replace the lost sand.¹⁰⁷ Both of these practices adversely affect nesting sea turtles and their eggs.¹⁰⁸

Besides causing permanent degradation of nesting habitat through erosion,¹⁰⁹ coastal armoring physically prevents females

100. See NOAA, *supra* note 2, at 11, 14.

101. See *id.* at 11; see also *infra* notes 126-36 and accompanying text (describing the effects of artificial beachfront lighting on sea turtles).

102. See NRC, *supra* note 16, at 77-78.

103. See FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS, SAND IN MY SHOES: A GUIDE TO LIVING WITH FLORIDA'S COAST at 17 (1995) [hereinafter DCA].

104. See *id.*

105. See *id.* Coastal armoring includes sea walls, rock revetments, riprap, sandbag installations, groins, jetties, and bulkheads. See NRC, *supra* note 16, at 77; DCA, *supra* note 103, at 17.

106. See DCA, *supra* note 103, at 17-19. "More than 350 of Florida's 825 miles of sandy beach . . . are eroding. Of these, 233 miles have critical erosion problems." See *id.* at 18. Approximately 21% of Florida's beaches are armored. See HAWKSBILL RECOVERY PLAN, *supra* note 49, at 7.

107. See DCA, *supra* note 103, at 19; NRC, *supra* note 16, at 77-78.

108. See NRC, *supra* note 16, at 77-78; Molly E. Lutcavage et al., *Human Impacts on Sea Turtle Survival*, in THE BIOLOGY OF SEA TURTLES 387, 390 (Peter L. Lutz & John A. Musick eds., 1997) (explaining that renourishment usually takes place during the summer nesting season because costs are lower due to calmer seas).

109. During the 1997 nesting season at Egmont Key State Park on Florida's west coast, erosion narrowed the beach so much that females were forced to nest below the high tide line, and hundreds of sea turtle eggs were flooded. See N-J Wire Services, *Sea Turtle Nests Swamped By Tides* (visited Nov. 1997) <<http://www.n-jcenter.com/97/aug/11/en3.htm>>.

from reaching suitable nesting sites.¹¹⁰ When females deposit nests seaward of armoring structures, the nests may be flooded at high tide or washed out by waves.¹¹¹ When inadequate amounts of sand cover the armoring structures, females nesting over them may abandon nesting attempts or may construct improperly sized nests.¹¹² Coastal armoring structures tend to break apart after time, and the resulting debris left on the beach can cause false crawls and trap nesting turtles and hatchlings.¹¹³

When beach renourishment is conducted during the nesting season, it can bury nests and adversely affect nesting turtles and hatchlings with its increased human activity and artificial lighting at night.¹¹⁴ Heavy machinery and pipelines associated with beach renourishment projects can also cause false crawls and entrapment of nesting females and hatchlings.¹¹⁵ An element of beach renourishment is the depositing of new sand on the affected area. However, the sand deposited on the nesting beach may be different from native beach sediments, which could affect females' nest site selection and digging behavior, the nests' incubation temperature,¹¹⁶ gas-exchange

110. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 3; NRC, *supra* note 16, at 77. Because the majority of coastal armoring structures are vertical seawalls, the most common problem caused by coastal armoring occurs when females intercept seawalls and abandon nesting. See Letter from Dr. Robbin Trindell, *supra* note 61; see also WITHERINGTON & MARTIN, *supra* note 8, at 4 (reporting 1994 loggerhead nesting success at undeveloped beaches of Canaveral National Seashore as 61%, while nesting success at the residential, heavily armored beaches of Jupiter Island was 45%).

111. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 3.

112. See HAWKBILL RECOVERY PLAN, *supra* note 49, at 7-8. Digging impediments can cause false crawls. See WITHERINGTON & MARTIN, *supra* note 8, at 4.

113. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 3; NRC, *supra* note 16, at 77. "Sandbags are particularly susceptible to rapid failure and result in extensive debris on nesting beaches." See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 5. Sand or drift fences used to stabilize dunes can also impede nesting and trap hatchlings and nesting females if they are improperly located. See *id.* at 5-6.

114. See NRC, *supra* note 16, at 78. These projects are often conducted twenty-four hours a day. See *id.* The artificial lights and activity may also affect nesting females and hatchlings on adjacent beaches. See *id.* The "mechanical earth moving" of renourishment projects may damage nests by compression or excavation, and may increase the chance of storm washover. See NOAA, *supra* note 2, at 13.

115. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 4. Access to nesting sites is affected by steep escarpments, which form in the mid-beach zone as a result of wave action caused by the renourishment. See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 6; Lutcavage et al., *supra* note 108, at 389. During the 1997 nesting season, beach renourishment created a steep beach in Sebastian Inlet State Park which discouraged sea turtles from nesting, causing a high number of false crawls. See David Kearns, *Some Turtles Won't Nest in Renourished Beach Area*, FLORIDA TODAY, Aug. 29, 1997, available in 1997 WL 12790356.

116. Sand color affects nest temperature, and thus hatchling sex ratios. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 17. See generally *supra* note 20 (explaining effects of temperature on nests).

characteristics of the nest,¹¹⁷ and the nest's moisture content.¹¹⁸ This difference in sand could also affect the success of hatchling emergence from both egg and nest.¹¹⁹ Transporting the sand onto the beach and the renourishment itself often result in severe compaction of the beach, significantly reducing nesting success.¹²⁰

Although the necessary repetitive maintenance of beach renourishment projects heightens the threat to sea turtle nesting habitat,¹²¹ beach renourishment is preferable to coastal armoring for nesting habitat protection.¹²² Renourishment of extremely eroded beaches, especially where the entire dry beach has been lost, can improve nesting habitat.¹²³ However, the renourishment process must be conducted carefully to ensure proper timing and sand quality,¹²⁴ and where compaction occurs during renourishment, tilling can be used to soften the sand.¹²⁵

E. Artificial Beachfront Lighting

Florida's extensive coastal development brings with it a high level of artificial beachfront lighting, which can make beaches unsuitable for sea turtle nesting.¹²⁶ Artificial beachfront lighting, including lights located on or near beaches¹²⁷ and the "urban skyglow" from intensive inland light,¹²⁸ affects both nesting females and hatchlings.¹²⁹ Lighting can deter female sea turtles from emerging from the sea to nest¹³⁰ and can interfere with their sea-finding ability¹³¹

117. Sand grain shape, size, and compaction can affect gas diffusion within the nest. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 17. See NOAA, *supra* note 2, at 5.

118. See NRC, *supra* note 16, at 78. The process could also expose buried sediments unsuitable for nesting. See NOAA, *supra* note 2, at 13. "Differences in temperature, hydric environment, and gas exchange affect hatching rates and possibly the vigor and survivorship of hatchlings." Lutcavage et al., *supra* note 108, at 388.

119. See NRC, *supra* note 16, at 78.

120. See *id.*

121. See LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 6.

122. See *id.* at 16.

123. See *id.* at 6.

124. See *id.*

125. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 17.

126. See VAN METER, *supra* note 1, at 42.

127. See NRC, *supra* note 16, at 79. This type of lighting includes light from buildings, streetlights, dune crossovers, vehicles, and parking lots. See *id.*

128. See *id.*; WITHERINGTON & MARTIN, *supra* note 8, at 16.

129. See WITHERINGTON & MARTIN, *supra* note 8, at 2, 4-5.

130. See *id.* at 2-3. The reason for this deterrence may be that sea turtles perceive artificial lighting as daylight. See *id.* at 2. Nesting sea turtles deterred from one beach by lighting may choose a less appropriate nest site or may shed their eggs at sea. See *id.* at 4. One study found that loggerhead turtles nesting on beaches where background glow is visible prefer darker areas where buildings are silhouetted against the glow. See *id.* at 2.

131. Sea turtles "rel[y] on brightness for correct seaward orientation." See *id.* at 5.

after nesting is completed.¹³² Because emergent hatchlings rely on visual brightness cues to find the sea, artificial beachfront lighting causes hatchlings to become misdirected during their crucial and dangerous trip from the nest to the sea.¹³³ Hatchlings in this situation often die from exhaustion, dehydration, predation,¹³⁴ entrapment in vegetation or debris, or wandering onto roadways and parking lots where they are struck by cars.¹³⁵ Artificial lighting can also cause hatchling disorientation while in the surf and even draw them back out of the water.¹³⁶

The artificial beachfront lighting problem may be the most manageable of the human-caused sea turtle disturbances.¹³⁷ Although some beachfront lighting is necessary for safety and security, light management measures can help prevent interference with sea turtle nesting habitat while still addressing human safety concerns.¹³⁸ These measures include turning off unnecessary lights during the nesting season; using a smaller number or lower wattage of lights; repositioning, shielding, redirecting, lowering, or recessing fixtures so light does not reach the beach; using timers and motion detector switches; planting native dune vegetation to screen light; and reducing interior lighting by moving lights from windows, drawing curtains or blinds after dark, and tinting windows.¹³⁹ In addition, sea turtles are less affected by red, yellow, and low-pressure sodium-vapor lights, which can be substituted for ordinary lights.¹⁴⁰

Marking, caging, and relocation of nests are defenses against some of the coastal problems described above, but are not always desirable alternatives. Sea turtle nests can be marked or caged to prevent damage by pedestrian and vehicular traffic and beach

132. *See id.* at 4-5. This situation occurs rarely, but when it does occur it is often fatal: the turtles may be prevented from returning to the sea by topography or obstacles, or may wander onto a road and be struck by a car. *See id.* at 5.

133. *See id.* at 5-15.

134. *See id.* at 5.

135. *See* NRC, *supra* note 16, at 79. From 1989 to 1990, 37,159 misoriented hatchlings were reported to the Florida Department of Natural Resources (precursor of the Florida Department of Environmental Protection), but this does not include the many unreported misorientations. *See* LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 7.

136. *See* NRC, *supra* note 16, at 79. In addition to artificial lights on shore, hatchlings can be attracted to lights on boats, platforms, and piers. *See* WITHERINGTON & MARTIN, *supra* note 8, at 15, 68. These hatchlings may become prey to fish in the near-shore waters. *See id.* at 15.

137. *See* WITHERINGTON & MARTIN, *supra* note 8, at v.

138. *See id.* at 20. Although it is difficult to quantify the amount of beach lighting that negatively affects sea turtles, Blair Witherington and R. Erik Martin offer the following rule: "An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach." *Id.* at 16.

139. *See id.* at 20-22.

140. *See id.* at 23.

cleaning equipment.¹⁴¹ Though no longer in favor as a remedy for all such problems, nest relocation to protected hatcheries or more suitable nest sites is another option to remove nests from the threats of predators,¹⁴² erosion,¹⁴³ pedestrian and vehicular traffic,¹⁴⁴ beach cleaning activities,¹⁴⁵ beach renourishment projects,¹⁴⁶ artificial beachfront lighting,¹⁴⁷ and areas of heavy vegetation.¹⁴⁸ However, nest relocation may have negative consequences¹⁴⁹ and does not address the threatened habitat problem.¹⁵⁰ The current emphasis of nesting habitat management is to avoid manipulation of nests and hatchlings as much as possible.¹⁵¹

141. See NRC, *supra* note 16, at 122.

142. See RUDLOE, *supra* note 1, at 17; VAN METER, *supra* note 1, at 41.

143. See NRC, *supra* note 16, at 121; LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 24.

144. See NRC, *supra* note 16, at 122; LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 8.

145. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 5.

146. See NRC, *supra* note 16, at 121; Stephen H. Higgins & Louis E. Fisher, *The Impacts of Sea Turtle Nest Relocation in Broward County, Florida*, in *THE STATE OF THE ART OF BEACH NOURISHMENT: PROCEEDINGS OF THE 1993 NATIONAL CONFERENCE ON BEACH PRESERVATION TECHNOLOGY* 309 (Lawrence S. Tait ed., 1993) [hereinafter Higgins].

147. See WITHERINGTON & MARTIN, *supra* note 8, at 69; Higgins, *supra* note 146, at 309.

148. See Higgins, *supra* note 146, at 316. However, such nest and hatchery protection measures should always enable hatchling release the same night of hatching. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 21.

149. See WITHERINGTON & MARTIN, *supra* note 8, at 69 (listing possible dangers of nest relocation as loss of missed and unrellocated nests and damage to eggs during transit, and stating, "Putting eggs in places other than those chosen by the nesting turtle can be detrimental."); VAN METER, *supra* note 1, at 47 (observing that temperature differences in new location may affect sex ratios); see also U.S. Fish and Wildlife Service, *Final Environmental Assessment for the Incidental Take Permit and Volusia County Beach Habitat Conservation Plan*, at 3-42 (1996) [hereinafter *Environmental Assessment*] (stating that relocation could affect gas exchange parameters and moisture conditions in nests, and could disrupt the hatchling imprint process, which research has shown may cause some female sea turtles to return to their natal beach to nest). However, a study of the effects of nest relocation in Broward County, Florida, found that the hatching success of relocated nests is equivalent to that of unrellocated nests. See Higgins, *supra* note 146, at 309. The study also found that the short-term impact of the relocation program was a decrease in nest destruction and hatchling disorientation. See *id.* But see Telephone Interview with Dan Evans, Coordinator, Sea Turtle Survival League (Nov. 13, 1997) (stating that, in general, hatchling success after relocation is lower because all the natural conditions of the nest cannot be duplicated; the nest location is part of the decision-making process of the nesting female).

150. See VAN METER, *supra* note 1, at 41 ("The goal of sea turtle conservation programs is self-sustaining populations that do not require human intervention such as [nest relocation.]"); see also LOGGERHEAD RECOVERY PLAN, *supra* note 18, at 24 ("Nest relocation programs at best should be considered as a short-term measure to protect nests in these situations with primary efforts directed towards habitat restoration.").

151. See GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 11. In 1995, the Florida Department of Environmental Protection ("DEP") recommended nest caging rather than relocation to protect nests from human impacts. See *Environmental Assessment*, *supra* note 149, at 3-44. DEP considers relocation undesirable as a management tool. See Letter from Dr. Robbin Trindell, *supra* note 61. Currently, DEP authorizes nest relocation only for conservation reasons, and not for human-related impacts other than erosion and beach renourishment projects. See *id.* An exception to this policy is the Dade and Broward County area, where intense urban development and associated lighting impacts necessitate moving nests to hatcheries. See *id.* DEP is

IV. STATUTORY PROTECTION OF SEA TURTLES IN FLORIDA

A. *Federal Endangered Species Act*

Six species of sea turtles are federally protected under the Endangered Species Act of 1973 (ESA).¹⁵² They are the green, hawksbill, Kemp's ridley, leatherback, loggerhead, and olive ridley sea turtles. Section 7 of the ESA requires federal agencies to ensure that their actions are "not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of" such species' critical habitat.¹⁵³ Section 9 prohibits the sale, import, export, or transport of any endangered species and most threatened species, and makes it unlawful to "take" them.¹⁵⁴ The term "take" is broadly defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."¹⁵⁵ The United States Supreme Court has affirmed the Secretary of the Interior's interpretation that take includes "significant habitat modification or degradation where it actually kills or injures wildlife."¹⁵⁶ Section 10 of the ESA authorizes the Fish and Wildlife Service and National Marine Fisheries Service to permit "incidental"¹⁵⁷ takings by non-federal, private actions if the action "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild."¹⁵⁸

B. *Florida Endangered and Threatened Species Act*

The Florida Endangered and Threatened Species Act of 1977 (FETSA) established Florida's policy to conserve and wisely manage its resources, especially endangered and threatened species.¹⁵⁹ The intent of the FETSA is to "provide for research and management to conserve and protect [endangered and threatened] species,"¹⁶⁰ and the act appoints the Florida Department of Environmental Protection (DEP) as the agency responsible for research and management of

working with these counties to avoid relocation whenever possible and to develop a lighting plan to reduce the current amount of artificial beachfront lighting. *See id.*

152. 16 U.S.C. §§ 1531-43 (1998).

153. *Id.* § 1536(a)(2).

154. *See id.* §§ 1538(a)(1)(B)-(C).

155. *Id.* § 1532(19).

156. *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 515 U.S. 687, 691 (1995).

157. An incidental take is one otherwise prohibited by the ESA but which is "incidental to, and not for the purpose of, the carrying out of an otherwise lawful activity." § 1539(a)(1)(B).

158. *Id.* § 1539(a)(2)(B)(iv).

159. *See* FLA. STAT. § 372.072(2) (1997).

160. *Id.*

marine species.¹⁶¹ With this authority, DEP listed the green, leatherback, hawksbill, and Kemp's ridley sea turtles as endangered.¹⁶² The loggerhead sea turtle was listed as threatened.¹⁶³

C. Marine Turtle Protection Act

In 1995, the Florida Legislature passed the Marine Turtle Protection Act (MTPA), giving DEP the authority to enforce regulations protecting the green, leatherback, hawksbill, Kemp's ridley, and loggerhead sea turtles.¹⁶⁴ DEP was instructed to implement its responsibilities under the United States Fish and Wildlife Service (USFWS) recovery plans for the five species of sea turtles.¹⁶⁵ The MTPA states that "no person may take, possess, disturb, mutilate, destroy, cause to be destroyed, sell, offer for sale, transfer, molest, or harass any marine turtle or its nest or eggs at any time."¹⁶⁶ "Take" is defined as an act which kills or injures sea turtles, including "significant habitat modification or degradation that kills or injures marine turtles by significantly impairing essential behavioral patterns, such as breeding, feeding, or sheltering."¹⁶⁷

Under the MTPA, a permit application to DEP for any activity that affects sea turtles, their nests, or habitat is subject to conditions and requirements for sea turtle protection.¹⁶⁸ When considering a

161. See *id.* § 372.072(4)(a)2. The Marine Turtle Protection Program in DEP's Bureau of Protected Species Management is responsible for management efforts toward sea turtle recovery, including recovery program planning, management and administration, coordination of research and management activities, habitat protection, and education. See *Bureau of Protected Species Management, Sea Turtle Protection Efforts* (visited Nov. 1997) <<http://www.dep.state.fl.us/psm/webpages/turtle2.htm>>. Florida Marine Research Institute, the marine research arm of DEP, monitors statewide nesting activity, documents mortalities, conducts research on the biology of sea turtles, and provides data for managing and evaluating coastal-development effects. See *Florida Marine Research Institute, Marine Turtles* (visited Nov. 1997) <<http://www.fmri.usf.edu/fmri/programs/ecosystems/endthrsp/turtles/index.html>>.

162. See FLA. ADMIN. CODE R. 39-27.003(6)-(9) (1998). "Endangered" means a species "whose prospects of survival are in jeopardy due to modification or loss of habitat; overutilization for commercial, sporting, scientific, or educational purposes; disease; predation; inadequacy of regulatory mechanisms; or other natural or manmade [*sic.*] factors affecting its continued existence." FLA. STAT. § 372.072 (3)(b) (1997).

163. See FLA. ADMIN. CODE R. 39-27.004(3) (1998). "Threatened" means a species "which may not be in immediate danger of extinction, but which exists in such small populations as to become endangered if it is subjected to increased stress as a result of further modification of its environment." FLA. STAT. § 372.072(3)(c) (1997).

164. FLA. STAT. § 370.12(1)(b) (1997).

165. See *id.* Each of these recovery plans prepared by USFWS "delineates and schedules those actions believed necessary to restore [the species] as a viable self-sustaining element of its ecosystem." LEATHERBACK RECOVERY PLAN, *supra* note 42, at i; see also GREEN TURTLE RECOVERY PLAN, *supra* note 33, at i; HAWKSBILL RECOVERY PLAN, *supra* note 49, at i; KEMP'S RIDLEY RECOVERY PLAN, *supra* note 58, at i; LOGGERHEAD RECOVERY PLAN, *supra* note 18, at i.

166. FLA. STAT. § 370.12(1)(c) (1997).

167. *Id.*

168. See *id.* § 370.12(1)(d).

permit application for such an activity, DEP may condition the nature, timing and sequence of construction to protect nesting sea turtles, hatchlings, and their habitat.¹⁶⁹ DEP must recommend denial of a permit if an activity would result in a "take," unless the taking is incidental under the federal ESA.¹⁷⁰

However, on the Atlantic coast, DEP cannot restrict the timing of a beach restoration, beach renourishment, or inlet sand transfer project when the applicant already has a sea turtle nest relocation program or has agreed to administer such a program.¹⁷¹ In this situation, DEP can only require the applicant to successfully relocate and monitor all turtle nests that would be affected by the permitted activity.¹⁷² The MTPA instructs DEP to give special consideration to beach preservation and renourishment projects that restore sea turtle habitat and requires the consideration of nest relocation for all such projects in urbanized areas.¹⁷³

D. Coastal Zone Protection Act

The Coastal Zone Protection Act of 1985 (CZPA), designed to manage sensitive coastal areas by minimizing damage to the environment, private property, and life,¹⁷⁴ specifically addresses protection of sea turtles by allowing DEP to place conditions on construction that provide sea turtle protection pursuant to the MTPA.¹⁷⁵ Further, the CZPA indirectly assists sea turtle conservation efforts by prohibiting vehicular traffic on coastal beaches, with some exceptions.¹⁷⁶ Beach driving authorized by a local government prior to July 1, 1989,¹⁷⁷ is permitted to continue as long as less than fifty percent of the peak demand for off-beach parking is available.¹⁷⁸ Driving is not allowed on any additional beaches.¹⁷⁹

169. *See id.* § 370.12(1)(e).

170. *See id.* § 370.12(1)(f).

171. *See id.* § 370.12(1)(e).

172. *See id.*

173. *See id.* § 370.12(1)(g).

174. *See* FLA. STAT. § 161.53(5) (1997).

175. *See id.* § 161.53(5)(a).

176. *See id.* § 161.58(2). The exceptions are traffic "necessary for cleanup, repair, or public safety, or for the purpose of maintaining existing licensed and permitted traditional commercial fishing activities or existing, authorized public accessways" *See id.*

177. *See* Act effective July 1, 1989, ch. 89-249, 1989 Fla. Laws 1036.

178. *See* FLA. STAT. § 161.58(2)(b) (1997).

179. *See id.* § 161.58(2).

E. Beach and Shore Preservation Act

The Beach and Shore Preservation Act (BSPA) regulates coastal construction and beach and shore preservation projects such as beach restoration and renourishment, navigation inlet improvement, and erosion control projects.¹⁸⁰ Section 161.041 requires that a permit must be obtained from DEP before commencement of any of these activities on sovereignty lands of Florida, below the mean high water line of any tidal water.¹⁸¹ Section 161.053 requires permits with special siting and design considerations to construct seaward of the coastal construction control line (CCCL).¹⁸²

DEP can condition a permit to alter, excavate, or construct on property seaward of the CCCL to protect nesting sea turtles, hatchlings, and their habitat.¹⁸³ Protection of sea turtles and their nesting sites must also be addressed under this section when DEP grants general permits¹⁸⁴ or areawide permits to local governments and utility companies for special activities,¹⁸⁵ in development agreements between DEP and property owners,¹⁸⁶ and in certain permit-exempt projects to maintain navigation inlets or renourish nearby downdrift beaches.¹⁸⁷

Pursuant to permit requirements for construction on sovereignty lands or seaward of the CCCL, DEP can issue a permit for installation of rigid coastal armoring structures or other emergency response measures.¹⁸⁸ However, the BSPA delegates to local counties and municipalities the authority to approve construction of

180. FLA. STAT. §§ 161.011-.45 (1997). Coastal construction is defined as including "any work or activity which is likely to have a material physical effect on existing coastal conditions or natural shore and inlet processes." *Id.* § 161.011(6).

181. *See id.* § 161.041(1) (1997).

182. *See id.* § 161.053(1)(a). With the aim of protecting Florida's beach-dune system, the Beach and Shore Preservation Act ordered DEP to establish coastal construction control lines (CCCLs) in counties on Florida's coast where necessary to protect uplands and control erosion. *See id.* § 161.053(1)(a). The CCCLs were established to define the "portion of the beach-dune system which is subject to severe fluctuations based on . . . predictable weather conditions." *Id.*

If a proposed structure is seaward of the CCCL but is sited and designed to protect sea turtles, the construction is exempted from regulation under this section as long as it is located landward of existing armoring that meets certain requirements. *See id.* § 161.053(2)(b).

183. *See id.* § 161.053(5)(c).

184. *See id.* § 161.053(19). This section addresses general permits for projects including dune walkovers, decks, fences, landscaping, sidewalks, driveways, pool resurfacing, minor pool repairs, and certain single-family homes. *See id.*

185. *See id.* § 161.053(18). Such activities can include road repairs, utility repairs and replacements, beach cleaning, and emergency response. *See id.*

186. *See id.* § 161.0531(1).

187. *See id.* § 161.142(3).

188. *See id.* § 161.085(2).

temporary coastal armoring in certain emergency situations.¹⁸⁹ In installing these structures, the local government must consider the protection of nesting sea turtles and hatchlings.¹⁹⁰

The BSPA requires consideration of sea turtle protection¹⁹¹ in conjunction with state funding for beach restoration and renourishment projects and navigation inlet improvement.¹⁹² When prioritizing projects which can receive up to seventy-five percent state funding, the state considers, among other criteria, the impact of the project on sea turtle nesting and the extent of local government legislation which protects sea turtles from the adverse effects of beachfront lighting and preserves their habitat.¹⁹³ In order to receive any state funds, such a project must provide for protection of sea turtles and their nesting habitat.¹⁹⁴

The 1986 amendments required DEP to designate "coastal areas which are utilized, or likely to be utilized, by sea turtles for nesting," and to adopt guidelines for regulations of local governments to control beachfront lighting to protect sea turtles.¹⁹⁵ DEP carried out these instructions in chapter 62B-55 of the *Florida Administrative Code*, where it designated twenty-six coastal counties as nesting habitat¹⁹⁶ and published the Model Lighting Ordinance for Marine Turtle Protection (MLO).¹⁹⁷

V. RULES AND PROCEDURES FOR SEA TURTLE PROTECTION

A. Permitting Activities on Sovereignty Lands

Chapter 62B-41 of the *Florida Administrative Code*, Rules and Procedure for Application for Coastal Construction Permits, implements section 161.041 of the Florida Statutes, which regulates coastal construction on sovereignty lands below the mean high water line of the tidal waters of Florida.¹⁹⁸ Coastal construction upon sovereignty

189. See *id.* § 161.085(3). The county or municipality may authorize installation of these structures to protect private structures or public infrastructure from erosion caused by a major storm event. See *id.* Within 60 days of installation, the local government must submit a permit application to DEP for a permanent structure, or the temporary structure must be removed. See *id.* § 161.085(6).

190. See *id.* § 161.085(3)(e).

191. See *id.* § 161.161(1)(i), (2)(j) – (k).

192. See *id.* § 161.111.

193. See *id.* § 161.161(2)(j)–(k).

194. See *id.* § 161.161(2).

195. *Id.* § 161.163 (1997).

196. See FLA. ADMIN. CODE R. 62B-55.003 (1995). For a list of the counties, see *infra* note 237.

197. See FLA. ADMIN. CODE CH. 62B-55 (1995); see also *infra* notes 236–44 and accompanying text (describing chapter 62B-55 in detail).

198. See FLA. ADMIN. CODE CH. 62B-41 (1996).

lands may not cause the "take" of sea turtles pursuant to the MTPA.¹⁹⁹ Any coastal construction permitted under this chapter and determined to have an adverse impact²⁰⁰ is monitored to determine its impacts upon, among other things, sea turtles.²⁰¹

Applications for permits for coastal construction on sovereignty lands that affects sea turtles are subject to the conditions and requirements for sea turtle protection set forth in Rule 62B-41.0055.²⁰² Before granting a permit under this rule, DEP must determine that the coastal construction is consistent with the federal ESA and Florida's MTPA and would not result in a "take" under the MTPA.²⁰³ In making this determination, DEP evaluates the number of sea turtles and nests that would be affected, the potential impacts of disturbance on the turtles and nests, and the quality and suitability of the existing beach for nesting in the area of the construction.²⁰⁴

Except in certain emergency situations,²⁰⁵ construction of coastal armoring structures on sovereignty lands is prohibited in federally-designated critical habitat for sea turtles or on the shore of the Archie Carr National Wildlife Refuge.²⁰⁶ When any coastal construction is permitted, even in the excepted emergency situations, DEP requires "nest surveys, nest relocation, nest marking, modification of coastal construction, measures to reduce sand compaction, and short and long term monitoring to assess the impacts of the permitted coastal construction on marine turtles and their habitat."²⁰⁷

Beach restoration and renourishment projects and mechanical sand bypassing projects on sovereignty lands must be designed to provide suitable habitat for sea turtle nesting activity.²⁰⁸ These beach preservation activities cannot take place during the nesting season

199. See FLA. ADMIN. CODE R. 62B-41.003(4) (1995); FLA. STAT. § 370.12(1)(c)(1) (1997).

200. Adverse impact is defined as an impact "to the active portion of the coastal system . . . caused by coastal construction which has a reasonable potential of causing a measurable interference with the natural functioning of the coastal system." FLA. ADMIN. CODE R. 62B-41.002(28)(a) (1996).

201. See *id.* at R. 62B-41.005(17) (1995).

202. See *id.* at R. 62B-41.0055(1). This rule is used as a guideline for local government ordinances for the protection of sea turtles. See Paden E. Woodruff, III, Address at Florida State University College of Law, Ocean and Coastal Law Class (Oct., 1997).

203. See FLA. ADMIN. CODE R. 62B-41.0055(2) (1995).

204. See *id.*

205. See *infra* note 227 and accompanying text.

206. See FLA. ADMIN. CODE R. 62B-41.0055(4) (1995). For information on the Archie Carr National Wildlife Refuge, see *infra* notes 259-63 and accompanying text.

207. FLA. ADMIN. CODE R. 62B-41.0055(5) (1995).

208. See *id.* at R. 62B-41.0055(3). Nesting activity includes "nesting beach selection, emergence of adult marine turtles from marine waters onto the beach, nest site selection, transit to and from the nest site, nest excavation, egg deposition, nest covering, incubation of eggs, hatching, hatchling emergence, orientation and the transit of hatchlings into marine waters." *Id.* at R. 62B-41.002(39).

unless sea turtle protection measures are employed, including "nest surveys, nest relocation, nest marking, modification of coastal construction and measures to reduce sand compaction."²⁰⁹ Also, the applicant must provide DEP with justification to conduct the construction during that time period.²¹⁰ Coastal construction on sovereignty lands other than beach restoration and renourishment and mechanical sand bypassing is prohibited from taking place during the sea turtle nesting season if DEP determines the construction will result in a significant adverse impact or an inconsistency with the provisions of the MTPA.²¹¹

Additional sea turtle protections provided by this chapter include the requirement that construction on sovereignty lands must be sited and designed to minimize any adverse impact on sea turtles.²¹² Permit applicants must provide evidence that deviation from specified DEP design guidelines does not increase potential adverse impacts to sea turtles.²¹³ Permit applications for construction, excavation, or maintenance of a coastal inlet must include an analysis of the expected effect on sea turtles in the inlet area, including the effect of alternative construction and no construction.²¹⁴ Applications for all coastal construction on sovereignty lands must include "[i]nformation required to assess potential impacts to marine turtles, nests and their habitat."²¹⁵ Once the permit is granted, "extreme care" must be exercised during the construction to prevent adverse impacts to sea turtles, nests, and their habitat.²¹⁶

209. *Id.* at R. 62B-41.0055(6)(a).

210. *See id.* at R. 62B-41.0055(6)(b). Such justification includes:

1. Economic, technological, environmental, and public health, safety and welfare factors; or,
2. A determination that the habitat within the area of the coastal construction does not support successful marine turtle nesting activity due to beach profile and substrate characteristics; or,
3. A nest relocation program exists within the area of the coastal construction permitted by [DEP] for marine turtle protection reasons unrelated to the proposed coastal construction

Id.

211. *See id.* at R. 62B-41.0055(7). A significant adverse impact includes a "take" as defined in the MTPA. *See id.* at R. 62B-33.002(23)(b); FLA. STAT. § 370.12(1) (1997).

212. *See* FLA. ADMIN. CODE R. 62B-41.007(1)(a) (1995).

213. *See id.* at R. 62B-41.007(3).

214. *See id.* at R. 62B-41.008(1)(m)8-9 (1996).

215. *Id.* at R. 62B-41.008(1)(o).

216. *Id.* at R. 62B-41.015(1)(b).

B. Permitting Activities Seaward of the CCCL

Chapter 62B-33 of the *Florida Administrative Code*, Rules and Procedure for Coastal Construction and Excavation, implements section 161.053 of the Florida Statutes, which regulates coastal construction seaward of the CCCL.²¹⁷ When DEP considers a permit application under this rule, the agency must assess the effects of the proposed activity on sea turtles, among other things.²¹⁸ With the exception of some emergency protection structures, DEP cannot issue a permit if the agency determines that the activity will result in "a significant adverse impact to marine turtles."²¹⁹

When necessary to protect sea turtles and their habitat, DEP may place conditions on the nature, timing, and sequence of permitted construction seaward of the CCCL.²²⁰ In nesting areas, lighting must be shielded or designed so that it will not disturb sea turtles, and windows and doors visible from nesting areas must use tinted glass or other light control measures.²²¹ If these and other sea turtle protection measures are not taken, DEP will suspend the permitted construction.²²²

Coastal armoring²²³ structures seaward of the CCCL must be sited and designed to minimize adverse impacts on sea turtles.²²⁴ Construction of armoring during the sea turtle nesting season is prohibited if DEP determines that a take will occur pursuant to the MTPA, except in the case of some emergency permitting.²²⁵ Additional coastal armoring is banned on public lands in the Archie Carr National Wildlife Refuge, a refuge established for the protection of sea turtle nesting grounds.²²⁶ However, coastal armoring is permitted on these lands where there is no reasonable alternative and the armoring is "necessary to protect public infrastructure."²²⁷

217. FLA. ADMIN. CODE CH. 62B-33 (1996).

218. See FLA. ADMIN. CODE R. 62B-33.005(3)(a) (1996).

219. *Id.* at R. 62B-33.005(4)(g).

220. See *id.* at R. 62B-33.005(11).

221. See *id.*

222. See *id.*

223. Armoring includes rigid coastal structures such as seawalls, revetments, and bulkheads. See *id.* at R. 62B-33.0051(1)(b).

224. See *id.* at R. 62B-33.0051(3).

225. See *id.* at R. 62B-33.0051(4). The nesting season is March 1 through October 31 for Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties, and May 1 through October 31 for all other counties. See *id.* at R. 62B-33.002(32).

226. See *id.* at R. 62B-41.0055(4) (1995).

227. *Id.* at R. 62B-33.0051(4) (1996). Public infrastructure includes public evacuation routes, emergency facilities, bridges, utilities, hospitals, and structures of governmental significance. See FLA. STAT. § 161.085(7) (1997).

Ordinarily, only DEP can issue emergency permits for certain types of coastal construction when there is a "shoreline emergency" resulting from storm impact.²²⁸ However, when a storm causes erosion "such that existing eligible structures have either become damaged or vulnerable to damage from a subsequent frequent coastal storm," local governments are authorized to construct coastal armoring to protect public infrastructure and private structures.²²⁹ Alternatively, the local government may declare an emergency and issue permits to private property owners to construct armoring to "protect their private structures."²³⁰

These emergency permits must be issued pursuant to the appropriate rules and statutes, and before issuing such a permit, the local government must notify DEP.²³¹ The emergency armoring must be removed within sixty days unless the local government applies for a DEP permit.²³² Also, the armoring must be sited and designed to minimize impacts to sea turtles.²³³ If the installation of the armoring occurs during the sea turtle nesting season, the local government must obtain information on the location of any sea turtle nests in the area and the armoring "shall be sited and constructed in a manner that protects marine turtles."²³⁴ DEP must require removal of armoring that causes a take pursuant to the MTPA.²³⁵

C. Model Lighting Ordinance for Marine Turtle Protection and Local Ordinances

When implementing section 161.163 of the Florida Statutes in 1993, DEP promulgated the MLO.²³⁶ As instructed by the legislature, the agency designated twenty-six coastal counties which are used, or likely to be used, by nesting sea turtles,²³⁷ and developed guidelines for local governments to control beachfront lighting.²³⁸ Rule 62B-

228. FLA. ADMIN. CODE R. 62B-33.014(1) (1997).

229. *Id.* at R. 62B-33.0051(6). In addition to armoring, other measures, including sand bags, reinforcement of foundations, and protective sand berms, can be used. *See id.* at R. 62B-33.0051(6)(d).

230. *Id.* at R. 62B-33.0051(6).

231. *Id.*

232. *See id.* at R. 62B-33.0051(6)(g).

233. *See id.* at R. 62B-33.0051(6)(c).

234. *Id.* at R. 62B-33.0051(6)(k)(2).

235. *See id.* at R. 62B-33.0051(6)(j).

236. FLA. ADMIN. CODE CH. 62B-55 (1995).

237. *See* FLA. ADMIN. CODE R. 62B-55.003 (1995). The designated counties are Bay, Brevard, Broward, Charlotte, Collier, Dade, Duval, Escambia, Flagler, Franklin, Gulf, Indian River, Lee, Manatee, Martin, Monroe, Nassau, Okaloosa, Palm Beach, Pinellas, St. Johns, St. Lucie, Santa Rosa, Sarasota, Volusia, and Walton. *See id.*

238. *See id.* at R. 62B-55.004 - .009.

55.004 encourages local governments to adopt and enforce these minimum guidelines.²³⁹ The guidelines prohibit driving on the beach at night during the nesting season and campfires or bonfires on the beach,²⁴⁰ and suggest model standards for new and existing beachfront lighting.²⁴¹

These model standards include positioning light fixtures so that they are not directly visible from the beach and do not illuminate areas seaward of the frontal dune; mounting fixtures as low as possible and positioning them so that light is cast downward; using recessed or shielded light sources without reflective interior surfaces; using low wattage yellow "bug" type bulbs or low pressure sodium vapor lighting; and using motion detector switches that switch light on for a minimum duration.²⁴² The guidelines also suggest shielding light sources from the beach with ground level barriers or vegetation buffers.²⁴³ Tinted glass, window treatments, and moving lamps away from windows are recommended to shield interior lighting.²⁴⁴

Many counties and cities along Florida's coast have adopted sea turtle lighting ordinances patterned on DEP's MLO. DEP's 1993 survey of Florida sea turtle lighting ordinances showed that twenty-seven cities in fourteen coastal counties have adopted such ordinances.²⁴⁵ Some of the ordinances include protections beyond those recommended in the MLO. Palm Beach County, for example, established a Sea Turtle Protection Zone and requires an approved Sea Turtle Lighting Plan for all new construction and artificial lighting proposed within the zone.²⁴⁶ St. Lucie County's ordinance requires an approved Sea Turtle Protection Plan for all coastal development involving the installation of lighting and all coastal development conducted during the nesting season seaward of the primary dune or at night.²⁴⁷ During the nesting season, St. Lucie County also prohibits turning on exterior light sources directly visible from the beach

239. *See id.* at R. 62B-55.004.

240. *See id.* at R. 62B-55.005.

241. *See id.* at R. 62B-55.006 - .007.

242. *See id.*

243. *See id.* at R. 62B-55.007(2)(h).

244. *See id.* at R. 62B-55.007(3).

245. *See* "Florida Sea Turtle Lighting Ordinances," provided by Dr. Robbin Trindell (on file with author). DEP is currently in the process of compiling an updated list. Telephone Interview with Robbin Trindell, Ph.D., Biological Administrator, Marine Turtle Protection Program, Bureau of Protected Species Management, DEP (Oct. 24, 1997).

246. *See* PALM BEACH COUNTY, FLA., LAND DEVELOPMENT CODE art. 9, § 9.1.G.1 (1996). The county also requires that existing lighting in the zone be brought into compliance with listed standards. *See id.* at § 9.1.H.3.

247. *See* ST. LUCIE COUNTY, FLA., LAND DEVELOPMENT CODE § 6.04.02.E.1 (1996).

or illuminating areas seaward of the primary dune.²⁴⁸ Palm Beach, St. Lucie, and Sarasota Counties require a nighttime site inspection prior to granting a certificate of occupancy to ascertain that all beachfront lighting is in compliance.²⁴⁹

In an innovative step, Lee County is in the process of revising its lighting regulations to avoid the difficulty of quantifying possible lighting violations.²⁵⁰ The county's proposed revision includes the following:

2) A rebuttable presumption that there is a violation . . . exists when:

(1) a shadow is created or cast by artificial lighting directly or indirectly illuminating an opaque object in sea turtle nesting habitat during the nesting season; or

(2) the disorientation or mortality of a nesting sea turtle or . . . hatchling is caused by artificial lighting directly or indirectly illuminating sea turtle nesting habitat during the nesting season.²⁵¹

Some local ordinances protect sea turtles from dangers other than beachfront lighting. For instance, Collier County requires a county permit for construction within 100 feet of a nesting beach during the nesting season,²⁵² and Sarasota County requires written approval from DEP for such construction, as well as coordination of activities with sea turtle monitoring personnel.²⁵³ St. Lucie County's mandatory Sea Turtle Protection Plan must incorporate standards that

248. *See id.* § 6.04.02.K.

249. *See* PALM BEACH COUNTY, FLA., LAND DEVELOPMENT CODE art. 9, § 9.1.H.5.a (1996); ST. LUCIE COUNTY, FLA., LAND DEVELOPMENT CODE, § 6.04.02.I.9.a (1996); SARASOTA COUNTY, FLA., ORDINANCE 97-082, § 5(K) (1997).

250. The county's current ordinance requires the use of a light meter to measure whether an artificial beachfront light is in compliance, but DEP advised the county not to require measurement with a light meter. Telephone Interview with Carol A. Lis, Senior Environmental Planner, Lee County Department of Community Development Division of Planning (Nov. 12, 1997); *see also* WITHERINGTON & MARTIN, *supra* note 8, at 8 (explaining that light meters cannot accurately gauge brightness from a sea turtle's perspective).

251. LEE COUNTY, FLA., ORDINANCE § 14-73(a)(2) (proposed Nov. 7, 1997). Assistant County Attorney Patrick G. White, who is working on the revision, cited difficulty in enforcing the previous ordinance as the main reason for the revision. Telephone Interview with Patrick G. White, Assistant County Attorney, Lee County, Florida, (Nov. 13, 1997). The county wants to establish a quantifiable standard that does not require the hiring of experts to prove a violation. *See id.* By including the rebuttable presumption in the proposed regulations, the burden of proof is shifted to the alleged violator, who must present evidence sufficient to prove there was no violation. *See id.*

252. *See* COLLIER COUNTY, FLA., LAND DEVELOPMENT CODE, § 3.10.7 (1994).

253. *See* SARASOTA COUNTY, FLA., ORDINANCE no. 97-082, § 9 (1997).

minimize impacts on sea turtles for placement of structures and timing of development.²⁵⁴

VI. RESEARCH AND PROTECTED AREAS: ARCHIE CARR CENTER FOR SEA TURTLE RESEARCH AND ARCHIE CARR NATIONAL WILDLIFE REFUGE

In 1986, the Florida Legislature and the University Board of Regents established the Archie Carr Center for Sea Turtle Research at the University of Florida.²⁵⁵ The Center is named for the pioneer of sea turtle research, Archie Carr, who died in 1987.²⁵⁶ The Center conducts research on the biology of sea turtles, and its findings are used to further the international conservation of sea turtles.²⁵⁷ To facilitate sea turtle research around the world, the Center established CTURTLE, a listserv conference network, and the Sea Turtle On-Line Bibliography.²⁵⁸

In 1989, the Archie Carr National Wildlife Refuge was designated to protect sea turtle habitat.²⁵⁹ The refuge consists of over twenty miles of shoreline on Florida's east central coast between Melbourne and Wabasso and attracts more nesting loggerhead turtles than virtually anywhere else on earth, more nesting green turtles than anywhere else in the continental United States, and some nesting leatherback turtles.²⁶⁰ The refuge is being pieced together as funds for land acquisition become available.²⁶¹ The State of Florida purchased the first parcel in 1990 and federal acquisition began in 1991.²⁶² The U.S. Fish and Wildlife Service (USFWS) is in the process of acquiring the remaining undeveloped land in the refuge with the financial assistance of the State of Florida, Brevard and Indian River Counties, and the Mellon Foundation.²⁶³

254. See ST. LUCIE COUNTY, FLA., LAND DEVELOPMENT CODE, § 6.04.02.G-I (1990, rev. 1996).

255. See *Archie Carr Center for Sea Turtle Research* (visited Nov. 1997) <<http://nervm.nerdc.ufl.edu/~accstr/accstr.html>>.

256. See NAT'L GEOGRAPHIC, *supra* note 40, at 94, 112.

257. See *Archie Carr Center for Sea Turtle Research* (visited Nov. 1997) <<http://nervm.nerdc.ufl.edu/~accstr/accstr.html>>.

258. See *id.*

259. See *The Archie Carr National Wildlife Refuge: America's First Sea Turtle Refuge* (visited Nov. 1997) <<http://www.cccturtle.org/carrref.htm>>.

260. See *id.* In 1994, 16,000 loggerhead nests were counted in the refuge, followed by a record 20,000 nests in 1995. In 1994, 1169 green turtles nests were counted, but fewer than 200 were found in 1995. See *id.*

261. See NAT'L GEOGRAPHIC, *supra* note 40, at 94, 112.

262. See *LOGGERHEAD RECOVERY PLAN*, *supra* note 18, at 14.

263. See *The Archie Carr National Wildlife Refuge: America's First Sea Turtle Refuge* (visited Nov. 1997) <<http://www.cccturtle.org/carrref.htm>>. "By mid-1996, over \$60 million had been spent to purchase 4.7 miles of beachfront out of 9.3 miles targeted for acquisition (61% of available targeted land.)" *Id.* Amendments to H.R. 2107, which include a \$2 million appropriation for acquisition of land in the refuge, have passed through committee and may reach the

VII. SUCCESS OF SEA TURTLE PROTECTIONS

The federal government can prosecute for a sea turtle take under the ESA and state agencies can prosecute for a take under Florida's MTPA. DEP can protect sea turtles by imposing conditions on permits or denying permits for coastal construction and erosion control projects. Local governments can enforce local ordinances. Nonetheless, whether these laws are being successfully enforced in Florida is questionable.

A. Federal Laws

1. Violations of the ESA

The federal government holds primary responsibility for enforcing violations of the ESA. USFWS has jurisdiction over sea turtles while they are on land,²⁶⁴ and the ESA authorizes the agency to seek civil penalties²⁶⁵ for violations of the statute. Additionally, USFWS may seek criminal penalties such as fines, imprisonment, revocation of federal licenses and permits, and forfeiture of all equipment used in the taking.²⁶⁶ The ESA also authorizes citizen suits against any person alleged to be in violation of the ESA and against the Secretary of the Interior and USFWS for failure to perform any nondiscretionary duty.²⁶⁷

USFWS does not get involved in violations of state or local statutes unless there is evidence of a take under the ESA. In most situations, after notification of a possible take by USFWS, the problem is corrected and there is no need for a civil or criminal proceeding.²⁶⁸ However, this is not always the case. In 1994, as part of an enforcement initiative to protect sea turtle hatchlings from beach lighting,²⁶⁹ USFWS initiated a civil penalty proceeding against a

House floor this session. See H.R. CONF. REP. NO. 105-337, at 123 (1997), 1997 WL 664422 (Leg. Hist.)

264. See 50 C.F.R. § 17.11 (1997); *id.* § 402.01.

265. See 16 U.S.C. § 1540(a) (1994).

266. See *id.* § 1540(b), (e).

267. See *id.* § 1540(g).

268. Telephone Interview with Sandy MacPherson, Southeast Sea Turtle Recovery Coordinator, USFWS (Nov. 12, 1997). Ms. MacPherson described two recent cases in which USFWS investigated parties for violation of the ESA for beachfront lighting problems. See *id.* In one case, the party fixed the lighting situation immediately. See *id.* In the other case, correction of the lighting problem took several years of negotiation. See *id.*

269. See News Release, U.S. Fish and Wildlife Service, *Deaths of Sea Turtle Hatchlings Due to Beach Lighting Brings Civil Penalty Proceeding Against Florida Condominium Association*, at 1, Sept. 20, 1994 [hereinafter News Release].

Florida condominium association in Melbourne, Florida.²⁷⁰ USFWS alleged three violations of the ESA and proposed a penalty of \$15,000 per violation. The violations resulted from high loggerhead hatchling mortality on three separate nights caused by the condominium association's lighting near a turtle nesting beach.²⁷¹ The case ended with a settlement agreement in which the condominium association agreed to pay a \$15,000 fine and correct the lighting situation.²⁷²

2. Incidental Take Permits

Under the ESA, USFWS can authorize permits for the incidental taking of sea turtles.²⁷³ The permittee is not liable for any taking that falls within the scope of the permit. As a condition for issuance of such a permit, the applicant must develop a habitat conservation plan specifying actions to minimize negative impacts to the sea turtles.²⁷⁴ The plan must also identify funds for mitigation efforts, show that there will be no appreciable reduction in the survival of the species or hindrance of its recovery, and contain assurances that the plan will be fully implemented.²⁷⁵ USFWS recently granted an incidental take permit to Volusia County so that the county could continue to allow driving on its beaches.

Volusia County's fifty miles of beaches²⁷⁶ have served as a roadway for vehicles for over one hundred years²⁷⁷ and have served for much longer as nesting grounds for loggerhead, green, leatherback,

270. See Notice of Violation, *U.S. v. The Breakers Condominiums*, Civil Penalty Proceeding, No. INV 0091 AO, U.S. Department of the Interior, April 18, 1994.

271. See *id.* Prior to the initiation of the proceeding, USFWS warned the association several times that it was violating the Brevard County lighting ordinance and the lighting was likely to result in a take, but the association ignored the warnings. See News Release, *supra* note 269, at 1.

272. See Settlement Agreement, *U.S. v. The Breakers Condominiums*, Civil Penalty Proceeding, No. INV 0091 AO, U.S. Department of the Interior, June 8, 1995. One reason for the settlement may have been the existence of substantial evidence suggesting that when USFWS warned the condominium property manager of the hatchling disorientation, the manager did not inform the Condominium Association Board. However, when the Board received the Notice of Violation, it took immediate corrective action. See *id.* at 1-2.

The penalty money was paid into the Lacey Act Reward Account, used to reward people who provide information about wildlife violations that end in arrest and conviction, forfeiture notices in newspapers, and for payment of records custodians who maintain property seized by law enforcement officers that is being used in the prosecution of cases. See Letter from Sandy MacPherson, USFWS Southeast Sea Turtle Recovery Coordinator, to Karen Moody, Environmental Specialist, DEP (June 30, 1995) (on file with author).

273. See 16 U.S.C. § 1539(a)(1)(B) (1994).

274. See *id.* § 1539(a)(2)(A).

275. See *id.*

276. Of Volusia County's 50.61 miles of coastline, only about 35.61 miles are under the regulatory authority of the county. See *Environmental Assessment*, *supra* note 149, at 1-3.

277. Interview with Rob Walsh, Project Coordinator, Volusia County Department of Environmental Management (Nov. 12, 1997).

hawksbill, and Kemp's ridley sea turtles.²⁷⁸ In 1994, USFWS warned Volusia County that permitting driving on its beaches was a potential taking of sea turtles.²⁷⁹ The county agreed to develop a conservation plan and pursue an incidental take permit from USFWS.²⁸⁰

In 1995, two local citizens, on behalf of the loggerhead and green sea turtle species, filed suit against the county in United States District Court under the ESA citizen suit provision.²⁸¹ The plaintiffs alleged that Volusia County's allowance of beach driving and the county's ineffective beach lighting ordinance violated the ESA.²⁸² The plaintiffs sought a preliminary injunction to prevent driving on the beach during the sea turtle nesting season and to compel the county to enforce Florida's Model Lighting Ordinance for Marine Sea Turtle Protection.²⁸³ The court did not compel the county to enforce a stricter lighting ordinance, but temporarily enjoined the county from permitting driving on the beach at night and from allowing driving and parking in the county-designated "Conservation Zone."²⁸⁴

During the following year, the county worked with USFWS to develop a Habitat Conservation Plan (HCP) in an attempt to procure an incidental take permit.²⁸⁵ After a public notice and comment period, USFWS granted the permit to the county in November of 1996.²⁸⁶ A month later, the judge dismissed the lawsuit. The HCP established three beach areas, each with differing levels of intensity

278. See *Biological Opinion*, *supra* note 4, at 15-18. However, only about 20% of the turtle nesting on the county's beaches occurs on beaches over which the county has jurisdiction; most of the remainder occurs in Canaveral National Seashore and North Peninsula State Recreation Area. See Orientation and Training Certification Program Master Curriculum at 4-5, in Volusia County Habitat Conservation Plan, Nov., 1996.

279. See *Loggerhead Turtle v. County Council*, 896 F. Supp. 1170, 1175-76 (M.D. Fla. 1995).

280. See *Biological Opinion*, *supra* note 4, at 2.

281. See *id.* at 3.

282. See *id.* at 1176.

283. See *Loggerhead*, 896 F. Supp. at 1172.

284. See *id.* at 1182. The "conservation zone" extended thirty feet seaward from the dunes. See *id.* at 1174.

285. See *Biological Opinion*, *supra* note 4, at 4. The county hired two environmental consultants to complete the plan. See *id.* The county also partially prepared an Environmental Assessment which USFWS was required to complete pursuant to the National Environmental Policy Act, 42 U.S.C. § 4332(C) (1998). See *id.*

286. See Federal Fish and Wildlife Permit PRT-811813, Nov. 21, 1996. One of the plaintiffs, Shirley Reynolds, stated she felt USFWS's granting of the permit was "an abandonment of an ecosystem for political reasons," and questioned the short time frame of the permitting process. Krys Fluker, *Fish and Wildlife Gives County Turtle Permit* (visited Nov. 1997) <<http://www.n-jcenter.com/enviro/en1116b.htm>>. The judge postponed the trial twice to allow the county time to negotiate the permit. See *id.* Reynolds described as "cronyism" the county's hiring of an influential Democratic fund-raiser to lobby Washington officials for expedition of the permit process; the lobbyist himself claimed Secretary of the Interior Bruce Babbitt as "a personal friend for 20 years." Carol B. Cole, *Feds to Issue Turtle Permit* (visited Nov. 1997) <<http://www.n-jcenter.com/enviro/en1106b.htm>>.

of use.²⁸⁷ The Natural Beach Areas (18.92 miles) are generally undeveloped and have the highest concentration of sea turtle nests; public driving is not allowed in these areas.²⁸⁸ The Transitional Areas (11.65 miles) are a mixture of dunes and development and nesting is moderate; driving and parking are permitted except in the thirty-foot wide Conservation Zones.²⁸⁹ The Urban Areas are heavily developed and minimally used by sea turtles; driving and parking are permitted except in the fifteen-foot wide Conservation Zones.²⁹⁰

The HCP also banned driving on the beach at night, and required the county to establish a sea turtle monitoring and management program, hire a professional Protected Species Specialist, establish a cooperative effort with USFWS and DEP to develop an ongoing protected species monitoring program, continue a beach management program, including a vehicle rut removal and maintenance program tailored for protection of sea turtles, and develop a county-wide Beach Lighting Management Plan.²⁹¹ The summer of 1997 was the first time the HCP was in force during a sea turtle nesting season, and the county is currently compiling data from its sea turtle monitoring during the season.²⁹² However, one year of data will not necessarily prove whether the plan worked because sea turtle nesting seasons naturally fluctuate from year to year.²⁹³

In July of 1997, the plaintiffs appealed the court's dismissal of the lawsuit and two of the judge's earlier rulings: her refusal to allow the addition of leatherback turtles as complainants and her dismissal of the portion of the suit dealing with lighting impacts on sea turtles.²⁹⁴

287. See Volusia County Beach Habitat Conservation Plan at 7-3, Nov. 1996 [hereinafter HCP].

288. See *id.* at 7-3 to 7-4.

289. See *id.* at 7-3. The Conservation Zone widths are based on sea turtle nesting records and protect the soft sand area in front of the dunes. See *id.* at E-7, 7-4.

290. See *id.* at 7-3. Nests laid outside the Conservation Zone will usually be barricaded and left in place. See *id.* at E-9.

291. See HCP, *supra* note 287, at E-6. The HCP also protects the Southeastern Beach Mouse, Least Tern, and Piping Plover. See *id.* at 4-19 - 4-21. The permit protects the county from liability for sea turtle injuries and deaths caused by beach driving, but not by beachfront lighting.

292. Interview with Rob Walsh, *supra* note 276.

293. Telephone Interview with Dawn Zattau, biologist, U.S. Fish and Wildlife Service (Nov. 12, 1997). Zattau, who worked very closely with the county on the HCP, suggests the HCP made an improvement. *Id.* Nevertheless, DEP received over 45 disorientation reports during the 1997 nesting season (with 341 nests in Volusia County), compared to 28 in 1996 (500 nests). See Staff Report, *Hatchlings Still Emerging and Getting Disoriented* (visited Nov. 1997) <<http://www.n-jcenter.com/97/oct/08/en2.htm>>. The USFWS Southeast Sea Turtle Recovery Coordinator stated that, as expected, in the plan's first year of implementation there have been some problems, but Volusia County has "done pretty well." Interview with Sandy MacPherson, *supra* note 268. USFWS will annually review the HCP and can revoke the permit if the county does not remain in compliance with the HCP. See HCP, *supra* note 287, at 11-2.

294. See Carol B. Cole, *Women File Appeal of Decision on Turtles* (visited Nov. 1997) <<http://www.n-jcenter.com/97/july/12/en712.htm>>.

The 11th Circuit Court of Appeals in Atlanta heard oral arguments in the case in December of 1997.²⁹⁵ In August of 1998, the Court of Appeals entirely reversed the federal district court ruling, remanding the case for further proceedings, including a trial on the artificial beachfront lighting issue.²⁹⁶

B. Florida Laws

1. Penalties for Violation

Several Florida laws provide penalties for harming sea turtles. Section 327.0725, *Florida Statutes*, states that any person who violates the Florida Endangered and Threatened Species Act of 1977 (FETSA) by intentionally killing or wounding an endangered or threatened species or intentionally destroying the eggs or nest of such a species is guilty of a third degree felony.²⁹⁷ The legislature also established the Endangered and Threatened Species Reward Program to reward persons who provide information leading to the arrest and conviction of violators of FETSA.²⁹⁸

A person who violates the Marine Turtle Protection Act (MTPA)²⁹⁹ is minimally punished for a first conviction with imprisonment of not more than sixty days or a fine between \$100 and \$500, or both. A second conviction within one year is punished with imprisonment of not more than six months or a fine between \$250 and \$1,000, or both.³⁰⁰ In addition to these penalties for taking, harvesting, or possessing sea turtles or eggs, the court must assess a fine of \$100 per "unit of marine life or part thereof."³⁰¹ This additional fine appears to dramatically increase the penalty for destruction of a nest, which may contain over 100 turtle eggs. However, in

295. See Carol B. Cole, *Oral Arguments Set for Dec. 11 in Volusia County Turtle Lawsuit Appeal* (visited Nov. 1997) <<http://www.n-jcenter.com/97/nov/13/en1.htm>>.

296. See *Loggerhead Turtle v. County Council*, No. 97-2083, 1998 WL 436547, at *26 (11th Cir. Aug. 3, 1998). The court also found that the district court "abused its discretion" in denying plaintiffs' request to add leatherback turtles as complainants. See *id.* Volusia County requested a rehearing by the appellate court, but the court has not yet ruled on the request. See Staff Report, *County Council Looks to Stave Turtle Costs Through Consultant* (visited Sept. 9, 1998) <<http://www.n-jcenter.com/1998/Sep/4/ENV2.htm>>. The county plans to pursue a new federal incidental take permit to protect the county against liability for turtle deaths caused by artificial beachfront lighting. See *id.*

297. FLA. STAT. § 372.0725 (1997). A third degree felony can be punished with up to five years of imprisonment and a fine of up to \$5,000. See *id.* §§ 775.082 & 775.083 (1997).

298. See *id.* § 372.073 (1997).

299. *Id.* § 370.12(1) (1997).

300. See *id.* § 370.021(2)(a) & (b).

301. See *id.* § 370.021(2)(c)(5)(d)-(h). "Marine life" is defined as "any saltwater fish, saltwater products, or shellfish collected for . . . live specimens." See FLA. ADMIN. CODE R. 62R-5.001(2)(a) (1997).

1991, the Fourth District Court of Appeal held that "unit of marine life" within the meaning of the statute did not include a sea turtle egg and that fining a defendant \$100 per egg violated procedural due process.³⁰² Additional possible penalties include the revocation of licenses and permits and the forfeiture of equipment used in the violation.³⁰³

Florida's Environmental Protection Act of 1971³⁰⁴ enables citizens and local governments to sue a governmental agency to compel it to enforce laws protecting sea turtles, or to sue to enjoin an individual or governmental agency from violating laws protecting sea turtles.³⁰⁵ A citizen or local government can also intervene as a party in certain administrative, licensing, or other proceedings to assert that the activity to be licensed or permitted will harm sea turtles.³⁰⁶ However, what seems to be a desirable citizen suit provision may not be so desirable; the statute also provides that the prevailing party in any such action is entitled to attorney's fees and costs.³⁰⁷ The fear of being required to pay the other side's fees likely is a deterrent to taking advantage of the citizen suit provision.

2. Permitting

The coastal construction permitting process protects sea turtles through prevention of harm. DEP reviews the proposed activity and may withhold a permit until the agency is reasonably certain the activity will not harm sea turtles.³⁰⁸ Under the Marine Turtle Protection Act and the Beach and Shore Preservation Act, all applications for DEP permits for activities that affect nesting sea turtles, hatchlings, or their habitat are subject to conditions for sea turtle protection.³⁰⁹ DEP may condition the nature, timing, and sequence

302. See *Bivens v. Florida*, 586 So. 2d 442, 444-45 (Fla. 4th DCA 1991). When arrested, the defendant was found holding a bag full of 1088 turtle eggs. See *id.* at 443. The lower court fined the defendant \$500, sentenced him to 60 days in jail, and fined him an additional \$108,800 (\$100 per egg). See *id.*

303. See FLA. STAT. § 370.021(2)(c) & (e) (1997).

304. *Id.* § 403.412 (1997).

305. *Id.* § 403.412(2)(a) (1997). The complaining party may be able to obtain a temporary restraining order to prevent "immediate and irreparable harm," but cannot obtain an injunction until the person or entity charged with the violation is given 30 days to "take appropriate action." *Id.* at (2)(c). The Supreme Court of Florida has ruled that a plaintiff need not show a special injury to institute suit under this statute, as required by the traditional rule of standing. See *Florida Wildlife Fed'n v. State Dep't of Envtl. Regulation*, 390 So. 2d 64, 67 (Fla. 1980). However, mere allegation of irreparable injury not sustained by facts is not sufficient to warrant the granting of injunctive relief. See *id.*

306. See FLA. STAT. § 403.412(5) (1997).

307. See *id.* § 403.412(2)(f).

308. See *id.* § 161.053(5)(c).

309. See *id.* § 370.12(1)(e).

of most permitted construction to protect nesting sea turtles and hatchlings.³¹⁰ If, after the permit is granted, the permittee does not comply with the requirements of the permit, the agency may halt the activity, order compliance with the permit, and in some cases revoke the permit or order removal of the structure.³¹¹ In addition to these restrictions, any person who violates the restrictions on construction seaward of the CCCL or on sovereignty lands, or those on erosion control projects, is guilty of a first degree misdemeanor.³¹² Florida Statutes also authorize DEP to impose a fine of up to \$10,000 per day for refusal to comply with or willful violation of these restrictions on coastal construction, or any DEP rule or order regarding such coastal construction.³¹³

3. Enforcement

Florida has extensive laws and regulations protecting sea turtles and their nesting habitat on the state's coastline, and these laws and regulations contain provisions for enforcement and penalties. However laudatory Florida's sea turtle protection policies may be, they are ineffective if the laws are not enforced. Because of the potential of coastal development to destroy sea turtle nesting habitat in Florida, USFWS has stressed the importance of strict enforcement of lighting ordinances and laws regulating coastal construction, beach armoring, and beach nourishment.³¹⁴

Whether Florida is able to provide successful enforcement is another issue. DEP is working to ensure that the sea turtle protection laws are enforced,³¹⁵ but lack of funding and the resulting understaffing substantially impact enforcement efforts.³¹⁶ Funding of

310. *See id.*

311. *See* FLA. ADMIN. CODE R. 62B-41.0151(a) (1996).

312. *See id.* §§ 161.052(8), 161.053(8), & 161.121 (1997). A first degree misdemeanor is punishable with up to one year of imprisonment and a fine of up to \$1,000. *See id.* §§ 775.082 & 775.083 (1997).

313. *See id.* § 161.054(1). Violators are also liable for any damage the violation causes to sovereignty lands or beaches, including animal life thereon. *See id.* § 161.054(2).

314. *See* GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 16, 18, 22. "[DEP] must frequently monitor beaches and maintain strict enforcement when violations are observed." *Id.* at 18.

315. *See* Letter from Dr. Robbin Trindell, *supra* note 61. DEP recently fined a beach cleaner in Palm Beach County for violating the marine turtle protection conditions in his beach cleaning permit. *See id.* DEP's Bureau of Protected Species Management has formed a compliance/enforcement working group in West Palm Beach, an area with a high density of sea turtle nesting beaches, to discuss marine turtle protection requirements. *See id.* The Bureau will also receive funding from USFWS to assess remediation of lighting problems, including assessing compliance with DEP-approved lighting plans. *See id.*

316. *See* Telephone Interview with Bill Wilkinson, Environmental Specialist, Coastal Protection and Engineering, Bureau of Beaches and Coastal Systems, DEP (Nov. 14, 1997); Telephone Interview with Karen Moody, Environmental Specialist, Marine Turtle Protection

environmental protection measures may fluctuate according to the political party currently in power,³¹⁷ or may be a result of Florida's plethora of legal and societal problems, often viewed as more important than environmental issues.³¹⁸ Whatever the cause, one DEP employee suggests that because effective statewide enforcement seems to be economically and logistically impossible, enforcement by local governments and dedicated volunteers is much more feasible.³¹⁹ Local enforcement facilitates the day-to-day monitoring of sea turtle nesting habitat that is necessary for successful management of the sea turtle population.

Political pressures brought to bear on DEP by local communities can create significant problems with coastal construction permitting. Many people wishing to construct or modify structures in well-developed coastal areas, particularly Dade County, where most development occurred prior to the existence of regulation, have a difficult time understanding why they must comply with permit regulations while their neighbors are virtually unregulated.³²⁰ In Dade County, the beach is so well-lit that all sea turtle nests are immediately moved to a protected hatchery.³²¹ In this area, lighting regulations may seem unfair where the lights do not endanger the relocated hatchlings, although there is still a risk of impacting nesting female sea turtles.³²² Areas like the Panhandle, which has only recently started to increase development, offer a chance for better protection of sea turtles because most coastal construction has occurred since the imposition of CCCL regulations.³²³

Difficulties inherent in enforcement of coastal construction permits include discovery of and follow-up on violations. After receiving a permit, the permittee may either neglect to follow the permit during construction or construct according to the permit and then illegally change the structure afterwards.³²⁴ A building can be built to permit specifications, but later minor modifications may not

Program, Bureau of Protected Species Management, DEP (Nov. 17, 1997) (stating that there are not enough enforcement personnel because there is not enough funding).

317. Progress of enforcement can suffer when parties who advocate "less government" are in power. See Telephone Interview with Paden E. Woodruff, III, Environmental Program Administrator, Beach and Coastal Systems Management, Bureau of Beaches and Coastal Systems, DEP (Nov. 12, 1997).

318. See Interview with Dan Evans, *supra* note 149.

319. See Interview with Bill Wilkinson, *supra* note 316.

320. See *id.* Wilkinson described an additional problem with compliance in Dade County: a large number of coastal properties are owned by wealthy European investors who are not accustomed to such regulations governing their investments. See *id.*

321. See *id.*

322. See *id.*

323. See *id.*

324. See *id.*

require a permit and could bring the building out of permit compliance.³²⁵ Unless these violations are reported, DEP cannot always follow up on these matters.³²⁶ Permits are only enforceable for the life of the permit. Permits also expire when the permittee moves.³²⁷ Another problem is that dangers to sea turtles, like artificial lighting or shading of the beach, can be caused by structures such as buildings and parking lots landward of the CCCL, which do not require permits involving turtle protection,³²⁸ or by structures constructed prior to regulation.³²⁹ These structures are not within the enforcement jurisdiction of DEP.

Although beach driving is deleterious to sea turtle nesting habitat and unattractive to some beachgoers, prohibition of the practice in areas where it has been permitted for many years is a difficult and controversial issue. Off-beach parking in these areas usually is inadequate to accommodate beach users, as in Volusia County, where a study concluded that 10,000 additional off-beach parking spaces would be necessary to satisfy peak demand if beach parking were prohibited.³³⁰ Besides the financial difficulty for communities in creating off-beach parking, land use restrictions and residents concerned about property values near parking lots add to the problem.³³¹ Because of the lack of off-beach parking, public beach access would be significantly reduced if beach driving were prohibited, adversely affecting local businesses.³³² Prohibition of beach driving would also have a direct economic effect on beach communities by discontinuing the income from beach access fees, citations and franchise and concession licenses.³³³

Eliminating or minimizing the degradation of nesting habitat caused by erosion control measures is an important goal of sea turtle protection.³³⁴ However, the use of these measures seems likely to continue in the fight against erosion resulting from coastal development.³³⁵ In addition to state protection, federal protection of sea turtles under the ESA is relevant when erosion control projects

325. *See id.*

326. *See id.* (stating that, realistically, DEP officials cannot check all permitted structures at all times and are only able to do spot checks for compliance).

327. *See id.*

328. *See* Interview with Dr. Robbin Trindell, *supra* note 245.

329. *See* Interview with Bill Wilkinson, *supra* note 316.

330. *See Environmental Assessment*, *supra* note 149, § 4.3.3.1, at 4-10.

331. *See* USFWS, *Set of Findings: The County of Volusia Incidental Take Permit* (PRT-811813, USFWS Log. No. 96-535D), Nov. 21, 1996, at 32.

332. *See Environmental Assessment*, *supra* note 149, §§ 4.3.3.1, 4.3.3.4, at 4-10, -11.

333. *See id.* § 3.2.5.4.3, at 3-22.

334. *See* NRC, *supra* note 16, at 14.

335. *See id.* at 121.

involve federal land, federal funding, or a federal permit.³³⁶ In these instances, the ESA requires that such actions of federal agencies do not adversely affect endangered or threatened species or their habitat.³³⁷ Nearly all beach renourishment projects receive federal aid,³³⁸ so USFWS can require the proper timing and quality of renourishment projects that replenish nesting habitats. Unfortunately, the majority of coastal armoring does not involve the federal government.³³⁹

Coastal armoring, especially combined with Florida's new provision allowing local governments to permit so-called "emergency" armoring, is one of the greatest threats to sea turtle nesting habitats.³⁴⁰ In a 1996 biological opinion, USFWS stated that although the emergency armoring provisions are likely to adversely impact sea turtles, it is still too early to ascertain the regulation's cumulative effects.³⁴¹ Detrimental effects may have already occurred. Under the new statute, 2000 feet of armoring was erected with a county permit within the Archie Carr National Wildlife Refuge in 1996.³⁴² Within the proper amount of time, a DEP permit was applied for and DEP granted the permit because the sea wall was landward of a previously existing, though illegally constructed, sea wall and the agency determined the new sea wall was far enough landward that it would not interfere with sea turtle nesting.³⁴³ However, the armored beach in this refuge specifically designated to protect sea turtle habitat will most likely erode faster than it would have without the armoring, causing the nesting area to rapidly decrease.³⁴⁴ The emergency armoring statute can easily be abused by local governments and may

336. See *Biological Opinion*, *supra* note 4, at 31.

337. See 16 U.S.C. § 1536(a)(2) (1994).

338. See NRC, *supra* note 16, at 121.

339. See *id.*

340. See Interview with Karen Moody, *supra* note 316. However, in most situations, structures that would qualify for an emergency permit would likely not be located in suitable nesting habitat, because areas where such structures are necessary are subject to high rates of shoreline migration and inundation. See Letter from Dr. Robbin Trindell, *supra* note 61.

341. See *Biological Opinion*, *supra* note 4, at 31.

342. See Interview with Dan Evans, *supra* note 149; Interview with Karen Moody, *supra* note 316.

343. See Interview with Bill Wilkinson, *supra* note 316; Telephone Interview with Robbin Trindell, Ph.D., Biological Administrator, Marine Turtle Protection Program, Bureau of Protected Species Management, DEP (April 1, 1998). Dan Evans of Sea Turtle Survival League agrees with this assessment. See Interview with Dan Evans, *supra* note 149. This area of Florida's coast continues to be the subject of a struggle between DEP and local governments and property owners over the installation of emergency armoring. See Interview with Dr. Robbin Trindell, *supra*.

344. See Interview with Dan Evans, *supra* note 149. Even without the armoring structures, this is a "hot spot" coastal area, with six-foot regression rates per year. See Interview with Dr. Robbin Trindell, *supra* note 343.

end up seriously damaging sea turtle habitat. Already, Indian River County has permitted armoring structures without declaring an emergency, and although the structures come under the statutory definition of temporary, they are steel, concrete-capped, and appear to be permanent structures.³⁴⁵

Another recent coastal armoring threat to nesting habitat is experimental armoring on Casey Key.³⁴⁶ DEP is authorized to issue permits to property owners or local governments for the installation of certain experimental armoring.³⁴⁷ Ostensibly, DEP will not grant the permit if the project is expected to result in a significant adverse impact, including a take of sea turtles under the MTPA,³⁴⁸ and DEP periodically reviews the project and can order removal or modification of the structure if a take occurs.³⁴⁹ After DEP granted such a permit, in 1995 a forty-foot wide cement "stepped revetment" was installed on a six to seven hundred foot section of beach on Casey Key.³⁵⁰ The structure is essentially a series of large cement steps, some buried under the sand.³⁵¹ Casey Key does not have a large population of nesting sea turtles,³⁵² but DEP has received data that the structure is impacting the sea turtles that do nest there.³⁵³ False crawls occur when the turtles attempt to dig in the shallow sand above the steps, and when nests are laid over the steps, water can pool within them.³⁵⁴ DEP is currently in the process of deciding whether to issue a permit for the installation of a similar structure on Siesta Kay, a very high nesting density beach.³⁵⁵

Because local lighting ordinances provide for local enforcement, they are more successfully enforced than statewide regulations.³⁵⁶ Even with many of these ordinances in force, beachfront lighting continues to be a threat to hatchlings and nesting female sea turtles. Although many citizens voluntarily comply with lighting ordinances once they become aware of the regulations,³⁵⁷ tensions remain

345. See Interview with Karen Moody, *supra* note 316; Interview with Dr. Robbin Trindell, *supra* note 343.

346. See Interview with Karen Moody, *supra* note 316.

347. See FLA. ADMIN. CODE R. 62B-41.0075 (1995).

348. See *id.* R. 62B-41.0075(1)(d).

349. See *id.* R. 62B-41.0075(5)-(7).

350. See Interview with Karen Moody, *supra* note 316. Moody asserts that by the time the property owners pushed the permit request through after a two-year fight, the erosion was already severe. See *id.*

351. See *id.*

352. See Interview with Dan Evans, *supra* note 149.

353. See Interview with Karen Moody, *supra* note 316.

354. See *id.*

355. See *id.*

356. See Interview with Dan Evans, *supra* note 149.

357. See WITHERINGTON & MARTIN, *supra* note 8, at vi.

between sea turtles' need for darkness and the human need for security and traffic safety. Enforcement of these ordinances requires nightly attention during the nesting season, which is not always possible on the part of law enforcement agencies.³⁵⁸ Fortunately, local volunteers often take up this responsibility,³⁵⁹ but even when lighting ordinances are obeyed, hatchling disorientation sometimes results from inland light in highly developed areas.³⁶⁰

Many beachfront lighting problems can be solved through education of the public, especially in areas containing a large number of non-residents who may not be aware of sea turtles' needs. Palm Beach County devised an innovative solution to the beachfront lighting problem by converting violation fines into public education materials.³⁶¹ The county recently imposed fines on two condominium associations for violating the county's lighting ordinance.³⁶² In lieu of taking the money, the county's Department of Environmental Resources Management asked the associations to fund projects related to sea turtle protection or public education.³⁶³ As a result, Sea Turtle Survival League prepared door hangers explaining the dangers of beachfront lighting to nesting sea turtles and hatchlings, and Marine Life Center created dune walkover signs which display sea turtle information and contact phone numbers for additional information.³⁶⁴

Determining whether Florida's laws and law enforcement are helping to save the sea turtle and its nesting habitat is difficult to judge because the laws are relatively new in sea turtle time. Sea turtle longevity (possibly up to 100 years) and length of time before reaching sexual maturity (twenty-five to thirty years) require long-term study to acquire meaningful data.³⁶⁵ Sea turtle breeding habits fluctuate naturally from year to year, so a one, two or even five year study may not yield reliable information as to the status of the population.³⁶⁶ The current sea turtle population is a reflection of their

358. See Interview with Dan Evans, *supra* note 149.

359. See *id.*

360. See WITHERINGTON & MARTIN, *supra* note 8, at 16.

361. See Telephone Interview with Allison King, Environmental Analyst, Palm Beach County Department of Environmental Resources Management (Nov. 19, 1997).

362. See *id.* King admitted that the county only recently began enforcing the lighting ordinance because funds for the purpose just became available. See *id.*

363. See *id.*

364. See *id.*

365. See Interview with Anne Meylan, *supra* note 15; GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 13 ("Because of slow growth rates and subsequent delayed sexual maturity, all monitoring will need to be conducted over a long period of time to establish population trends.")

366. See Interview with Anne Meylan, *supra* note 15.

condition twenty to thirty years ago, a time delay that complicates sea turtle conservation.³⁶⁷ Also, there are so many threats to sea turtle survival, with new ones often being discovered, that pinpointing exactly what is causing a general decline and predicting the future are limited.³⁶⁸ To determine if Florida's laws are having a positive effect on sea turtles will require long-term, systematic research projects, which have only recently been initiated.³⁶⁹

The success of sea turtle conservation efforts depends on the involvement and education of the public.³⁷⁰ Florida's citizens and visitors must be informed of human effects on sea turtles and their habitat as a result of coastal development and public use of nesting beaches.³⁷¹ Especially with artificial beachfront lighting, increasing public awareness of the problem and the means to alleviate the problem is a positive step towards improving Florida's sea turtle nesting habitat.³⁷² Often, people are unaware of the detrimental effects their actions may have on sea turtles and are willing to change their behavior once they become aware.³⁷³ However, education does not result in compliance by everyone, hence the need for legislation and successful enforcement.³⁷⁴

Additional sea turtle conservation efforts include DEP's sale of \$5 sea turtle decals, primarily associated with boat registrations.³⁷⁵ Revenue from the sale of these decals goes to the Marine Resources Conservation Trust Fund, which is used for sea turtle protection, research, and recovery efforts, among other things.³⁷⁶ Governor Lawton Chiles recently signed a law establishing a Florida sea turtle

367. *See id.*

368. *See id.*

369. *See id.* Past research efforts were inconsistent: volunteers at different levels of experience and training documented nests in a variety of methods. *See* Telephone Interview with Andrea Mosier, Environmental Specialist/GIS Coordinator, Florida Marine Research Institute (Nov. 12, 1997). Standardized monitoring procedures and data collection are necessary to recognize trends in the nesting population. *See* GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 27.

370. *See* GREEN TURTLE RECOVERY PLAN, *supra* note 33, at 32.

371. *See id.*; *see also* *Biological Opinion*, *supra* note 4, at 48 (stating that voluntary compliance with ordinances by beachfront property owners is essential to decreasing artificial beachfront lighting).

372. *See* WITHERINGTON & MARTIN, *supra* note 8, at vi.

373. *See id.*; *see also* Telephone Interview with Carol Pratt, USFWS Refuge Ranger at Ding Darling Refuge (Nov. 12, 1997) (stating that most people do not need a law to change their lighting for sea turtles); Interview with Allison King, *supra* note 361 (stating that when a condominium association is informed of its noncompliance with the county lighting ordinance, the association usually will voluntarily come into compliance).

374. *See* WITHERINGTON & MARTIN, *supra* note 8, at vi; Interview with Karen Moody, *supra* note 316.

375. *See* Bureau of Protected Species Management, *Sea Turtle Protection Efforts* (visited Nov. 1997) <<http://www.dep.state.fl.us/psm/webpages/turtle2.htm>>.

376. *See* FLA. STAT. § 327.25 (1997).

license plate, which will provide a secure source of funding for DEP's Marine Turtle Protection Program.³⁷⁷ Organizations such as Caribbean Conservation Corporation, the Working Group, Mote Marine Laboratory, Center for Marine Conservation, Audubon Society, and countless local sea turtle conservation organizations in Florida's coastal communities continue to work towards protection of sea turtles and their habitat. Ecotourism "turtle watch" outings are becoming popular and help educate the public about sea turtle conservation.³⁷⁸ DEP and Florida Marine Research Institute published a Technical Report, *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches*, geared toward biologists, conservationists, and managers, which contains instructions on how to institute local light management legislation.³⁷⁹ Florida Power and Light published a booklet on Florida's sea turtles, funds research and educational projects, and works hard to bring its coastal lights into compliance with local sea turtle lighting ordinances.³⁸⁰

VIII. CONCLUSION

The beautiful coast of Florida so loved by humans is also a sea turtle nesting habitat critical to the survival of the species. With more people moving to Florida every day, the inexorable development of Florida's sandy beaches will continue to put adverse pressure on sea turtle populations. Coastal development negatively impacts sea turtle nesting habitat with beach cleaning, driving, artificial lighting, and other manifestations of increased human presence in the beach area. Also, this increased development requires repeated use of erosion control measures that intensify the threat to nesting habitat.

Federal and state laws, administrative regulations, and local ordinances protect sea turtles and their nesting habitat in Florida. Whether these laws are successfully being enforced is questionable. Lack of funding results in lack of personnel to discover and follow up on violations, and Florida law does not provide an incentive to file citizen suits. Although we cannot know the true effects of these

377. See Velador, *Caribbean Conservation Corporation Newsletter* (visited Nov. 1997) <<http://www.cccturtle.org/velart6.htm>>.

378. See Lutcavage et al., *supra* note 108, at 390-91. But see WITHERINGTON & MARTIN, *supra* note 8, at 4 (stating that "watched" turtle nests may result in abbreviated nest covering and camouflaging on the part of the nesting female).

379. WITHERINGTON & MARTIN, *supra* note 8.

380. See VAN METER, *supra* note 1, at 45-46; Carol B. Cole, *Turtles Face the Light for Life* (visited Nov. 1997) <<http://www.n-jcenter.com/enviro/en922a.htm>>.

laws and their enforcement on the protection of sea turtles until long-term studies are completed, there is evidence that increased public awareness has resulted in at least a higher hatchling survival rate. The survival of sea turtles and protection of their nesting habitat will require the concerted effort of dedicated federal, state, and local government employees, conservation groups, and Florida's citizens. We can only hope that with human cooperation and conscientious management of coastal development, sea turtles will continue to successfully nest on Florida's beautiful shores.

