HABITAT CONSERVATION PLAN

A PLAN FOR THE PROTECTION OF SEA TURTLES AND ANASTASIA ISLAND BEACH MICE ON THE BEACHES OF ST. JOHNS COUNTY, FLORIDA

Prepared for:

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES DIVISION
ENDANGERED SPECIES PERMITS BRANCH
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A PLAN FOR THE PROTECTION OF SEA TURTLES AND ANASTASIA ISLAND BEACH MICE ON THE BEACHES OF ST. JOHNS COUNTY, FLORIDA

Prepared in Support of St. Johns County's Application for an Incidental Take Permit for the Take of Sea Turtles and Anastasia Island Beach Mice Causally Related to Public Vehicular Beach Access and Associated Activities

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August 18, 2003

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Prepared for:
U.S. Fish & Wildlife Service
Prepared by:
St. Johns County Planning Division
Technical assistance provided by:
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EXECUTIVE SUMMARY

Introduction

The take of any federally listed species of plants or animals is prohibited under the Endangered Species Act (ESA) of 1973, as amended, unless specifically authorized through a section 10 Incidental Take Permit (ITP). The ESA defines the term take as an action "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (ESA section 3(18)). Harassment includes the disruption of normal behavioral patterns, like breeding, feeding, and sheltering (50 CFR 222.102). Harming includes habitat modification or degradation (50 CFR 17.3). Thus, both direct and indirect impacts can constitute a take under the ESA.

St. Johns County is applying to the U.S. Fish and Wildlife Service (USFWS) for a 20-year section 10 ITP that will authorize the incidental take of Anastasia Island beach mice (AIBM) and five species of sea turtles causally related to public vehicular beach access initiated under the County's authorization. This Habitat Conservation Plan (HCP) is a mandatory element of the County's ITP application. This HCP outlines programs and policies to allow for limited public beach driving to continue in a manner and extent that is compatible with protected species conservation within the HCP Plan Area.

The HCP Plan Area includes all beaches along St. Johns County between the Duval County Line on the north and the Flagler County Line on the south, except for those beaches fronting Fort Matanzas National Monument (FMNM). The beaches along FMNM are excluded from the HCP Plan Area, and incidental take coverage for public beach driving along FMNM is not requested by St. Johns County. The status of this area will be reevaluated (and the HCP may be amended) when the National Park Service addresses public beach driving in an approved FMNM General Management Plan. The eastern limit of the Plan Area is the Mean Low Water line (MLW) of the Atlantic Ocean, and the western boundary follows the Coastal Construction Control Line (CCCL).

The beaches of St. Johns County are recognized as important habitat for protected species including sea turtles, AIBM, and several species of nesting shorebirds. An average of 277 nests from loggerhead, green, and leatherback turtles are deposited along the County's 42-mile shoreline each year (FWC *unpublished data* 2001a). Additionally, these same beaches support the only known population of the endemic and highly endangered AIBM (USFWS 1993).

Currently, varying levels of beach driving occur along 16.3 miles of the County's shoreline. St. Johns County Ordinance No. 97-34 authorizes beach traffic from the southwestern tip of Porpoise Point to the southern boundary of Guana State Preserve (4.8 miles of which 4.1 miles are restricted to North Beach Vehicular Access Permit holders) and from Ocean Trace Road to Fort Matanzas Ramp (7.2 miles). Additionally, there is 1.6 miles of local resident and Old A1A right-of-way beach driving along Summer Haven south of Matanzas Inlet. St. Augustine Beach Ordinance No. 97-23 authorizes 1.8 miles of beach driving between "A" Street Ramp and Ocean Trace Road. St. Johns County considers the National Park Service to have controlling authority over public beach driving that occurs landward of the Mean High Water (MHW) line on the 0.9 miles of shoreline between Fort Matanzas Ramp and the southwestern tip of Matanzas Point. The Mean High Water (MHW) line along FMNM represents the seaward limit of the National Park Service's jurisdictional (and law enforcement) boundary.

Factors Affecting Sea Turtles and Beach Mice

Vehicular activities on the beach have the potential to directly and indirectly impact adult, hatchling, live stranded, and/or live post-hatchling washback sea turtles, as well as sea turtle nests, all takings prohibited under the ESA. As long as vehicles continue to operate within the HCP Plan Area, there will be a potential for impacting adult sea turtles, their eggs, and/or offspring during the nesting season.

In addition to beach driving, there are a variety of other human impacts to sea turtles on St. Johns County's beaches. These include: public and private beachfront lighting; special events; human presence on the beach at night; destruction of dunes by pedestrian traffic and horseback riding; trash and objects on the beach; coastal development and construction; seawalls, revetments, and other armoring structures; and other types of erosion control measures (e.g., beach nourishment, dune restoration, sand fencing, inlet sand bypassing, and in-water structures, etc.) (NMFS and USFWS 1991a, 1991b, 1992, 1993, USFWS AND NMFS 1992).

Additionally, a variety of other activities affect AIBM along St. Johns County. Such activities include uncontrolled public access, horseback riding, feral and free-roaming cats, coastal development and construction, shoreline protection, artificial lighting, emergency responses to storms and other unusual occurrences, special beach events, stormwater outfalls, contaminants and trash, and other beach management activities (USFWS 1993).

Incidental Take Assessment

The incidental take of sea turtles and AIBM has not been systematically or uniformly documented in St. Johns County. However, historical records demonstrate that both lethal and sublethal incidental take of sea turtles due to vehicles or vehicular activities has occurred along

the County's Atlantic beaches. Since 1991, an estimated 43 post-emergent hatchlings have been run over and killed by vehicles on the beaches of St. Johns County. Additionally, one nest was run over and 15 eggs/embryos were crushed/killed, 3 other nests were run over (with no or unknown damage to eggs/embryos/hatchlings), and an unspecified number of live hatchlings have been trapped in tire ruts.

There were no available documents recording historical cases of direct impacts to AIBM due to beach driving in St. Johns County (i.e., no recorded cases of a vehicle running over a beach mouse). However, the impacts on AIBM from public beach driving are most likely indirect impacts, including degradation of habitat by vehicles trimming dune vegetation, and the use of vehicles to gain public access to remote beaches where human trespassing, garbage, and unrestrained pets might pose problems.

Biological Goal

The over-arching biological goal of the HCP is to provide a net benefit to both sea turtles and AIBM throughout the life of the ITP.

Conservation Strategy: Minimization Measures

The programs and policies contained in the HCP will improve protected species management on the County's beaches relative to practices currently in place. The following minimization measures will be implemented to minimize the potential for impacts to sea turtles and the AIBM causally related to vehicular access to the beach allowed under the County's authorization.

1. ***Reducing public vehicular beach access hours during the sea turtle nesting season.*** From May 1 through October 31, public vehicular access to authorized beaches will begin each day at 8:00 AM. From May 1 through October 31, public vehicular access to authorized beaches will end each day at 8:00 PM, except for the period when the gates will remain open from 8:00 AM on July 4 through 1:00 AM on July 5 at Porpoise Point. Gates on all public driving beaches will remain open on a 24-hour basis from November 1 through April 30.

2. ***Installing and maintaining traffic barricades at beach ramps and other points to regulate vehicular access.*** St. Johns County will monitor and maintain impenetrable gate arms at all authorized public vehicular access points and identify and barricade illegal vehicular access points.

3. ***Monitoring and conspicuous marking of all sea turtle nests in the Plan Area.*** The HCP Coordinator will consult with the Marine Turtle Principal Permit Holders in St. Johns County and the Florida Fish and Wildlife Conservation Commission to develop a standardized Countywide sea turtle monitoring plan.

4. ***Developing a standard protocol to remove vehicle ruts seaward of sea turtle nests during periods when hatchlings are expected to emerge.*** Sea turtle nests expected to emerge will be flagged for rut removal. The County will develop and implement a vehicle rut removal plan along all public driving beaches within the Plan Area.

5. ***Increased and dedicated enforcement of beach driving policies and procedures.*** St. Johns County will increase the physical presence of law enforcement officers on all public driving beaches by either: 1) the addition of 2 Deputy Sheriffs that are specifically trained to enforce beach-related ordinances, or 2) the addition of 4 Beach Rangers that are dual-trained in code enforcement and lifesaving. During the summer season, 1 Beach Ranger will patrol from Vilano Ramp around Porpoise Point, 2 Rangers will patrol from Ocean Trace Road to the A1A Bridge at Matanzas Point, and 1 Ranger will patrol Old A1A at Summer Haven. Incidences of violations on the beaches will be systematically recorded and summarized in reports to USFWS.

6. ***Developing and implementing a public awareness program that includes, but is not limited to, the following features:***

    a. Developing and distributing public awareness materials containing information regarding driving regulations and protected species' issues to beach drivers as they access beaches within the Plan Area;
    b. Developing Public Service Announcements, including "special reports," to be aired on the St. Johns County government television station discussing HCP regulations and protected species;
    c. Designing and conducting periodic public workshops that include the general public but will also focus on the beach community and hotels/motels to discuss HCP issues; and posting phone numbers to report HCP violations and sea turtle emergencies

7. ***Elevating trash receptacles on posts along public driving areas within AIBM habitat (i.e., Anastasia Island, excluding FMNM).*** St. Johns County will elevate all trash receptacles on posts between "A" Street Ramp and Fort Matanzas Ramp to reduce the potential for AIBM and their predators to congregate on the beach.

8. ***Increased enforcement of existing Conservation Zone (CZ) regulations (defined in Ordinance No. 97-34 and an expansion in the width of the CZ in one region to protect and enhance AIBM and nesting bird habitats.*** St. Johns County will mark and enforce the 15-foot wide CZ on all unincorporated public driving beaches in the Plan Area and a 30-foot wide CZ north of St. Augustine Inlet around Porpoise Point.

9. ***Developing and instituting a training program that must be attended by drivers wishing to obtain a four-wheel drive permit for driving north of Vilano Ramp.*** North Beach Vehicular Access Permits will be granted to qualified drivers on a quarterly cycle each year. The HCP Coordinator will design and conduct a training program for these drivers and training must be completed prior to issuance of a permit. Recurrent training will occur minimally at least once each year.

10. ***Reducing public beach driving along Summer Haven.*** The County will install a locked gate arm just south of the Summer Haven revetment and keys will be provided to local residents only. The County will post signs indicating that the general public has no rights of access on the upland road landward of the primary dune line. Additionally, the County will stabilized the existing roadbed landward of the restored dune with a mix of coquina shell and sand.

Conservation Strategy: Mitigation Measures

In addition to the minimization measures described above, the County will mitigate unavoidable take that might occur as the result of County-authorized beach driving through the following programs.

1. ***Develop a proactive Beach Lighting Management Program and align the City of St. Augustine Beach's lighting regulations and the County's lighting regulations.*** The City of St. Augustine Beach will amend their Ordinance 96-13 in order to unify their lighting regulations with those of St. Johns County (Ordinance 97-34). St. Johns County will hire a Beach Lighting Officer and assume all monitoring and enforcement responsibilities on both City and County beaches.

2. ***Developing and instituting a beach horseback riding registration and education program.*** Horseback riding will be restricted to the beach seaward of the most recent high-tide line year-round between sunrise and sunset. Beach horseback riders will receive registration cards, protected species training, and record their activity on logs at kiosks by the beach.

3. ***Restrict Porpoise Point vehicular access to allow re-establishment of natural dune features.*** St. Johns County will establish a single, marked driving lane from Vilano Ramp to the southwestern tip of Porpoise Point and a single, marked traffic corridor from Porpoise Point Ramp to this driving lane. St. Johns County will monitor and maintain barricades and signage at entrances to previous interdunal driving lanes.

4. ***Restoring the primary dune along Summer Haven.*** St. Johns County will construct 8,000 linear feet of sand berm (clean fill). This restored dune line will naturally block unauthorized vehicular access routes to the beach proper and serve to minimize vehicles on the beach, reduce light trespass on the beach, and enhance the beach/dune habitat for nesting sea turtles and least terns.

Monitoring

The County will oversee a uniform and consistent sea turtle monitoring program that will help collect the data needed to better quantify current natural and human-related impacts to sea turtles on the County's beaches. This information will be used to direct the County's limited resources toward those programs that are likely to have the greatest conservation value.

Funding

HCP programs and policies will be funded in one-third proportions from the following funding sources: Category III Tourist Development Tax, the General Fund, and Beach Toll Revenue. The St. Johns County Division of Beach Management estimates that total first-year expenses for implementation of the HCP will range between $251,077 and $397,290. Total estimated expenses during subsequent years will range between $208,627 and $370,740.

Administration of the HCP and ITP

Upon implementation of the HCP, the Division of Beach Habitat Conservation will be created under the Division of Beach Management. The Department of Beach Habitat Conservation will contain at least two new positions, the HCP Coordinator and the Beach Lighting Officer. The purpose of the HCP Coordinator is to provide professional leadership to all aspects of sea turtle and beach mouse management on the County's beaches. The HCP Coordinator will administer the ITP and coordinate sea turtle monitoring activities and related conservation programs in the County. The HCP Coordinator will be supervised by the Supervisor of Beach Management.

Under this HCP, implementation and enforcement of St. Johns County's Beach Lighting Code on the unincorporated beaches of St. Johns County will be managed and coordinated by the Beach Lighting Officer. For Countywide consistency and thoroughness, the Beach Lighting Officer will also assume the responsibilities for implementation and enforcement of the City of St. Augustine Beach's Beach Lighting Code within municipal boundaries upon unification of City and County regulations. The Beach Lighting Officer will be supervised by the HCP Coordinator.

The St. Johns County Division of Beach Management, under the management of the Supervisor of Beach Management, will provide logistical and administrative support for implementation of the HCP. The Supervisor of Beach Management will be responsible for filling the positions of HCP Coordinator and Beach Lighting Officer and for allocating sufficient material and fiscal resources to ensure that these individuals are able to effectively fulfill their responsibilities under the HCP.

Enforcement of the HCP

To provide enhanced enforcement of the St. Johns County Beach Code and HCP programs and policies, the HCP presents two alternatives:

1. Addition of two Deputy Sheriffs; or
2. Addition of four Beach Rangers.

Data will be collected and maintained to document the County's efforts to enforce provisions of the HCP and ITP. This enhanced record-keeping will document all violations of the beach driving rules and regulations.

Compliance Monitoring and Reporting

The County will submit annual reports to the USFWS to review HCP performance and discuss the County's monitoring programs during the first three years that the ITP is in effect and periodically thereafter. Formal revisions to the HCP will occur once every five years after a joint review by the County and USFWS. The HCP is intended to be a dynamic document and have the capacity to respond to changed and unforeseen circumstances. Adjustments to monitoring, minimization, and mitigation programs will be made, as needed, to ensure that the biological goals of the HCP are achieved.

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LIST OF ABBREVIATIONS

AIBM	Anastasia Island beach mouse
ASP	Anastasia State Park
ATM	Applied Technology Management
ATV	All Terrain Vehicle
BEBR	Bureau of Economic Business Research
CCCL	Coastal Construction Control Line
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CZ	Conservation Zone
DACS	Department of Agriculture and Consumer Services
DNA	Deoxyribonucleic acid
DOR	State of Florida Department of Revenue
EA	Environmental Assessment
EAI	Ecological Associates, Inc.
EDC	Economic Development Council
EIS	Environmental Impact Statement
ESA	Endangered Species Act
F	Fahrenheit
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
FDEP	Florida Department of Environmental Protection
FDOR	Florida Department of Revenue
FGDL	Florida Geographic Data Library
FMNM	Fort Matanzas National Monument
FNAI	Florida Natural Areas Inventory
FRED	Florida Research & Economic Database
FS	Florida Statutes
FWC	Florida Fish and Wildlife Conservation Commission
GPS	Global Positioning System
GRMAP	Guana River Marsh Aquatic Preserve
GRSP	Guana River State Park
HCP	Habitat Conservation Plan
HOI	Hatchling Orientation Index
ITP	Incidental Take Permit
IUCN	International Union for the Conservation of Nature (World Conservation Union)
LPDC	Louisiana Population Data Center
MHW	Mean High Water
MLW	Mean Low Water
NMFS	National Marine Fisheries Service
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPS	National Park Service
NRC	National Research Council
PPH	Principal Permit Holder

PSA	Public Service Assistant
PVA	Population Viability Analysis
SJCPAO	St. Johns County Property Appraiser's Office
SSC	Species of Special Concern
TDC	St. Johns County Tourist Development Council
TEWG	Turtle Expert Working Group
USACE	United States Army Corps of Engineers
USDC	United States District Court
USFWS	United States Fish and Wildlife Service

Chapter 1. INTRODUCTION AND BACKGROUND

1.1. GENERAL OVERVIEW

The County of St. Johns, Florida, has applied to the U.S. Fish and Wildlife Service (USFWS) for an Incidental Take Permit (ITP) pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973 (ESA or the Act), as amended. If issued, the ITP will authorize the incidental take of federally listed sea turtles and Anastasia Island beach mice (AIBM) on selected Atlantic coast beaches of St. Johns County (hereafter referred to as the County) causally related to vehicular driving and associated activities. This Habitat Conservation Plan (HCP or Plan) has been developed in support of the County's ITP application.

1.2. REGULATORY AND LEGAL FRAMEWORK FOR PLAN

The ESA (Public Law 93-205) went into force on December 28, 1973 and is considered by some as the United States' strongest legal tool for conserving biodiversity (Rohlf 1991). The stated purposes of this Act are "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species…" (ESA section 2(b)). The ESA seeks to protect both listed species and the habitats upon which they depend.

Section 9 of the ESA prohibits any person subject to the jurisdiction of the United States to "take" endangered or threatened species (fish or wildlife listed in section 9(a)(1), and plants listed in section 9(a)(2)). The Act defines the term "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (ESA section 3(18)). Under Title 50 Code of Federal Regulations (CFR), *harm* is defined as "an act which actually kills or injures fish or wildlife. Such an act might include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering" (50 CFR Part 222.102, Federal Register Vol. 64, No. 215, November 8, 1999). "Harassment" is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3). Thus, both direct and indirect impacts, such as modification of habitat, constitute take under the ESA.

The 1982 Amendments to the ESA allow for the "incidental take" of endangered and threatened species of wildlife by non-Federal entities (ESA as amended, 16 USC 1513-1543). The term "incidental take" is defined in section 10 of the ESA as "any taking otherwise prohibited by section 9(a)(1)(B) if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" (section 10(a)(1)(B)). In order to apply for an ITP, the ESA requires that the applicant submit a "conservation plan" as an accompanying document. This Habitat Conservation Plan fulfills that requirement and supports St. Johns County's application for an ITP.

1.3. PLAN AREA

1.3.1. Geographical Setting

St. Johns County is located on the northeast coast of Florida, approximately midway between Cape Canaveral and the Florida-Georgia State Line. It is bounded on the north by Duval County and on the south by Flagler County (Figure 1-1). The County's coastline is comprised of a series of three barrier islands. Separated from the mainland only by the Intracoastal Waterway, the northern barrier island stretches approximately 52 km (32 mi) from the St. Johns River (north of Jacksonville in Duval County) to the St. Augustine Inlet. This northern barrier island stretches for 38.9 km (24.0 mi) in St. Johns County. The middle barrier island, Anastasia Island, is completely contained within St. Johns County and extends about 24.8 km (15.4 mi) from the St. Augustine Inlet south to the Matanzas Inlet. The southernmost barrier island stretches about 81 km (50 mi) from Matanzas Inlet south to Ponce de Leon Inlet in Volusia County, and only 4.1 km (2.6 mi) of this island falls within St. Johns County.

A vast majority of St. Johns County's coastline consists of sandy beaches, with the exception of two inlets and two major regions of oceanfront armoring. For about 5,050 ft along St. Augustine Beach and 2,300 feet along Summer Haven, the ocean tides regularly meet a rock revetment.

From the north to south, constituent municipalities fronting the County's beaches include the City of St. Augustine, the City of St. Augustine Beach, and the northern section of the Town of Marineland (Figure 1-1). Unincorporated areas include Ponte Vedra Beach, Vilano Beach, and Crescent Beach. Large portions of the oceanfront are publicly held lands within Guana River State Park (GRSP) and Anastasia State Park (ASP), both managed by the State government. Another smaller portion of oceanfront public lands is managed by the Federal government at Fort Matanzas National Monument (FMNM).

1.3.2. Boundaries of the Plan Area

The *Plan Area* represents the area for which incidental take has been requested under the ITP (Figures 1-2a and 1-2b). The beaches herein described are included in the boundaries of the Plan Area only for the limited purpose of obtaining an Incidental Take Permit. The Plan Area consists of approximately 2,400 acres of oceanfront land and includes 41.1 miles of beaches along the 42.0-mile coastline in the County (Table 1-1). This includes the beaches in GRSP, ASP, and the beaches within the municipalities of St. Augustine, St. Augustine Beach, and Marineland. Even though the County does not exercise regulatory authority in the State parks nor municipalities, these areas are included in the Plan Area, because the County performs beach services and operates safety and/or emergency vehicles in these zones. Through such activities, the County might impact protected species that occur there.

Within the Plan Area, the* County Beaches *include those beaches over which St. Johns County exercises sole beach management and regulatory authority. The* County Beaches *include all beaches, except those managed by the State and Federal parks and the City of St. Augustine, City of St. Augustine Beach, and the Town of Marineland. County Beaches

consist of 28.6mi of sandy beaches encompassing about 1,440 acres (Table 1-1). 1.3.2.1. North-South Boundaries

The Plan Area is bounded on the north by the St. Johns/Duval County Line and stretches south to the northern border of FMNM (the side north of Fort Matanzas Ramp) The southern section of the Plan Area extends from the south side of Matanzas Inlet to the St. Johns/Flagler County Line (Figures 1-2a and 1-2b).

1.3.2.2. East-West Boundaries

The eastern limit of the Plan Area is the Mean Low Water (MLW) line of the Atlantic Ocean (Figures 1-2a and 1-2b). Even though State jurisdiction officially begins at the Mean High Water (MHW) line and stretches seaward to 3 mi offshore, the area landward of the MLW line functionally defines that portion of the beach where driving might occur.

The western boundary of the Plan Area follows the Coastal Construction Control Line (CCCL) (Figures 1-2a and 1-2b), as defined in the Florida Beach and Shore Preservation Act of 1998, pursuant to Part I of Chapter 161, Florida Statutes. The CCCL "defines the portion of the beach and dune system subject to severe fluctuations based on a 100-year storm event and establishes the landward limit of jurisdiction of the Florida Department of Environmental Protection (FDEP) along sandy beaches of the State which front on the Gulf of Mexico, Atlantic Ocean, and the Straits of Florida" (FDEP 2001). FDEP uses the following process to establish the control line: "Historical weather data, including past hurricanes, which have impacted the area under study, tide cycles, offshore bathymetry, erosion trends, upland topography, and existing vegetation and structures are evaluated using appropriate engineering predictive models and scientific principles to determine the upland limits of a one-hundred-year coastal storm" (FDEP 2001).

1.4. SPECIES TO BE COVERED BY PERMIT

Sea turtles and AIBM, federally protected species, might be impacted by public vehicular access to the beach. Although several species of federally listed birds, such as the bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), and wood stork (*Mycteria americana*) occasionally utilize the Plan Area for foraging and/or loafing, no impacts are expected and therefore incidental take is not requested. The same situation exists for the eastern indigo snake (*Dymarchon corais couperi*). Small numbers of eastern indigo snakes have been occasionally sighted within or near the Plan Area. Incidental take of eastern indigo snakes due to impacts from County-authorized beach driving is not expected; therefore incidental take is not requested.

Accordingly, incidental take is requested for the following species:

- loggerhead turtle (*Caretta caretta*),
- green turtle (*Chelonia mydas*),
- leatherback turtle (*Dermochelys coriacea*),
- hawksbill turtle (*Eretmochelys imbricata*),
- Kemp's ridley turtle (*Lepidochelys kempii*), and

- Anastasia Island beach mouse (*Peromyscus polionotus phasma*).

1.5. COUNTY AUTHORITY FOR MANAGING LOCAL BEACHES

The general powers of authority to regulate the beaches and shores of St. Johns County falls upon the Board of County Commissioners, as outlined in the Beach and Shore Preservation Act of 1998, section 161.36, Florida Statutes. The following regulations and codes detail the specifics of coastal management in the County:

- The St. Johns County Comprehensive Plan, Conservation/Coastal Management Element, as adopted May 10, 2000 (sets goals and policies for coastal management),
- St. Johns County Land Development Code Article 4 (June 12, 2001), section 4.01.08: Environmentally Sensitive Area, Threatened or Endangered Species and Species of Special Concern (protection of marine turtles),
- St. Johns County Code (Ordinance No. 98-70):
- Chapter 4. Animals and Fowl. (leash laws for cats and dogs),
- Chapter 5. Beaches. Article II. Beach Code. (Ordinance 97-34; outlines policies and procedures for beach activities),
- St. Johns County Ordinance 96-48 (defines a Conservation Zone and prohibits night driving during the sea turtle nesting season except for a period of non-enforcement on the night of July 4-5),
- St. Johns County Ordinance 99-33 (beach lighting code),
- St. Johns County Ordinance 2001-5 (restrictions on horseback riding),
- Special Use Permit Number 5260-9500-009 granted to St. Johns County by the U.S. Department of the Interior, National Park Service, Castillo de San Marcos and Fort Matanzas National Monuments (to place County tollbooth at Matanzas Ramp), and
- Interlocal Agreements between St. Johns County and the City of St. Augustine Beach (regulation of beach traffic, road maintenance, and beach pass revenues).

1.6. CONFLICTS BETWEEN TRADITIONAL BEACH USES AND PROTECTED SPECIES CONSERVATION

1.6.1. Beach Driving and Protected Species

St. Johns County's beaches are utilized by a number of State- and federally protected species, the most conspicuous of which are sea turtles. Each year between May and September, several species of threatened or endangered sea turtles come ashore on local beaches and collectively deposit several hundred nests.

Vehicular activities on the beach have the potential to impact adult, hatchling, live stranded, and/or live post-hatchling washback sea turtles, as well as sea turtle nests, a taking prohibited under the Act. As long as vehicles continue to operate within the Plan Area, there will be a potential for impacting adult sea turtles, their eggs, and/or offspring during the nesting season. The nesting season, the inclusive period during which adult turtles are coming ashore to nest and hatchling sea turtles are emerging from their nests to enter the sea, is established by the Florida Fish and Wildlife Conservation Commission (FWC) and is based on long-term Statewide data. FWC defines the nesting season in St. Johns County as May 1 through October 31. Likewise, St.

Johns County Ordinance No. 97-34 section 7.03 defines the nesting season of sea turtles as May 1 through October 31. The beachfront municipality of St. Augustine Beach identifies the nesting season as the period from June 1 through September 30 of each year (St. Augustine Beach Code of Ordinances Chapter 5, Article I, section 5-15).

1.6.1.1. Historical Perspective on Beach Driving in St. Johns County

Historically, public beach driving occurred along the entire coastline of St. Johns County. "In the past, homemade motor vehicles called 'skeeters' were built with a lightweight chassis and over-sized wheels. They were used for driving on both the hard and soft areas of the beaches, as well as illegally in the dunes" (State of Florida Division of Administrative Hearings 1993).

The following is a timeline that describes the evolution of jurisdiction over vehicular traffic and the chronological changes regarding public beach driving on the Atlantic Ocean beaches of St. Johns County.

1941. "In 1941, the Florida Legislature declared the Atlantic Ocean beach within St. Johns County seaward of the mean high water line to be a public highway under the jurisdiction and control of St. Johns County, subject to the right of the public to use the beach for bathing and recreation. Chapter 21543, Laws of Florida (1941)" (Florida Division of Administrative Hearings 1993).

1949. "In 1949, the Legislature limited the County's jurisdiction by prohibiting the operation of motor vehicles on the northerly two and a half miles of the beach referred to in Chapter 21543, Laws of Florida (1941). Chapter 26196, Laws of Florida (1949)" (Florida Division of Administrative Hearings 1993).

1961. "In 1961, the Legislature further limited the County's jurisdiction by prohibiting the operation of motor vehicles on the southerly four miles of the northerly six and a half miles of the beaches referred to in Chapter 21543, Laws of Florida (1941). Chapter 61-2744, Laws of Florida (1961)" (Florida Division of Administrative Hearings 1993). This extended the beach driving prohibition to just south of the current Mickler's Landing Beach Access in Ponte Vedra Beach.

1965. "In 1965, the Legislature specified that the County only had jurisdiction to "supervise, regulate, prohibit, and permit the operation of" motor vehicles on the beaches within the county limits over which the county had jurisdiction. Chapter 65-2178, Laws of Florida (1965)" (Florida Division of Administrative Hearings 1993).

"These earlier special acts dealing with vehicular traffic on the coastal beaches of St. Johns County must be read in *pari materia* with more recent legislative pronouncements on the same subject. Specifically, more recent legislative acts addressing the entire subject, only some of which was addressed in earlier enactments, take precedence over the older legislation. See Alvarez v. Board of Trustees of the City Pension Fund for Fire Fighters and Police Officers in the City of Tampa, 580 S. 2d 151 (Fla. 1991). It is assumed that the more recent laws were

enacted with full knowledge of the older ones. Oldham v. Rooks, 361 So. 2d 140 (Fla. 1978)" (Florida Division of Administrative Hearings 1993).

1982. The National Park Service (NPS) developed a draft General Management Plan for Fort Matanzas National Monument (NPS 1982). This draft Plan acknowledged that driving was occurring on the beach fronting the Park. The NPS has arranged for continued public vehicular access to the beaches through a NPS Special Use Permit No. 5260-9500-009 that is valid from March 1, 2001 until February 28, 2006. This permit, which was granted to the County, specifically authorized, "parking a mobile beach toll booth and collecting beach parking tolls". The permit also authorized the, "installation of a portable toilet in the same vicinity".

1984. Land acquisitions for Guana River State Park began in 1984 (FDEP 1999).

1985. "In 1985, the Legislature enacted the Coastal Zone Protection Act, which recognized the importance of beach ecology and the need to control and manage beaches in order to preserve their unique features. See Sections 161.52-161.58, Fla. Stat. (1991)" (Florida Division of Administrative Hearings 1993).

1985. "Also in 1985, the Legislature designated the Guana River Marsh Aquatic Preserve for inclusion in the Florida Aquatic Preserve Act of 1975. Section 258.394, Fla. Stat. (1991)." "The FDEP's Division of Recreation and Parks (DRP) is a state agency charged with the responsibility of managing Florida's state parks under Chapter 258, Fla. Stat. (1991), and the rules promulgated under that law" (Florida Division of Administrative Hearings 1993).

1988. Guana River State Park was leased to the State of Florida, Department of Natural Resources, Division of Recreation and Parks (DRP) (Florida Division of Administrative Hearings 1993).

1990. The management plan for Guana River State Park was approved by the Board of Trustees of the Internal Improvement Trust Fund on August 14, 1990. This management plan prohibited beach driving through the contiguous 4.2-mile stretch of Guana River State Park (based on F.A.C. Rule 16D-2.002(4)-(5)). Because there were no vehicular access ramps north of the park, this effectively prohibited beach driving in the area (about 2 miles) from the northern boundary of Guana River State Park to the boundary in Ponte Vedra Beach established by Chapter 61-2744, Laws of Florida (1961).

1991. "Section 161.58(1), Fla. Stat. (1991), prohibits 'vehicular traffic…on the dunes or native stabilizing vegetation of the dune system of coastal beaches,' except that which is necessary for cleanup, repair, or public safety, 'and except for traffic upon authorized local or state dune crossovers.' Section 161.58(2), Fla. Stat. (1991), provides:

> Vehicular traffic, except that which is 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, is prohibited on coastal beaches except where a local

> government with jurisdiction over a coastal beach or portions of a coastal beach has:
>
> (a) Authorized such traffic, by at least a three-fifths vote of its governing body, on all or portions of the beaches under its jurisdiction prior to the effective date of this act; and
> (b) Determined, by October 1, 1989, in accordance with the rules of the department, that less than 50 percent of the peak user demand for off-beach parking is available. However, the requirements and department rulemaking authority provided in this paragraph shall not apply to counties that have adopted, prior to January 1, 1988, unified countywide beach regulations pursuant to a county home rule charter" (Florida Division of Administrative Hearings 1993).

St. Johns County proved compliance with the terms of above paragraphs (a) and (b) of Section 161.58(2) of Florida Statutes (1991) (Florida Division of Administrative Hearings 1993).

1991. Guana River Marsh Aquatic Preserve Management Plan was approved by the Board of Trustees of the Internal Improvement Trust Fund on December 17, 1991 (Florida Division of Administrative Hearings 1993). This management plan prohibited the driving of motorized vehicles on the Atlantic Ocean beaches within the Preserve (however, this policy was not enforced until 1993).

1993. "The DRP was reassigned to the new Department of Environmental Protection in 1993. Chapter 93-213, Laws of Florida (1993)" (Florida Division of Administrative Hearings 1993).

Jun 1993. FDEP announced that they would no longer permit the driving of motor vehicles on the Atlantic Ocean beaches within Guana River Marsh Aquatic Preserve. On June 11, 1993, the DEP's DRP sent a letter to the St. Johns County Commission requesting that the County "assist the Department in protecting these valuable natural resources by helping get the word out that driving will no longer be allowed within this area" (based on the Guana River Marsh Aquatic Preserve Management Plan of 1991) (Patchett *unpublished letter* 1993).

Jul 1993. On July 8, 1993, St. Johns County began challenging the FDEP's decision to prohibit vehicular access within Guana River Marsh Aquatic Preserve (Florida Division of Administrative Hearings 1993).

Aug 1993. "On or about August 18, 1993, the DEP agreed not to enforce the beach driving prohibition in the [Guana River Marsh Aquatic] Preserve" until the court cases were resolved (Florida Division of Administrative Hearings 1993).

Nov 1993. On November 30, 1993, the Agency Final Order from the Hearing Officer upheld FDEP's decision to ban public vehicular access to the beaches within Guana River Marsh Aquatic Preserve (Florida Division of Administrative Hearings 1993).

1997. On June 24, 1997, the St. Johns County Board of County Commissioners passed Ordinance No. 97-34 outlining that beach traffic was restricted to: "(1) A single lane of southbound traffic and a single lane of northbound traffic between the southwestern tip of Porpoise Point to the southern boundary of Guana State Preserve; (2) A single lane of southbound traffic from Ocean Trace Road to Crescent Beach Ramp; (3) A single lane of southbound traffic and a single lane of northbound traffic between the Crescent Beach Ramp and the Fort Matanzas Ramp." This ordinance only applies to the unincorporated areas of the County and did not address beach driving within the State parks, Federal park, or municipalities (at this time, public beach driving was occurring along Anastasia State Park, Fort Matanzas National Monument, and the City of St. Augustine Beach).

"When construing a statute, the mention of one thing in the statute implies the exclusion of things not mentioned. *(Expressio unius est exclusion alterius.)* Thayer v. State, 335 So. 2d 815 (Fla. 1976); Devin v. City of Hollywood, 351 So. 2d 1022 (Fla. 1976)." (Florida Division of Administrative Hearings 1993). Applying this rule, it can be concluded that the explicit authorization of beach driving in the unincorporated areas between (1) the southwestern tip of Porpoise Point to the southern boundary of Guana State Preserve, (2) Ocean Trace Road to Crescent Beach Ramp, and (3) Crescent Beach Ramp to the Fort Matanzas Ramp (Ordinance 97-34) was intended to prohibit public beach driving in all other unincorporated areas.

1997. The St. Augustine Beach Board of City Commissioners passed Ordinance No. 97-23, which states, "Sec. 5-7(a). It is unlawful for any person to operate a motor vehicle upon any portion of the beach bordering the Atlantic Ocean between the north right-of-way line of the 'A' Street ramp extended easterly to the Atlantic Ocean and the northerly limit of the city [the southern boundary of Anastasia State Park]. Vehicular traffic is authorized on the coastal beach with the exception of the portion of the coastal beach lying to the north of the 'A' Street ramp."

1999. In August 1999, FDEP discontinued public driving within the boundaries of Anastasia State Park in response to human safety and environmental concerns.

1999. After Hurricane Floyd, the St. Johns County Division of Beach Management temporarily closed the Surfside Beach Ramp (this ramp has remained closed through 2002) (Williams *pers. comm.* 2002).

2000. On May 15, 2000, the St. Johns County Board of County Commissioners reduced public vehicular access to the beaches between the southern boundary of Guana River Marsh Aquatic Preserve and the north side of Vilano Beach Ramp. In this area, beach driving has since been authorized only to those citizens with an appropriate four-wheel drive vehicle and a special North Beach Vehicular Access Permit.

2000. Due to erosion, St. Augustine Beach and St. Johns County have cooperatively (and temporarily) prohibited vehicular beach access through the "A" Street Ramp in St. Augustine Beach.

Before the HCP, two major sections of beach driving existed in St. Johns County (addressed in detail in section 2.4.3. of this HCP). Public beach driving was occurring along the section of beach from the southern boundary of Guana River Marsh Aquatic Preserve around to the southwestern tip of Porpoise Point at St. Augustine Inlet. Additionally, the general public could drive on the beach between "A" Street Ramp and Matanzas Beach access ramp.

1.6.1.2. Need for Continued Vehicular Access to the Beach

The Conservation/Coastal Management Element of the St. Johns County Comprehensive Plan (section E.1., as adopted on May 10, 2000 by Ordinance No. 2000-34) charges the County to "manage, use, conserve, protect, and enhance coastal resources, along with protecting human life from natural disasters." The County's Comprehensive Plan also mandates that "the County will maintain, improve, and increase public beach and waterway access through acquisition and other land use controls. At least one existing and/or new public beach and waterways access ways shall be improved and/or created per year beginning with the adoption of this plan amendment (Objective E.1.1 Public Beach Access)." Additionally, section 7.1.1.4. of the 2015 Comprehensive Plan Amendment (May 10, 2000) dictates that, "The County shall not vacate existing easements, walkways, and other access points to beaches, and waterways without equivalent or greater mitigation."

One of the requisite elements for ensuring public access to the beach is accommodation for parking. Historically, beach users traveling to County Beaches by car simply parked on the beach. Insofar as the beach remains accessible to vehicles, there has been adequate parking, even during the busiest holiday periods (Williams *pers. comm*. 2001). Because of this traditional and lawful activity, few accommodations have been made for off-beach parking. Although the County is aggressively pursuing acquisition of new off-beach parking locations, development along the coastline and high costs for undeveloped property currently limit available options. For these reasons, the County seeks to maintain continued vehicular access to its beaches to ensure public access.

1.6.2. Other Activities that Impact Protected Species

In addition to beach driving, there are a variety of other human impacts to sea turtles on St. Johns County's beaches. These include: public and private beachfront lighting; special events; human presence on the beach at night; destruction of dunes by pedestrian traffic and horseback riding; trash and objects on the beach; coastal development and construction; seawalls, revetments, and other armoring structures; and other types of erosion control measures (e.g., beach nourishment, dune restoration, sand fencing, inlet sand bypassing, and in-water structures, etc.) (NMFS and USFWS 1991a, 1991b, 1992, 1993, USFWS AND NMFS 1992).

Additionally, a variety of other activities affect AIBM along St. Johns County. Such activities include uncontrolled public access, horseback riding, feral and free-roaming cats, coastal development and construction, shoreline protection, artificial lighting, emergency responses to storms and other unusual occurrences, special beach events, stormwater outfalls, contaminants and trash, and other beach management activities (USFWS 1993).

Consequently, St. Johns County recognized the need for coordinating beach activities in a manner that maintains public use, while minimizing negative impacts to the natural beach/dune environment and the protected species that depend on its health.

1.7. GENERAL PURPOSE AND EVOLUTION OF THE PLAN

The beaches of St. Johns County are recognized as important nesting habitat for sea turtles (Meylan *et al.* 1995). Using best available data, an average of 267.5 loggerhead, 8.3 green, and 1.3 leatherback nests were deposited each year between 1996 and 2001 along the 42.0 mi of the County's coastline (FWC unpublished data 2001a; section 3.5.2.1.1.). Additionally, these same beaches support the only known population of the endemic and highly endangered AIBM (USFWS 1993). These beach mice inhabit the dunes of St. Johns County and nowhere else in the world.

The County is seeking an ITP, because take of sea turtles and AIBM might occur as a result of public vehicular driving on the beach and activities related to public vehicular driving initiated under the County's authorization.

The purpose of this HCP is to develop a framework for providing continued public access to the County's beaches through the authorization of driving and parking on the beach, in a manner and extent compatible with the protection of sea turtles and AIBM. To that end, this document presents the following:

- A description of the goals, objectives, and benefits of the HCP;
- A description of the social, economic, and environmental conditions within the Plan Area;
- General and site-specific biological information related to protected flora and fauna within the Plan Area;
- A discussion of natural factors and human activities potentially affecting sea turtles and AIBM within the Plan Area;
- Descriptions of recorded historical and anticipated future take that has or might occur from County-authorized beach driving and related activities;
- A description of the programs, policies, and procedures that the County will implement to minimize the potential for take;
- A description of measures that the County will implement to mitigate take that is unavoidable despite the minimization measures;
- A detailed HCP budget and a commitment to funding the Plan;
- A description of Plan administration and implementation;
- Methods for addressing changed and unforeseen circumstances during the period when the ITP is in effect; and
- A mechanism for assessing HCP performance through compliance monitoring.

1.8. GOALS AND OBJECTIVES

The primary goal of this HCP is to develop a comprehensive plan to protect federally endangered sea turtles and AIBM and other federally and State-listed species of wild flora and fauna within the Plan Area over the next 20 years while preserving public access to the beach. To achieve this goal, the HCP has established the following objectives:

- Embrace Federal, State, County, and municipal laws and regulations pertaining to the conservation of protected species on St. Johns County's beaches;
- Establish a plan that will effectively and efficiently manage vehicular access to the beach for the various County departments, contractors, private citizens, and State and Federal agencies that drive on the beach; and
- Create a plan that will continue to allow the public to drive and park on authorized sections of the beach in a manner that will sustain the social, recreational, cultural, economic, and environmental values of the beach.

This HCP is designed as a dynamic document. It is structured to permit adaptive changes in response to new information derived from monitoring programs. Mechanisms are established to facilitate dialogue between the USFWS and St. Johns County in response to changing conditions and to allow for the timely revision of procedures and policies to better achieve HCP objectives and/or respond to unforeseen circumstances.

1.9. DESIRED TERM OF SECTION 10(A)(1)(B) PERMIT

The County is requesting a section 10 ITP that will authorize the incidental take of sea turtles and AIBM within the Plan Area for a period of 20 years pursuant to the terms and conditions of this HCP and the ITP.

1.10. REQUESTED INCIDENTAL TAKE

The following list enumerates the incidental take requested by St. Johns County for proposed activities within the Plan Area.

1.10.1. Requested Incidental Take of Sea Turtles Causally Related to Vehicular Beach Driving and Associated Activities

1. Harassment, injury, and/or death to sea turtle eggs and/or hatchlings resulting from public vehicles driving over undetected and unmarked sea turtle nests located in designated traffic lane/driving area(s) or ramp grading area(s) within the HCP Plan Area.

2. Harassment, injury, and/or death to sea turtle eggs and/or hatchlings resulting from emergency, public safety, wildlife protection, and/or other official vehicles driving over undetected and unmarked sea turtle nests located within the Plan Area, pursuant to the terms and conditions of the ITP. Official vehicles include those operated by Code Enforcement personnel and/or County staff charged with implementing and managing the HCP or conducting other official County business.

3. Harassment, injury, and/or death to sea turtle eggs and/or hatchlings resulting from emergency and/or safety vehicles driving over marked sea turtle nests located within the Plan Area.

4. Harassment, injury, and/or death to hatchling sea turtles emerging from undetected and unmarked nests in the Plan Area and subsequently encountering vehicle ruts.

5. Harassment, injury, and/or death to hatchling sea turtles emerging from marked nests in the Plan Area and subsequently encountering vehicle ruts in areas where rut removal was not performed due to circumstances beyond the control of the Applicant, including, but not limited to, dangerous weather conditions, extreme high tides, equipment failure, vandalism of nest barriers, and hatchling emergence prior to the scheduled date/time for initiation of rut removal activities, pursuant to the terms and conditions of the ITP.

6. Harassment, injury, and/or death to hatchling sea turtles emerging from marked nests in the Plan Area and subsequently encountering vehicle ruts in areas where rut removal was performed in conformance with the terms and conditions of the ITP.

7. Harassment, injury, and/or death to adult, hatchling, stranded, or post-hatchling washback sea turtles resulting from collisions with emergency, safety, wildlife protection, and/or other official vehicles operating within the Plan Area, pursuant to the terms and conditions of the ITP; such vehicles might also disorient/harass adults and/or hatchling sea turtles with vehicle headlights or in-vehicle handheld lights, while in motion or at rest for less than one minute. In-vehicle handheld lights are used by County staff predominantly during night searches for missing persons. The lights are not continually turned on and are used mainly to scan the surface of the water. Official vehicles include those operated by Code Enforcement personnel and/or County staff charged with implementing and managing the HCP and ITP or conducting other official County business.

8. Harassment, injury, and/or death to adult female sea turtles attempting to nest within the Plan Area between 5:00 AM and 10:00 PM, resulting from collisions with vehicles operated by the general public.

9. Harassment, injury, and/or death to hatchling sea turtles emerging from the nest and/or crawling on beaches within the Plan Area to the ocean between 5:00 AM to 10:00 PM, resulting from collisions with vehicles operated by the general public, pursuant to the terms and conditions of the ITP.

10. Harassment, injury, and/or death to post-hatchling washback sea turtles resulting from collisions with vehicles operated by the general public, pursuant to the terms and conditions of the ITP.

11. Harassment, injury, and/or death to adult, hatchling, stranded, or post-hatchling washback sea turtles resulting from public nighttime driving from the north side of Vilano Road

beach access ramp to the southwestern tip of Porpoise Point from 5:00 AM on July 4, until 1:00 AM on July 5, of each year, pursuant to the terms and conditions of the ITP.

12. Harassment, injury, and/or death to adult sea turtles attempting to nest in the Plan Area related to physical changes in beach conditions resulting from vehicles operating in the Plan Area in accordance with the terms and conditions of the ITP. Changes to beach conditions include, but are not limited to, increased sand compaction and the presence of ruts, both of which might result in physiological stress to nesting turtles through reduced nesting success (percentage of crawls resulting in nests), increased digging attempts, and/or increased energy expenditure during nest construction.

13. Harassment, injury, and/or death to sea turtle eggs and/or hatchlings in undetected and unmarked nests due to physical crushing by activities associated with:

    a. marking the established Conservation Zone (CZ) on County Beaches;
    b. placement of trash receptacles on County Beaches;
    c. placement of portable toilets pursuant to the terms and conditions set forth in the HCP and ITP; and/or
    d. beach maintenance activities, including ramp maintenance.

14. Harassment, injury, and/or death to sea turtle eggs and/or hatchlings in undetected and unmarked nests within the Plan Area due to excavation, physical crushing, and/or burial caused by vehicular activities associated with:

    a. emergency shoreline protection measures initiated under County authorization in accordance with Chapter 161, Florida Statutes and Chapter 62B-33, Florida Administrative Code;
    b. removal of hazardous material, debris, and/or obstacles from the beach that pose a public health or safety risk; and/or
    c. scientific monitoring and studies, pursuant to the terms and conditions of the ITP.

15. Harassment, injury, and/or death to female sea turtles attempting to nest in the Plan Area resulting from physical interaction with:

    a. lifeguard towers;
    b. CZ posts;
    c. traffic signs;
    d. portable toilets and portable toilet trailers; and/or
    e. other devices and structures used for traffic management, public safety, or public awareness pursuant to the terms and conditions of the ITP.

16. Harassment, injury, and/or death to sea turtle eggs and/or nests laid outside the normal sea turtle nesting season, May 1 through October 31, when a nest monitoring/marking program is not in place.

1.10.2. Requested Take of AIBM Causally Related to Vehicular Beach Driving and Associated Activities

1. Harassment, injury, and/or death to AIBM resulting from collisions and/or interactions with emergency, safety, wildlife protection, and/or other official vehicles operating within the Plan Area, pursuant to the terms and conditions of the ITP; such vehicles might also disturb the nocturnal activities of beach mice with vehicle headlights or in-vehicle handheld lights, while in motion or at rest for less than one minute. Official vehicles include those operated by Code Enforcement personnel and/or County staff charged with implementing and managing the HCP and ITP or conducting other official County business.

2. Harassment, injury, and/or death to AIBM resulting from public vehicles operating in designated traffic lane/driving area(s) or ramp grading area(s) within the Plan Area.

3. Habitat destruction or alteration, harassment, injury, and/or death to AIBM due to activities associated with:

    a. placement of trash receptacles on County Beaches;
    b. placement of portable toilets pursuant to the terms and conditions set forth in the HCP; and/or
    c. beach maintenance activities, including ramp maintenance.

4. Habitat destruction or alteration, harassment, injury, and/or death to AIBM within the Plan Area due to excavation, physical crushing, and/or burial during vehicular activities associated with:

    a. emergency shoreline protection measures initiated under County authorization in accordance with Chapter 161, Florida Statutes and Chapter 62B-33, Florida Administrative Code;
    b. removal of hazardous material, debris, and/or obstacles from the beach that pose a public health or safety risk; and/or
    c. scientific monitoring and studies, pursuant to the terms and conditions of the ITP.

5. Habitat destruction or alteration, harassment, injury, and/or death to AIBM within the Plan Area resulting from physical interaction with signs and structures used for traffic management, public safety, or public awareness, pursuant to the terms and conditions of the ITP.

1.11. BENEFITS OF THE HABITAT CONSERVATION PLAN

1.11.1. Benefits to St. Johns County

The citizens of St. Johns County derive social, cultural, and economic benefits from vehicular beach access. However, beach driving might result in the incidental take of federally protected sea turtles and AIBM, a prohibition under the ESA. Thus, St. Johns County will benefit from issuance of a section 10 ITP by being afforded Federal protection for take of these species

pursuant to the terms and conditions of the ITP. If not authorized by a section 10 ITP, such take could result in civil and/or criminal penalties. Additionally, in the absence of an ITP, the County is vulnerable to citizen lawsuits alleging take of protected species in violation of the ESA. Such legal proceedings could result in a court's prohibition of beach driving or other legal actions contrary to the County's best interests. Implementation of a HCP in St. Johns County will also improve the County's management of activities on the beach and enforcement of the Beach Code. Development of a HCP in support of the ITP is one way to balance protected species conservation with the social and economic values of beach driving.

1.11.2. Benefits to Private Citizens

Some private citizens derive social, cultural, and economic benefits from vehicular access to the beach. Many types of people, from teenage "spring-breakers" to families, enjoy driving and parking on the beach for fun, recreation, and fellowship. In St. Johns County, there are also groups of people that derive cultural benefits from driving on the beaches to fish. Such groups include the Menorcan Cultural Society (with 1,500 members). Cast netting for mullet, a traditional Menorcan delicacy, is considered part of their cultural heritage, and the art of hand-weaving cast nets is generally passed from father to son (Delany *pers. comm.* 2002). Fishermen drive along the water's edge at daybreak to find schools of mullet nearshore. Once sighted, the fish are cast netted and then dumped into large coolers located in the back of the fishermen's truck.

Commercial and recreational fishermen derive economic benefits from beach driving. These fishermen use hook and line and/or cast nets at the water's edge to fish for a variety of fish. The ability to drive on the beach increases the catch per unit effort of fishermen (Gassman *pers. comm.* 2002) by:

1. Providing fast and easy access to areas of the beach that may be a considerable distance from an authorized pedestrian beach access point;
2. Allowing fishermen to haul large loads of gear and equipment to the beach;
3. Enabling fishermen to haul thousands of pounds of fresh fish from the beach (commercial fishermen only); and
4. Allowing fishermen to survey large sections of beach along the water's edge in search of schools of fish to cast net or in search of appropriate water conditions to surf fish.

By increasing their catch per unit effort, fishermen derive increased economic benefits. These economic benefits represent annual income for commercial fishermen (see section 4.3.1.4.). But, there is also a contingent of fishermen in St. Johns County that are not commercially licensed. They drive on the beach to fish in order to provide food for themselves and their families (Perry, Skinner, Delany, Gassman, L. Mickler, Y. Mickler, Maguire, Usina *pers. comm.* 2002).

Many citizens enjoy the aesthetic pleasure and intrinsic benefits associated with the long-term conservation of the coastal environment and the protected species that depend on the beaches of St. Johns County. The HCP implements many new programs to enhance the natural beach environment and improve protected species management.

1.11.3. Benefits to Municipalities and Public Parks

Portions of the HCP Plan Area fall within the regulatory jurisdiction of several municipalities and public parks. Within these stretches of the coastal zone, entities other than St. Johns County might regulate public vehicular access. Take of federally protected species causally related to those authorized vehicular activities could result in civil and/or criminal penalties and litigation similar to that described for St. Johns County (section 1.11.1.).

1.11.4. Benefits to Protected Species

1.11.4.1. Minimization Measures

The programs and policies contained in this HCP will improve protected species management on the County's beaches relative to practices currently in place. The Plan contains measures that will be implemented to minimize the potential for impacts to sea turtles and the AIBM causally related to vehicular access to the beach allowed under the County's authorization. These minimization programs, which are described in detail in Chapter 7 of this HCP, include:

1. Authorizing public vehicular beach access between 8:00 AM and 8:00 PM from May 1 through October 31 of each year, (gates will remain open on a 24-hour basis from November 1 through April 30 on all public driving beaches and from 8:00 AM on July 4 through 1:00 AM on July 5 at Porpoise Point);
2. Installing and maintaining traffic barricades at beach ramps and other points to regulate vehicular access;
3. Monitoring and conspicuous marking of all sea turtle nests in the Plan Area;
4. Developing a standard protocol to remove vehicle ruts seaward of sea turtle nests during periods when hatchlings are expected to emerge;
5. Increased and dedicated enforcement of beach driving policies and procedures;
6. Developing and implementing a public awareness program that includes, but not limited to, the following features:
    a. Developing and distributing public awareness materials containing information regarding driving regulations and protected species' issues to beach drivers as they access beaches within the Plan Area;
    b. Developing Public Service Announcements, including "special reports," to be aired on the St. Johns County government television station discussing HCP regulations and protected species;
    c. Designing and conducting periodic public workshops that include the general public but will also focus on the beach community and hotels/motels to discuss HCP issues; and
    d. Posting phone numbers to report HCP violations and sea turtle emergencies.
7. Elevating trash receptacles on posts along public driving areas within AIBM habitat (i.e., Anastasia Island, excluding FMNM);
8. Increased enforcement of existing Conservation Zone (CZ) regulations (defined in Ordinance No. 97-34) and an expansion in the width of the CZ in one region to protect and enhance AIBM and nesting bird habitats;
9. Developing and instituting a training program that must be attended by drivers wishing to obtain a four-wheel drive permit for driving north of Vilano Ramp; and

10. Reducing public beach driving along Summer Haven.

1.11.4.2. Mitigation Measures

In addition to the minimization measures described above, the County will mitigate unavoidable take that might occur as the result of County-authorized vehicular driving through a number of programs that will provide benefits to sea turtles and AIBM. These mitigation programs, which are described in detail in Chapter 7 of this HCP, include:

1. Developing a proactive Beach Lighting Management Program and align the City of St. Augustine Beach's lighting regulations and the County's lighting regulations;
2. Developing and instituting a beach horseback riding registration and education program;
3. Redirecting Porpoise Point vehicular driving to allow re-establishment of natural dune features; and
4. Restoring the primary dune along Summer Haven.

Additionally, the County will oversee a uniform and consistent sea turtle monitoring program that will help collect the data needed to better quantify current natural and human-related impacts to sea turtles on the County's beaches. This information will be used to better direct the County's limited resources toward those programs that are likely to have the greatest conservation value.

Chapter 2. HUMAN DIMENSION

2.1. POPULATION

In 1970, only 30,727 people resided in St. Johns County (Figure 2-1). The U.S. Census revealed that this number had risen significantly to 123,135 people by 2000. Between 1970 and 1990, the County's population grew at an average rate of 5.9 percent per year. Between 1990 and 2000, the growth rate had slowed down to 4.7 percent per year. The population in St. Johns County is expected to reach 180,871 by 2010, if the average growth rate during the last decade continues. According to the 2000 US Population Census, 84.6 percent of the County's population lives in unincorporated areas (US Census Bureau 2001) and over 25 percent in coastal areas (LPDC 1998, US Census Bureau 2001).

The City of St. Augustine is the most populated municipality in St. Johns County with 11,592 residents in 2000 (Figure 2-1). Since the 1970s, its population has been decreasing at a rate of 0.17 percent a year. St. Augustine Beach is the next most populated city (4,683 residents in 2000), which experienced its largest growth during the 1980s (18 percent per year increase). This growth rate slowed to a rate of 2.7 percent per year over the past decade, as most land has been developed. In the last decade, the unincorporated areas of Vilano and Butler Beaches grew at the rates of 3.2 and 3.5 percent per year, respectively, while Crescent Beach saw a decrease in its resident population of 0.5 percent per year.

2.2. LAND USE

2.2.1. Existing Land Use

Single- and multi-family residential properties constitute the bulk of the oceanfront development in St. Johns County. This pattern of development is interrupted by two inlets and two State parks, Guana River State Park and Anastasia State Park, which encompass 7.2 of the 42.0 mi of coastline in the County. As shown in Figure 2-2, multi-family and high-density residential housing, in the form of condominiums and apartments, are concentrated primarily along the shores of Ponte Vedra Beach, Vilano Beach, the City of St. Augustine Beach, and Crescent Beach. The remaining coastal development is dominated by single-family and low-density residential housing.

Figures 2-3a and 2-3b detail the beachfront and upland land use patterns along the County's shoreline for the year 2000. At the time of preparation of this HCP, the Property Appraiser's 2000 data from the Ponte Vedra Beach area was not available. Thus, land use patterns for this area were derived from the 1996 data (Figure 2-2).

2.2.2. Publicly Held Lands

There are three major public parks that together constitute 8.1 mi or 19.3 percent of the beachfront in St. Johns County. These publicly held parks include Guana River State Park, Anastasia State Park, and Fort Matanzas National Monument (Figure 1-1).

2.2.2.1. Anastasia State Park

Located southeast of downtown St. Augustine, Anastasia State Park has 2.5 mi of Atlantic Ocean beaches and a 1,372-acre protected bird sanctuary (FDEP 1998). Acquisition began in 1949 and continued through 1987. Approximately 170 species of birds, including spring and fall migrant songbirds, may be sited in this park between the Atlantic Ocean and Salt Run Lagoon.

2.2.2.2. Guana River State Park

Located midway between Jacksonville and St. Augustine, Guana River State Park contains 4.7 mi of beachfront property. Land acquisition for the park began in 1984 (FDEP 1999). Located in Ponte Vedra Beach, the park contains 2,478.6 acres, of which 1,630.9 acres are uplands, and 847.7 acres are wetlands/submerged areas. Portions of this park serve as a sanctuary for wildlife and birds, and there are several trails that expose visitors to ancient Spanish wells and an Indian shell bluff. Both Anastasia and Guana River State Parks are managed by the Florida Parks Service.

2.2.2.3. Fort Matanzas National Monument

Fort Matanzas National Monument encompasses the southern end of Anastasia Island about 14 mi south of St. Augustine (NPS 1982). The Fort Matanzas National Monument consists of 298.5 acres of sandy dune systems just north of Matanzas Inlet with 0.9 mi of oceanfront beach. Fort Matanzas is administratively part of the Castillo de San Marcos National Monument under the jurisdiction of the National Park Service.

2.2.3. Future Land Use

Figure 2-4 shows the County's projection of future land use patterns and the boundaries of the new development areas through 2015. This figure shows a trend towards increased development in coastal areas with lower residential densities (two dwelling units per acre) in the northern part of the County and higher densities (two to eight dwelling units per acre) in the southern part of the County.

2.3. ECONOMIC INDICATORS

2.3.1. Building Permits

The number of building permits issued each year can be used as an indicator of economic growth. As shown in Figure 2-5, the number of Single-family Permits in St. Johns County has more than doubled since 1990. In most years, the number of Building Starts corresponded to the number of Single-family Permits issued. Multi-family Permits, which include condominiums and apartments, have shown more gradual increases and more annual fluctuations. Additionally, Building Starts have not always corresponded to the number of Multi-family Permits issued, construction often lagging a year or two behind permit issuance. The years 1995 and 1999 were marked by large increases in the number of Multi-family Permits issued.

2.3.2. Property Taxes

Revenues from property taxes in St. Johns County increased steadily through the 1990s (Figure 2-6). In 2001, the total revenue from property taxes in the County was $142,008,576. Considering the number of permits and building starts shown in Figure 2-5, it is safe to assume that the increasing trend of rising property tax value has continued through present.

Figures 2-7a and 2-7b show the 2001 total appraised property market value for coastal properties, and Figures 2-8a and 2-8b show the same figures, but on a per acre basis. The total 2001 appraised value of barrier island private properties was over $9.6 billion dollars, with about 8 percent of the properties being vacant (SJCPAO 2000). The total public property appraised value in 2001 was over $2 billion (SJCPAO 2000). As shown in Figures 2-8a and 2-8b, the value of oceanfront property is higher than other property on the barrier island, and in general, property on the barrier island has a higher appraised value than property elsewhere within the County (SJCPAO 2000).

2.4. ECONOMIC IMPORTANCE OF BEACHES

In addition to the high market value of oceanfront property, tourism is also a major contributor to the economic importance of the beaches. According to the Economic Development Council (EDC) of St. Augustine and St. Johns County Chamber of Commerce, 3.5 million people visited the area in 2000 spending a total of $490 million dollars (EDC 2002).

2.4.1. Tourism, Recreational Opportunities, and Beach Uses

Both residents and visitors to St. Johns County enjoy numerous recreational opportunities, including fishing and beach driving—two of the oldest beach uses in the County. Figures 2-9a and 2-9b (accompanied by Table 2-1) show recreational opportunities within the coastal zone of the County. The same figures show the location of lodging, condominiums, apartments, and restaurants to accommodate visitors. During 2000, about 79 percent of the visitors to the area dined out, and 57 percent paid for lodging.

A great part of tourism in St. Johns County is generated by the historical importance of the City of St. Augustine. From the 3.5 million visitors to the County in 2000, 82 percent walked St. Augustine's historical district, 42 percent visited area attractions, 28 percent toured museums, and 29 percent enjoyed other recreational activities (EDC 2002). St. Johns County's two national monuments (Fort Matanzas and Castillo de San Marcos National Monuments) attracted an average of 642,581 visitors during the year 2000 (NPS 2001), while Anastasia State Park visitation during the same year was 923,139 visitors (ASP statistics). At Guana River State Park, 125,413 people visited the park during the fiscal year of 1998-99 (BEBR 1999).

2.4.2. Tourism and the Tourist Development Tax

Since 1986, St. Johns County has collected a Tourist Development Tax (TDT). This tax is added to the bill paid by tourists who stay less than six months at overnight accommodations in the County, including hotels, motels, efficiency hotels, rooming houses, RV parks, campgrounds,

and condominiums (TDC 2002). In 2001, TDT receipts for St. Johns County exceeded 4 million dollars (Figure 2-10; DOR 2001). According to the EDC, two million visitors stayed in lodging in the area in 2001 for an average of 3.3 days, and each visitor spent about $110.73 in lodging per day.

Thirty percent of the revenues of the TDT are used to fund projects that benefit tourists visiting the County's beaches, such as fishing piers, boat ramps, beach maintenance, dune replenishing, visitor information centers, and sports promotions. These funds are managed by the St. Johns County Recreation and Parks Department. Figure 2-10 shows the relative proportions of funds allocated to the Recreation and Parks Department from the TDT. During the past three years, the TDT has contributed each year around one million dollars to the Recreation and Parks Department.

2.4.3. Beach Traffic

2.4.3.1. Pedestrian Traffic

Figures 2-11a and 2-11b show the results of a recently completed analysis of pedestrian traffic potential along the beaches of St. Johns County (ATM 2001). Based on beachfront land uses, public parking availability, and the presence and status of footpaths/walkovers, the pedestrian traffic potential along the beach was characterized as low, medium, or high. Pedestrian traffic potential was considered *low* in areas of low/medium residential densities with no public parking and unusable/undeveloped footpaths. Pedestrian traffic potential was considered *medium* in public parks with developed walkovers and parking, in areas of high residential densities without public parking or access, and in access areas with open footpaths. Finally, pedestrian traffic potential was considered *high* in commercial/resort areas and in open access points with public parking. Locations with high-density residential areas, where pedestrian traffic is typically high and persistent during the summer months, are found in distinct areas along Ponte Vedra Beach, Vilano Beach, St. Augustine Beach, Butler Beach, and Crescent Beach.

2.4.3.2. Horseback Riding Traffic

Horseback riding is addressed in the St. Johns County Land Development Code Article 4 (June 12, 2001), "Horseback riding on the beach during Nesting Season shall be allowed only seaward of the most high-tide line on the beach during times when such riding is otherwise allowed" (Sec. 4.01.08(B)(3)(c)). Further details of when and where horseback riding is permitted on the beaches are addressed in Ordinance No. 2001-5 (Amendment to St. Johns County Beach Code, Ordinance 97-34). This amendment states that no hoofed animals will be permitted "on any portion of the beach between the southern boundary of the Surfside Beach Access Ramp extending south to the southern boundary of St. Johns County from May 1 to October 31 of each year and during county recognized spring break periods…" (Sec. 1. Sec. 3.02(a)). This amendment has been further altered by Resolution No. 2001-5, which additionally allows horseback riding on *all* beaches of the County between November 1 and April 30 of each year. A permit is not needed to ride a horse on the beaches of St. Johns County, and the numbers of people who engage in this beach activity is not currently tracked. Personal observations by

County staff suggest that several hundred horseback riders use the beach for riding on a fairly regular basis (Williams *pers. comm.* 2002).

2.4.3.3. General Public Beach Driving

Beach driving in St. Johns County has traditionally occurred in six distinct sections. These sections include five stretches of two-way driving and one stretch of one-way driving (Table 1-2; Figures 2-9a and 2-9b). On the northern barrier island, owners of four-wheel drive vehicles can apply for a permit for two-way driving between the south boundary of Guana River Marsh Aquatic Preserve to the north side of the Vilano Ramp (section 2.4.3.5.). Also on the northern barrier island, the general public is afforded vehicular access for two-way driving between the Vilano beach access ramp and the southwestern tip of Porpoise Point. On the central barrier island in St. Johns County (Anastasia Island), general public beach driving occurs in the following sections: 1) one-way driving from"A" Street Ramp in St. Augustine Beach south to Ocean Trace Ramp, 2) one-way driving from Ocean Trace Ramp south to Crescent Beach Ramp, 3) two-way driving from Crescent Beach Ramp south to the north side of Fort Matanzas Ramp, and 4) two-way driving from Fort Matanzas Ramp to the north side of Matanzas Inlet.

There are a total of 12 official public vehicular access points in St. Johns County. Two of these access points are not staffed (Usina and Surfside Beach Ramps), while ten have attended tollbooths (Williams *pers. comm.* 2001) (Figures 2-9a and 2-9b). Between March 1 and Labor Day Weekend of each year, the toll booths are staffed by employees of St. Johns County. The ramps are attended from 9:00 AM to 6:00 PM on weekends and from 9:00 AM to 5:00 PM on weekdays (Williams *pers. comm.* 2002). Daily and season beach passes are sold at all tollbooths. The cost for a daily beach pass is $5.00. Season beach passes cost $20.00 if purchased between December 1 of the previous year and March 1 of the current year, and $30.00 if purchased between March 2 and November 30 of the current year (Williams *pers. comm.* 2001, Ordinance 97-34 section 6.02 and 6.03). At present, gates are sometimes open to traffic during periods when the tollbooths are unattended. During these times (5:00-9:00 AM and 5:00/6:00-10:00 PM), drivers are still required to possess a valid beach pass (Williams *pers. comm.* 2002).

The only compiled data of beach traffic trends in St. Johns County is published in a study conducted by ATM in 2001. This study describes the yearly total averages of daily and seasonal driving passes sold at each vehicle access ramp, the month of highest daily traffic, and whether the highest daily traffic counts were exhibited: 1) when school was in or out, and 2) on the weekends or weekdays. Unfortunately, this study did *not* generate the following types of data regarding the volume of beach vehicular traffic: 1) during the "off-season," 2) during times when the tollbooths are unattended, and 3) for areas where there are no tollbooths (Usina or Surfside Beach Ramps). Data regarding utilization of off-beach parking lots is also lacking.

Using this best available data, Ocean Trace Road Ramp appears to be the most utilized public vehicular access point in St. Johns County; between 1995-2000, a total average of 45,166 daily and 3,347 season beach access fees were collected per year (ATM 2001). The next most trafficked ramps include Crescent Beach Ramp (22,991 daily/1,229 season), Ft. Matanzas Ramp (13,061 daily/1,203 season), and Vilano Beach Ramp (10,890 daily/929 season). The least utilized beach access ramps are Porpoise Point Ramp (1,746 daily/190 season) and the

periodically closed Surf Drive Ramp (ATM only presented data between 1998-2000 when Surf Drive Ramp was actually opened; 490 daily/36 season). Most of the vehicle access ramps were busiest during the month of July, with the exceptions of Surf Drive (highest traffic counts in April), Matanzas Avenue, and Crescent Beach Ramps (both displayed highest daily traffic in May).

The Division of Beach Management considers the maximum capacity of parked vehicles on the public driving beaches of Anastasia Island to be about 4,500 (Williams *pers. comm.* 2001). The maximum capacity of parked vehicles was calculated using the formula below.

Maximum Capacity of Parked Vehicles on Anastasia Island = { [(L) – (U)] / (P) } + S
= { [(52,272 ft – 400 ft)] / (12 ft) } + 200
= { [(51,872 ft)] / (12 ft) } + 200
= { 4,323 } + 200
= 4,523 vehicles

L = *Length of public driving beaches on Anastasia Island* = 9.9 mi = 52,272 ft
U = *Length of public driving beaches on Anastasia Island where vehicles are not permitted to park on the beach* = (8 ramps) (50 ft wide) = 400 ft
P = *Width of an average parking space in an average parking lot* = 12 ft
S = *Maximum number of vehicles that might be parked seaward of driving lane* = 200

Typical summer beach attendance along Anastasia Island does not approach this maximum capacity. The maximum number of cars on these beaches on the busiest holiday weekend only reaches about 2,000 cars (Williams *pers. comm.* 2002). Beach attendance was calculated by the Division of Beach Management by multiplying the maximum number of daily passes sold by a *n* adjustment factor to account for beach driving visits made by season pass holders and by another factor to account for -- "beach turnover." The Division of Beach Management estimates that, on average, season pass holders use their passes five times per year, and beach attendance turns over three times a day. The typical beach visitor does not stay all day, but visits either during the 1) morning, 2) afternoon, or 3) late afternoon. Thus, "beach turnover" is equal to three.

2.4.3.4. General Public Beach Driving at Porpoise Point

The area immediately north of St. Augustine Inlet is extremely unique in that it has undergone tremendous physical changes in recent history (Figure 3-5; Miller *pers. comm.* 2001, Stauber *pers. comm*. 2002). The area known today as Porpoise Point was an east-west cross-section of Vilano Beach until 1940, when the United States Army Corps of Engineers (USACE) dug the present day St. Augustine Inlet (section 3.3.1.). For the next several decades, a large lagoon existed along the southwestern side of the point north of the new inlet. Porpoises, including the porpoise that later became the star of the popular television series *Flipper*, often congregated, corralled fish, and interacted with local people in this lagoon (Williams, S. Martin, and Gassman *pers. comm.* 2002). For this reason, the north shore of the St. Augustine Inlet became known as Porpoise Point. However, by the 1970s, this lagoon had naturally filled in (Figure 3-5).

The dune system at Porpoise Point is accreting and growing, though still ecologically very young. During the 1990s, severe storms washed in and deposited three separate and distinct shore-parallel rows of sargassum and flotsam (Gassman *pers. comm.* 2002). These sargassum rows were approximately 0.6-0.9 m (2.0-3.0 ft) high and 4.8-6.1 m (15.0-20.0 ft) wide and created a base over which windblown sand accreted and pioneering dune vegetation became established.

The rocks of the north jetty at St. Augustine Inlet were exposed and could not be driven over until 1992-1993. At that time, sand completely covered a large portion of north jetty and Porpoise Point can now be accessed either from Vilano Ramp or Porpoise Point Ramp. If the north jetty should become exposed again in the future, Porpoise Point would only be accessible by vehicle through Porpoise Point Ramp.

All parcels along Porpoise Point are platted. Since the early 1940s, the USACE has possessed the perpetual right and easement to build and maintain a sand trap groin along the parcels now containing the north jetty. There is one row of 10 houses south of the jetty and several vacant parcels based on 1999 aerial photographs. The land south of this row of houses, essentially most of Porpoise Point, has accreted since the 1950s, becoming State property (previously State submerged lands).
The development of the dune system at Porpoise Point may be slowed by the general public driving that occurs through the newly formed dune ridges, potentially a violation of F.S. Chapter 161.85 (Figure 4-9b). There are multiple shore-parallel driving lanes between the dunes, and several driving lanes fan out from the Porpoise Point Ramp. In the 1999 aerial photographs of this region, five to six shore-parallel driving lanes are visible and at least three lanes of traffic can be viewed diverging from Porpoise Point Ramp (Figure 4-9b).

Night driving is prohibited on beaches within the unincorporated boundaries of St. Johns County between the hours of 10:00 PM and 5:00 AM from May 15 through October 15 of each year (Ordinance 96-48; section 2.4.3.7.). However, a brief period of public night driving occurs at Porpoise Point. In order for citizens to view a Fourth of July fireworks display from their vehicles on the beach, Ordinance 96-48 explicitly states, "said prohibition shall not be enforced on such Beach from the north side of the Vilano Road Beach access ramp south to the St. Augustine Inlet from 5:00 AM on July 4, of each year, until 1:00 AM on July 5, of each year." The fireworks are funded jointly by the County and St. Augustine Beach and continue to be popular and well attended by local residents. The fireworks display occurs between the Vilano Bridge and the Bridge of Lions, and some of the best viewing is considered to be from the beach in the area of Porpoise Point (Williams *pers. comm.* 2001). Allowing citizens to park their vehicles on the beach to view the fireworks offsets the problem of inadequate off-beach parking in this area (Williams *pers. comm.* 2001).

2.4.3.5. Four-wheel Drive Public Beach Driving by Special Permit Only

Between the southern boundary of Guana River Marsh Aquatic Preserve south to the north side of the Vilano Ramp, beach driving is currently restricted to special permit holders (pre-HCP). These permit holders have bought an annual beach driving pass and applied for and obtained a North Beach Vehicular Access Permit (Appendix C). Permit holders must have renewed their

permit every three months. At that time, they received a packet of information regarding where they were permitted to drive and other appropriate information.

Three-month permits are only granted to owners of season beach passes who drive an appropriate four-wheel drive vehicle. The County Recreation and Parks Department gives the passes at no additional charge (above the cost of a season pass) upon completion of a permit application, which includes license and vehicle information (Appendix C). The permit application states, "Finally, I understand that any violation to the aforementioned activities including any violation to the St. Johns County Beach Code may lead to a citation and the immediate revocation of my permit" (Appendix C). The Sheriff's Office states that most of their problems with enforcement of the Beach Code, including illegal driving in the CZ and/or dunes, occur along the North Beaches and at Porpoise Point (Clark *pers. comm.* 2002, Mathis *pers. comm.* 2002). However, a North Beach Vehicular Access Permit has never been suspended or revoked (Williams *pers. comm.* 2001).

The North Beach Vehicular Access permit system was initiated on May 15, 2000. Between May 15, 2000 and May 20, 2002, a total of 556 permits were issued by the Division of Beach Management to a total of 432 individuals (Williams *pers. comm.* 2002). In order for one to have maintained permission to continuously drive on the North Beaches since the permit system's initiation, an individual would have needed 8 permits. The longest period of time that any individual drove on the North Beaches during this 24-month period was a cumulative total of 12 months (4 permits). Eight (8) individuals were granted 4 permits to drive for 12 months; 21 individuals were granted 3 permits to drive for 9 months; 59 individuals were granted 2 permits for 6 months; and 344 were granted 1 permit for 3 months. During the first 3-month period of 2002, 239 permits were issued, and 86 percent of the permit holders listed fishing as their intended purpose for vehicular access to the North Beaches (Williams *pers. comm.* 2002).

2.4.3.6. Local Resident Beach Driving in Summer Haven

As explained in section 1.6.1.1., the explicit authorization of public beach driving in the unincorporated areas between (1) the southwestern tip of Porpoise Point to the southern boundary of Guana State Preserve, (2) Ocean Trace Road to Crescent Beach Ramp, and (3) Crescent Beach Ramp to the Fort Matanzas Ramp (Ordinance 97-34) was intended to prohibit public beach driving in all other unincorporated areas, including the 4.1 km (2.6 mi) stretch of beach from Matanzas Inlet to the Flagler County Line. Most of this southern region falls within the unincorporated area of Summer Haven.

The area of Summer Haven possesses an extremely unique set of ecological and human circumstances. The physical environment is unique in that along this very narrow ribbon of sand land elevations are only about 1.5-3.0 m (5-10 ft) above sea level. In several areas of the barrier island, there is less than 61.0 m (200 ft) between the Atlantic Ocean and the Matanzas River.

The physical environment of Summer Haven exhibits recurring washover zones and repeated inlet formation (particularly just south of the Summer Haven revetment). "The most severe erosion problems in St. Johns County during storms occur in the St. Augustine Beach and Summer Haven areas due to a combination of natural conditions and the impact of man-made

structures on the beach. These two areas project seaward and act as headlands where wave energy is concentrated, causing more erosion as compared to a perfectly straight shore. In addition, man-made structures like seawalls, bulkheads, and concrete revetments contribute to greater wave scouring, lowering the beach profiles, higher velocities of the littoral currents, and higher erosion rates" (Pilkey *et al.*1984).

FDEP has deemed 3.9 km (2.4 mi) along Summer Haven and Marineland as a critical erosion zone (R-197 to R-209; section 3.3.; Table 3-1; Figure 3-4), and periodically, Summer Haven does experience tremendous erosion as storm events pass by St. Johns County. "The granddaddy of all northeasters to affect St. Johns County was the 1962 Ash Wednesday storm. An idea of the size of this storm can be gained from the fact that the Ash Wednesday storm did most of its damage along the New Jersey shore" (Pilkey *et al.*1984). After the Ash Wednesday storm in March 1962, the Federal Office of Emergency Planning authorized 550 m (1,800 ft) of granite revetment and 344 m (1,130 linear ft) of road pavement at Summer Haven. Since 1996, the beaches of Summer Haven (R-200 to R-208) have also been the periodic disposal area for beach-quality material dredged from the Intracoastal Waterway in St. Johns County (section 3.4.3.). According to the Beach Disposal Management Plan, the mean frequency of this beach placement was projected to be once every 2.7 years (Taylor Engineering, Inc. 1991). Additional oceanfront armoring is frequently considered in this area (Stephenson *pers. comm.* 2002), however is not recommended due to the tremendous adverse environmental consequences. Notably, the area along the Matanzas River including Summer Haven is within a CoBRA unit, thereby in the Coastal Barrier Resource System, and residents are generally not eligible for any direct or indirect Federal financial assistance, such as flood insurance, that might support development (USFWS *unpublished data* 2002).

Overlaid with this unique physical environment is a vital and vulnerable ecological environment. Summer Haven displays the highest sea turtle nesting densities in St. Johns County with 14.3 nests per mile (Figure 2-12; Figure 3-9; Table 3-5b; section 3.5.2.1.1.). Sea turtles have generally avoided nesting in the washover zones and typically cluster their nests in areas where the dunes are most stable. Additionally, least tern nesting colonies were documented along Summer Haven during the summers of 2001-2002 (section 3.5.2.1.10.8.).

There is also a complex human dimension to Summer Haven. The FDOT built the Old A1A roadway along the island (Figure 2-13). Provided with this infrastructure, homes were built along this narrow ribbon of sand. There are currently 61 privately owned parcels in Summer Haven, and 23 homes have been built along Old A1A south of the revetment. Most of the houses are only occupied seasonally or just on the weekends (Williams *pers. comm.* 2002). Every resident requires a four-wheel drive vehicle to access their home (Bowen and Cover *pers. comm.* 2002).

The Old A1A roadway suffered damage by storms in the late 1950s and during the Ash Wednesday storm of 1962 (Stephenson *pers. comm.* 2002). The paved surface of the roadway was extremely vulnerable to additional damage, prompting FDOT to abandon its responsibility for the roadway. Subsequently, the Old A1A was realigned slightly to the west, and the St. Johns County Board of County Commissioners explicitly and legally accepted responsibility for its maintenance (Stephenson *pers. comm.* 2002). In 1986, a major northeaster blew through St.

Johns County and washed away 1.6 km (1.0 mi) of the Old A1A roadway south of the revetment (Stephenson *pers. comm.* 2002). In 2002, only about 1.0 km (0.6 mi) of Old A1A was still paved and maintained (i.e., sand was periodically swept from the roadway) by the St. Johns County Public Works Department. On April 24, 2003, St. Johns County was granted a permit from FDEP to stabilize the roadway (with coquina shell and sand mix) and construct a sand berm (with clean fill) along Summer Haven. The purposes of stabilizing the roadway and restoring the dune are to provide residents with improved access to their homes, minimize public beach driving, reduce light trespass onto the beach, and enhance important sea turtle and least tern nesting habitat.

The human dimension at Summer Haven is complicated by numerous legal issues. As long as there are residents living along Summer Haven, the County cannot formally abandon the Old A1A right-of-way, because that would deny them vehicular access to their properties (Bosanko *pers. comm.* 2002). Furthermore, as long as the County maintains the right-of-way, the general public cannot be denied access. However, for the safety of their citizens, the County does prohibit parking along the Old A1A right-of-way and driving on the beach outside of the right-of-way. The County may be able to vacate some portions of the Old A1A right-of-way, pending the results of several "way of necessity" lawsuits currently working their way through the court system (Lopez *pers. comm.* 2002).

At present, some residents find it easier to access their homes by driving west of the Old A1A right-of-way along off-road trails that run parallel to the beach behind the primary dune. However, these paths take them across their neighbors' private properties and in some cases through neighbor's carports. Not surprisingly, some residents in Summer Haven have attempted to restrict these traditional vehicular pathways through their properties. The restrictions are being challenged through the "way of necessity" lawsuits referenced above. However, these lawsuits may not be resolved for years. Therefore, the HCP must be developed with the understanding that Summer Haven beaches are essentially the Old A1A right-of-way (Figure 2-13), and regardless of whether pavement is currently present, the County does not presently have the legal authority to restrict public access (Bosanko *pers. comm.* 2002).

2.4.3.7. Night Driving

Beach driving during the night is addressed in St. Johns County Ordinance 97-34 which stated that driving was prohibited on the beaches bordering the Atlantic Ocean within the unincorporated boundaries of St. Johns County between the hours of 10:00 PM and 5:00 AM from May 15 through October 15 of each year, except for a Fourth of July exemption at Porpoise Point (section 2.4.3.4.). Lifeguards currently lock the gates at the beach access ramps after the beaches are cleared of all vehicles, and the on-duty Deputy Sheriff reopens the gates at approximately 5:00 AM (Williams *pers. comm.* 2001). During the night, Deputy Sheriffs respond to calls regarding headlights on the beach. An unauthorized nighttime driver may be charged with a $25.00 fine for violation of the County Beach Code.

Chapter 3. ENVIRONMENTAL SETTING AND BIOLOGICAL RESOURCES

3.1. CLIMATE

The climate along the coast of St. Johns County displays mild year-round temperatures averaging between 55.8 and 80.6 degrees F, with maximum average temperatures between 66.2 and 89.6 degrees F and minimum average temperatures between 45.5 and 72.3 degrees F (Figure 3-1). Precipitation for the area follows the typical Florida pattern with rainy summers (averaging 5.9 inches between June and September) and dry winters; total yearly precipitation is 48.8 inches (Figure 3-2).

3.2. TOPOGRAPHY AND HYDROLOGY

The St. Johns County shoreline consists of 42.0 mi of barrier island beach backed by tidal marshes and lagoons. Figure 3-3 illustrates the County's shoreline land elevations. Along the northernmost 6 mi of St. Johns County, the barrier island is approximately 3 mi wide with dune elevations between 15 and 25 ft (Pilkey *et al.* 1984). Along the next 12 mi of County coastline, there are two dune ridges separated by low marshes. In this area, the shorefront sand dune ridge is about 500 to 1,500 ft wide with dune elevations between 15 and 44 ft. This area includes Guana River State Park and Guana River Wildlife Management Area. Over the next 7 mi from Vilano Beach to St. Augustine Inlet, the barrier island varies between 1,000 and 2,000 ft in width, and dune elevations average around 15 ft. South of the St. Augustine Inlet, Anastasia Island varies in width from over 2.5 mi on the northern part of the island to less than 1,000 ft in the narrower sections to the south. Dune elevations in this area are between 10 to 30 ft. South of Matanzas Inlet, the southernmost barrier island varies from about 0.5 mi in width just south of the inlet to about 200 ft near the Flagler County line. Dune elevations in this area range between 5 to 10 ft.

3.3. COASTAL PROCESSES AND COASTAL ENVIRONMENTAL CHARACTERISTICS

3.3.1. Erosion and the Historical Shoreline

Areas of Critical and Noncritical Erosion are generally located near inlets and collectively encompass 8.1 mi of beach in the Plan Area (FDEP 2002c; Table 3-1; Figure 3-4). In general, erosion is more severe south of the inlets, due to the interruption of the sediment supply by the inlet and the deposition of sediment in inlet interior channels and on the beaches north of the inlets. This erosion/deposition pattern is evident at St. Augustine Inlet, a stabilized inlet with a southerly-dominated littoral drift. Matanzas Inlet is not a stabilized inlet, and sediment shifts constantly. Over the years, most of the changes in the coastline have been east-west movements, with the exception of the inlet areas where south-north migration has also occurred. Net annual longshore sediment transport along Florida's East Coast is estimated to be around 550,000 cubic yards of sand per year to the south (Dean and Grant 1989). By diminishing the longshore transport of sand to the south, manmade inlet stabilization projects and coastal armoring might exacerbate erosion in some areas. Presently, 7.6 mi of beach in St. Johns County is classified as Critically Eroded (FDEP 2002c).

In the case of the St. Augustine Inlet, the natural orientation of the inlet was northwest-southeast from the mid-1800's through 1937 (Figure 3-5). Between 1937 and 1957, however, the USACE, with local sponsorship from the newly created St. Augustine Port, Waterway, and Beach District, undertook a series of measures to stabilize the inlet and improve navigation. In 1940, the USACE cut a new channel that oriented in an east-west direction approximately 400 yards north of the natural inlet. The following year, they constructed a 1,580-ft-long sand-trapping north groin, now referred to as the "north jetty." As a final stabilization measure, the USACE constructed the 3,695-ft-long "south jetty" in 1957. These measures contributed to the ongoing morphological changes occurring south of the St. Augustine Inlet outlined below (Taylor Engineering, Inc. 1994).

1924-1937	Bird Island became a spit as it attached to Anastasia Island.
1937-1952	North Point, separated from Vilano Beach during inlet construction, merged with Crazy Bank, the most significant shoal south of the inlet. The new landmass resulting from this merger became known as Conch's Island.
1952-1970	Conch's Island merged with Anastasia Island as it enveloped Bird Island. A massive spit by 1970, Conch's Island enclosed the 2-mile embayment known today as Salt Run Lagoon.

3.3.2. Beach Sediment Characteristics

The State of Florida occupies a part of the geographic unit called the Floridian Plateau, a partially submerged, 500-mile-long tableland that separates the Gulf of Mexico from the Atlantic Ocean (USACE 1979). The plateau has existed as dry or submerged land for millions of years. The following excerpt from the USACE's *Feasibility Report for Beach Erosion Control, St. Johns County, Florida* (1979) discusses the typical beach sediment characteristics of St. Johns County:

> Young shorelines of emergence in St. Johns County are characterized by sandy barrier islands, lagoons, and swamps that separate the mainland from the ocean. Beneath the sandy surface exists a mix of sand and shell of unconsolidated sedimentary form and, beneath the unconsolidated layer, large areas of coquina rock in various stages of consolidation. Within tidal lagoons north and south of the inlet, subsurface conditions vary widely. For example, shell deposits in the subsurface strata range from a few fragments to 100 percent shell content. Soft silts and organic materials typically found in marsh areas range in thickness from very thin to over 16 ft. Below the soft silts and organic materials lie a variety of elements ranging from sands to fine silt and clay (USACE 1979).

Finally, the Anastasia Formation, coquina rock composed of 60 to 90 percent shell, occurs in various locations south of St. Augustine Inlet. These are easily eroded by wave action and constantly contribute a supply of shell fragments to the County Beaches (Pilkey *et al*. 1984).

The USACE's report (1979) addresses the characteristics of sand located at St. Augustine Inlet and the adjacent beaches. Notably, the sands found on the beaches north and south of the inlet differ significantly. North of the inlet at Vilano Beach, sand grain sizes range from very fine to very coarse sand (0.07 to 2.28 mm - Wentworth Classification), compared to fine to coarse sand (0.18 to 0.51 mm - Wentworth Classification) at Conch's Island south of the inlet. The coarser sand at Vilano Beach also contains much higher shell content than the sand found further south in St. Johns County. In general, mean sediment size increases from the dune to the Mean Low Water line.

3.3.3. Waves and Wind

As a part of the USACE Wave Information Study (WIS), the Engineering Research and Development Center develops and maintains wave hindcast data records for select locations along the eastern Atlantic seaboard (USACE 1995). Data from WIS station A2025, located at 30.00N 81.00W or 28 km (18 mi) east of St. Augustine Beach, were used to compute wave statistics for the 20-year period from 1976 to 1995 and characterize wave and wind climate for St. Johns County. Figures 3-6 and 3-7 show wave height, wave period, wave direction offshore, wind speed, and wind direction offshore for WIS Station A2025. These illustrate the range of wave and wind parameters by direction. Wave and wind directions originating between 0° N and 180° N approach the shore, with shore normal assumed to be 90° N.

Prevalent wind direction in St. Johns County is between the northeast and the southwest with winds under 10 m/s (22 mph). About 60 percent of the waves are from the east, north, and southeast and display wave heights less than 1.5 m (5 ft) and periods less than 8 seconds. Occurrences of higher wave heights and periods are common during storms. The storms that are referred to as northeasters produce high winds and large wave heights from the northeast and can last several days into weeks. Hurricane swells, which are more short-lived, generate large wave heights and higher wave periods. The largest waves generally occur from northeasters during late fall, winter, and early spring. Summers are typically tranquil with the exception of passing hurricanes. In the past seven years, five hurricanes have passed within 150 mi of St. Johns County: Erin in 1995, Floyd and Irene in 1999, Gordon in 2000, and the most recent, Gabriele in 2001. All of these caused significant damage and erosion along the beaches of the County (Williams *pers. comm.* 2001).

3.3.4. Tides and Currents

St. Johns County experiences semidiurnal tides, or two high tides and two low tides each day. Table 3-2 lists the National Ocean and Atmospheric Administration's (NOAA) National Ocean Service (NOS) published tidal datum elevations for St. Augustine Beach. St. Augustine Beach exhibits an average daily tide range of 1.4 m (4.6 ft).

3.4. MANMADE FEATURES

Table 3-3 summarizes past, ongoing, and proposed types and lengths of various shore protection measures for St. Johns County, while Figure 3-8a and 3-8b show the locations of these measures. Shore protection measures include coastal armoring, beach nourishment, beach disposal of

dredged materials from inlet and channel maintenance, dune protection and enhancement, and dune restoration.

3.4.1. Coastal Armoring

Coastal armoring along St. Johns County includes jetties, groins, rock revetments, seawalls, retaining walls, rip-rap, and rocks (Table 3-3). As shown in Figures 3-8a and 3-8b, jetties and groins are located mostly in and near the inlets, while walls, rocks, revetments, and rip-rap structures occur throughout the County's shoreline. With the exception of the St. Augustine Beach seawall, most of the armoring structures are used for residential and condominium property protection. Approximately 2.6 mi or 8 percent of the shoreline in St. Johns County is armored (Table 3-3).

3.4.2. Beach Nourishment

Beach nourishment involves the dredging, transfer, and disposal of sand from offshore "borrow" areas onto eroded sections of coastline. A large federally sponsored project was completed in 2002. It involved the placement of beach fill along 2.9 miles of shoreline in the northern portion of Anastasia Island (R-137 to R151). At buildout it had a designed beach berm width of 60 ft at a crest elevation of 12 ft above Mean Low Water (MLW). An adjacent smaller project, cost-shared by St. Johns County and FDEP, placed sand on an additional 0.9 miles of beach immediately south of the Federal project (R-132 to R-137). It too was completed in 2002. Taylor Engineering, Inc. recommended that the projected 2,040,000 cubic yards of material obtained from the inlet ebb and flood shoals adjacent to St. Augustine Inlet be applied to the downdrift beaches of the County every four years (Taylor Engineering, Inc. 1997). These projects were the first major renourishment projects in St. Johns County.

3.4.3. Beach Placement from Dredging Activities

The USACE Jacksonville District, the entity responsible for ensuring the navigability of the two inlets in St. Johns County, must dredge sediments that impede navigation in channels. Very often, the sediment that accumulates in the channels of the intracoastal waterway and inlet entrances is beach-quality and can be placed on the beach. Dredged material from the navigation channels was disposed offshore until 1996. However, in that year suitable material was dredged and placed on the downdrift beaches south of the inlet (FDEP 1998b).

Figure 3-8b shows the location in Summer Haven north of Marineland (R-200 to R-208) of the disposal area for beach-quality material dredged from the Intracoastal Waterway and Matanzas Inlet in St. Johns County. According to the Beach Disposal Management Plan, the mean frequency of this event is projected to be once every 2.7 years (Taylor Engineering, Inc. 1991). The beach disposal south of Matanzas Inlet differs from a typical beach nourishment project in that the goal of the fill placement is not necessarily to create a stable beach. Rather, the dredging and disposal operation is intended to provide a means of effective long-range dredged material management—by bypassing the sand to the beaches south of the inlet that is typically lost from the littoral system and deposited in the inlet and adjacent Intracoastal Waterway.

3.4.4. Dune Enhancement and Restoration

Additional shoreline protection measures include sand fences that are installed either parallel or diagonal to the shoreline. In 1999, the USACE carried out a dune restoration project along the southern portion of Anastasia State Park (Figure 3-8b). The restoration encompassed the area between monuments R-135 to R-138. A more extensive dune restoration project is planned for that area (R-132 to R-141) in 2002 in conjunction with the proposed beach renourishment project.

3.4.5. Future St. Augustine Inlet Management Measures

During 1998, the FDEP adopted the following management actions for the St. Augustine Inlet (FDEP 1998a):

1. **Continue to bypass suitable sediment to the downdrift beaches.**
   As a first priority, material will be placed on the beach in areas of greatest need, as determined by FDEP, with an initial goal of having an average annual placement of 510,000 cubic yards on downdrift beaches.

2. **Restore the downdrift beaches, designated by the Department as experiencing critical erosion, to mitigate the effects of the inlet.**
   This action may be pursued under the St. Johns County Shore Protection Project or other available state or Federal authorizations.

3. **Pursue modifications to the inlet structures to improve natural sediment bypassing.**
   This action should be initiated in conjunction with the Federal St. Augustine Harbor Navigation Project in the form of a General Reevaluation Report or other appropriate study.

4. **Develop and implement a dune management program to restore and maintain the dune system located within the downdrift influence zone of the inlet.**
   To the extent possible, implementation should occur in conjunction with construction of the beach restoration project.

5. **Implement a comprehensive beach and offshore monitoring program subject to the approval of the Department.**
   The program will be used to identify beach placement locations for future bypassing efforts and to revalidate the sediment budget.

3.5. BIOLOGICAL RESOURCES

The 42.0-mile oceanfront of St. Johns County includes a variety of natural communities and ecological conditions. Some areas have wide, gently sloping beaches and relatively natural vegetation in the foredune and backdune communities. Other areas have experienced, or are experiencing, severe to moderate erosion marked by steep slopes with little or no vegetation. In addition to sea turtles and the Anastasia Island beach mouse, a variety of plants and other animals find suitable habitats within the HCP Plan Area. This portion of the report provides information concerning the biological resources that exist within the boundaries of the Plan Area and gives specific attention to the animals and plants that have been designated by the Federal government and the State of Florida as "endangered" or "threatened" (Table 3-4).

3.5.1. Natural Communities

In its publication *Guide to the Natural Communities of Florida*, the Florida Natural Areas Inventory (FNAI and FDEP 1990) defines 81 natural community types present in Florida. Six of these, Beach Dune, Coastal Grassland, Coastal Strand, Scrub, Maritime Hammock, and Estuarine Tidal Marsh, are present within the HCP Plan Area (Appendix D). General descriptions of these communities, including identification of the dominant vegetation and typical animals, are provided below. The plant names provided are consistent with the nomenclature in the *Guide to the Vascular Plants of Florida* by Richard P. Wunderlin (1998).

3.5.1.1. Beach Dune

The Florida Natural Areas Inventory (FNAI; 2001) defines the Beach Dune as "a wind-deposited foredune and wave-deposited upper beach that are sparsely to densely vegetated with pioneer species, especially sea oats." The Beach Dune community extends throughout the Plan Area, with occasional interruptions where seawalls, other beach stabilization measures, or development have replaced the natural community. The width of this zone within the Plan Area varies considerably. In some areas, where there has been substantial erosion and/or development, this community might be very narrow (i.e., less than 25 ft wide). In other areas, where there has been comparatively modest erosion and little or no landward development, it might be very wide displaying a natural gradation into the Maritime Hammock community.

In a significant portion of St. Johns County, the Beach Dune community consists of multiple lines of dunes running parallel to the shore. In particular, the region from Butler Beach through Crescent Beach (Figure 1-2b) exhibits primary, secondary, and often, tertiary systems of dunes formed from wind-blown sand and separated by interdunal swales. Countywide, these dunes vary considerably in height, reaching maximum elevations of approximately 44 ft along the shorefront sand dune ridge of Ponte Vedra Beach and GRSP (Figure 3-3; Pilkey *et al.* 1984). In some areas where the Beach Dune community is narrow and low (e.g., Summer Haven), wave-induced beach erosion has caused low dunes to be overwashed on a repeated basis.

The plants and animals that exist in the Beach Dune community are species that are able to withstand harsh environmental conditions, including loose, dry, unstable, and poor soils, exposure to wind and salt spray, sand abrasion, intense sunlight, and periodic storms. The dominant

vegetative species within this zone include sea oats (*Uniola paniculata*) and a variety of "pioneer plants" that exist above the seasonal high water levels, including beachgrass (*Panicum amarum*), cordgrass (*Spartina patens*), dune sunflower (*Helianthus debilis*), and morning glories (*Ipomoea imperati and I. pes-caprae*).

Due to the harsh environmental conditions, the diversity of animals that permanently inhabit the Beach Dune community is lower than in many other natural communities. Various shorebirds, such as black-bellied plovers (*Pluvialis squatarola*) and sanderlings (*Calidris alba*), often forage for sand fleas (*Emerita talpoida*) and other organisms at the beach/ocean interface, while gulls and terns often rest on the open beach. An abundant resident animal in this area is the ghost crab (*Ocypode quadrata*). The Anastasia Island beach mouse, which is described in detail in section 3.5.2.1.2., is found almost exclusively in this habitat.

3.5.1.2. Scrub

The FNAI (2001) defines Scrub as "a closed to open canopy forest of sand pines with dense clumps or vast thickets of scrub oaks and other shrubs dominating the understory." In most Scrub communities, the ground cover is relatively sparse, with frequent patches of barren sand. Scrub occurs on old sand dunes along historic shorelines. Fire is an essential element in the Scrub community, and areas that are protected from fire will succeed to xeric hammock. Typical plants found in Scrub habitats in northeast Florida include sand pine (*Pinus clausa*), sand live oak (*Quercus geminata*), Chapman's oak (*Quercus chapmanii*), myrtle oak (*Quercus myrtifolia*), rosemary (*Ceratiola ericoides*), and gopher apple (*Licania michauxii*). Animals that inhabit the Scrub community include the six-lined racerunner (*Cnemidophorus sexlineatus sexlineatus*), gopher tortoise (*Gopherus polyphemus*), rufous-sided towhee (*Papilo erythrophthalmus*) and, in the winter, yellow-rumped warbler (*Dendroica coronata*). The FNAI has reported that areas of Scrub are present on the barrier island north of St. Augustine Inlet along GRSP (Appendix D).

3.5.1.3. Coastal Strand

The FNAI (2001) defines the Coastal Strand as "stabilized wind-deposited coastal dunes that are vegetated with a dense thicket of salt-tolerant shrubs, especially saw palmetto." In areas where the natural communities remain intact, the Coastal Strand is actually a transitional community that is generally situated between the Beach Dune community and the Maritime Hammock. This backdune community varies considerably in abundance throughout the Plan Area. It is largely absent from areas of residential development and is largely intact in government-owned (e.g., GRSP) and undeveloped tracts. The dominant vegetation is saw palmetto (*Serenoa repens*). Other vegetation present in the Coastal Strand includes cabbage palm (*Sabal palmetto*), yaupon holly (*Ilex vomitoria*), and sand live oak. Animal life in this community includes gopher tortoise, snakes, such as the coachwhip (*Masticophis flagellum flagellum*), and various small mammals, such as the eastern cottontail rabbit (*Sylvilagus floridanus floridanus*) and spotted skunk (*Spilogale putorius ambarvalis*).

3.5.1.4. Coastal Grassland

The FNAI (2001) defines the Coastal Grassland as "treeless flat land or gently undulating land with barren sand or a sparse-to-dense ground cover of grasses, prostrate vines, and other herbaceous or suffrutescent species that are adapted to harsh maritime conditions." The Coastal Grassland community is typically located in the vicinity of inlets and overwash areas, where herbaceous vegetation colonizes recently deposited sands. In areas where this community is not subject to recurring overwash or other negative environmental or human-related impacts, Coastal Grassland eventually becomes colonized by shrubs and trees and naturally succeeds into Coastal Strand or Maritime Hammock habitats.

Within the Plan Area, the most extensive example of a Coastal Grassland community is on the north side of the St. Augustine Inlet at Porpoise Point. In other areas, Coastal Grassland is present only in small, intermittent patches that have been subjected to dune overwash in the relatively recent past (i.e., within five years).

Typical plants in this community include sand spurs (*Cenchrus* spp.), prickly pear cactus (*Opuntia stricta* and *O. humifusa*), beach elder (*Iva imbricata*), and sea purslane (*Sesuvium portulacastrum*). Animals that are typically found in the Coastal Grassland include ghost crabs, red-winged blackbirds (*Agelaius phoeniceus*), and wintering savannah sparrows (*Passerculus sandwichensis*).

3.5.1.5. Maritime Hammock

The FNAI (2001) defines the Maritime Hammock as "a narrow band of hardwood forest lying just inland of the Coastal Strand community. Maritime Hammock occurs on old coastal dunes that have been stabilized long enough for the growth of a forest." Within the Plan Area, with the exception of large government-owned tracts (e.g., GRSP), only small remnants of Maritime Hammock are present. The dominant vegetation is primarily tree and shrub species, including Florida's state tree, the cabbage palm, saw palmetto, silk bay (*Persea borbonia* var. *humilis*), coral bean (*Erythrina herbacea*), and beautyberry (*Callicarpa americana*). Groundcover species are comparatively few. Animals present within the Maritime Hammock community include the mammals that also frequent the Coastal Strand (described above), raccoons (*Procyon lotor*), and a variety of resident birds, such as the northern cardinal (*Cardinalis cardinalis*), as well as migratory birds such as warblers (*Dendroica* spp.).

3.5.1.6. Estuarine Tidal Marsh

The FNAI (2001) defines the Tidal Marsh as "expanses of grasses, rushes and sedges along coastlines of low wave-energy and river mouths." These areas are typically subjected to routine tidal inundation by saline waters. The salinity may vary, particularly from season to season, but will normally be intermediate between freshwater and ocean water. Although there are extensive areas of Estuarine Tidal Marsh in St. Johns County, only very small areas of this habitat are present within the Plan Area. The largest of these areas is on the west side of ASP. The dominant vegetation in this community includes black needlerush (*Juncus roemerianus*) and

smooth cordgrass (*Spartina alterniflora*). Other plants include saltgrass (*Distichlis spicata*), seashore dropseed (*Sporobolus virginicus*), and glassworts (*Salicornia* spp.).

Wildlife in the Estuarine Tidal Marsh include a variety of invertebrates, reptiles, mammals, fish, and birds, including marsh periwinkles (*Littorina irrorata*), fiddler crabs (*Uca* spp.), diamondback terrapin (*Malaclemys terrapin*), and raccoons. Although most species of fish are not present in this community on a continual basis, juveniles of many species will extend into the salt marsh during high tides. A variety of wading birds (e.g., herons, egrets, rails) inhabits this community either as year-round or seasonal residents. Some birds, such as the clapper rail (*Rallus longirostris*), nest in the tall marsh grasses.

3.5.2. Listed Species in the Plan Area

Given the comparatively large size (approximately 2,400 acres) of the Plan Area and the varied natural communities that are located within it, habitat is available for a broad diversity of flora and fauna. Over 475 species of plants and over 400 species of animals have been documented within GRSP alone, and this park comprises only 4.7 mi (approximately 11.4 percent) of the 42.0 mi within the HCP Plan Area boundaries. Within these varied communities, there is habitat for numerous invertebrates (including mollusks, arthropods, crustaceans, and insects), fish, amphibians, reptiles, birds, mammals, and plants.

Information concerning the plants and animals within the HCP boundaries was obtained through a variety of sources, including both cursory field excursions and reviews of previously published materials. Included in these materials is information concerning sedentary species (e.g., plants), species with comparatively small ranges (e.g., beach mice), and species that are highly migratory (e.g., sea turtles and many birds) that may use portions of the Plan Area for only part of the year.

The primary focus of this HCP is the protection of sea turtles, the Anastasia Island beach mouse, and other animals and plants that are designated by the Federal government as "endangered" or "threatened." Current species lists for animals and plants contained in 50 CFR 17 and 50 CFR 23 respectively, were used as the basis for field surveys and data inquiries. This work effort also included inquiries and searches for species that are protected by the State of Florida.

The FWC is the State agency responsible for enforcing Florida's wildlife protection regulations. Under this authority, FWC evaluates the populations of various species and designates animals whose populations are threatened by natural and/or anthropogenic impacts as "endangered," "threatened," or "species of special concern." In Florida, the authority to regulate plants rests with the Department of Agriculture and Consumer Services (DACS), which evaluates plant populations and, as warranted, designates individual plant species as "endangered," "threatened," or "commercially exploited."

Both the State and Federal governments may list species. However, because of varied habitat requirements and geographic distributions, an individual species' designation may vary at the Federal and State levels. Information regarding the presence of listed species within the Plan Area comes from two primary sources: 1) literature search and 2) field investigation. The results of these studies are described below.

Information concerning protected flora and fauna that have been observed within the Plan Area are primarily restricted to records available from the Florida Division of Recreation and Parks and the FNAI. At some locations where large tracts are in public ownership (i.e., GRSP and ASP), intensive surveys have already been performed to document the presence and/or abundance of protected plant and animal species. Prior to conducting field surveys, information was obtained from published sources to create a database for protected species throughout the Plan Area. The major literature sources include:

Florida Natural Areas Inventory, October 2001 (FNAI 2001). The FNAI maintains the single most comprehensive database of protected species in Florida. Based in Tallahassee, FNAI continually updates locations of protected species as verified reports are provided by governmental and private entities that are conducting fieldwork throughout the State. A query of FNAI's database revealed the known occurrence of various protected plants and animals within the Plan Area (FNAI 2001; Appendix D). In interpreting the FNAI database, the absence of listed species information at a specific site does not necessarily mean that the species does not occur at the site. Instead, it merely identifies that no documented sightings have been reported to FNAI.

Guana River State Park Unit Management Plan, November 1999 (FDEP 1999). This State-owned, beachfront tract encompasses almost 2,500 acres, extending from the Atlantic Ocean to areas west of SR A1A. 4.7 mi of oceanfront shoreline are within the Plan Area. A variety of surveys for flora and fauna have been conducted since its acquisition in 1984. These surveys, together with the records of observations by park staff, provide the most detailed biological inventories within the Plan Area.

Anastasia State Recreation Area (Anastasia State Park) Unit Management Plan, May 1998 (FDEP 1998a). Acquired by the State between 1949 and 1987, ASP contains approximately 1,370 acres, including 2.5 mi of beachfront habitat within the Plan Area. Inventories of the wildlife and plants found in the state park have been compiled from biological surveys and park staff observations.

Draft General Management Plan for Fort Matanzas National Monument, February 1982 (NPS 1982). This ± 300-acre tract is owned by the Federal government and managed by the U.S. Department of the Interior's National Park Service primarily as a site of historical significance. Located near St. Johns County's southern boundary, the majority of this tract is situated west of the CCCL on Rattlesnake Island. Approximately 50 acres of this property is east of the Matanzas River. The Draft General Management Plan provides detailed descriptions of the historical and cultural resources of the property, but has relatively little information concerning endangered and threatened species.

Atlas of Marine Resources, Version 1.3, Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, 2000 (FWC 2000). The state of Florida maintains a comprehensive database concerning the endangered West Indian Manatee. Site-specific information concerning the locations of manatee sightings and mortalities in St. Johns County was obtained using this CD.

Field Investigation

In November 2001, biologists from Ecological Associates, Inc. (EAI), in conjunction with staff from Taylor Engineering, Inc. and the Florida Park Service, performed a field assessment of the entire length of the HCP Plan Area to characterize natural communities and document the presence of listed species.

Cumulative analyses of these data sources revealed the presence or likely presence of a variety of plants and animals that are protected by Federal and/or State regulations. Federally designated species that are reported to occur within or adjacent to the Plan Area are identified in Table 3-4 and are later described. In situations where an individual federally listed species is also protected by State endangered species regulations, the State designation is also provided. The extent to which the protected species identified in Table 3-4 are present in any specific area within the HCP Plan Area is directly related to the extent and quality of available requisite habitat. No federally listed fish, invertebrates, or plants are known to occur within the Plan Area.

3.5.2.1. Listed Wildlife Species

Table 3-4 identifies 15 species of wildlife within or adjacent to the HCP Plan Area that are listed by the Federal government as endangered or threatened. Information concerning these wildlife species is provided in this section.

3.5.2.1.1. Sea Turtles

3.5.2.1.1.1. Loggerhead Turtle (Caretta caretta)

3.5.2.1.1.1.1. Biological Information on the Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) was federally listed on July 28, 1978, as a threatened species under the ESA (43 FR 32800). Internationally, it is considered "endangered" by the World Conservation Union (Hilton-Taylor 2001) and is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The loggerhead turtle is circum-global in distribution and inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). Loggerhead turtles spend virtually their entire life cycle in marine and estuarine waters, with the exception of brief periods when adult female turtles come ashore to lay their eggs.

The National Marine Fisheries Service (NMFS) and the USFWS (1991a) summarized the geographic distribution of loggerhead turtle nesting. Approximately 88 percent of loggerhead turtle nesting occurs in the southeastern United States, Oman, and Australia. Approximately 50,000 to 85,000 loggerhead turtle nests are deposited on southeastern U.S. beaches annually, ranking this rookery as the second largest in the world (NMFS and USFWS 1991a, FWC *unpublished data* 2002). The vast majority of this nesting occurs in Florida. The beaches of east central and southeast Florida from Brevard to Broward Counties are especially prolific nesting areas, accounting for about 90 percent of the total nests deposited each year in Florida (Meylan *et al.* 1995).

The adult loggerhead foraging grounds for the south Florida nesting population are thought to be around the Caribbean Islands of the Bahamas, Cuba, and Dominican Republic, as well as around the eastern seaboard of the United States, Florida Keys, and Gulf of Mexico (Meylan 1982, Meylan *et al.* 1983, Henwood 1987, Rankin-Baransky 1997). The average female makes reproductive migrations between her foraging grounds and nesting beach every two or three years (Richardson and Richardson 1982, Murphy and Hopkins 1984). Best available scientific information suggests that loggerheads, like other species of sea turtles, return to their natal beaches to lay their eggs (Bowen *et al.* 1993).

Mating season in southeastern Florida begins in early March, prior to commencement of nesting. The first loggerhead nests begin to appear in late April, and the last nests are deposited in early to mid-September (NMFS and USFWS 1991a, Meylan *et al.* 1995). Nesting peaks during the months of June and July. Aerial surveys have shown the numbers of adult turtles off the east coast of Florida to be about 15 times higher in the spring and summer than in the fall and winter, indicating that adults migrate from elsewhere to mate and nest (Thompson 1984, National Research Council 1990).

The general nesting process for all species of sea turtles is stereotypical, with subtle variations (Miller 1997). Hailman and Elowson (1992) documented the sequential behaviors associated with loggerhead turtle nesting (ascending the beach, making the body pit, digging the egg chamber, laying eggs, filling the egg chamber, covering the body pit, and returning to the surf). Unless otherwise noted, the phases described below for loggerheads apply to the other sea turtle species as well.

Nesting occurs almost exclusively at night. Female sea turtles emerge from the surf zone and ascend the beach in search of an appropriate place to construct their nests. If a suitable nesting site cannot be found, the turtle will return to the ocean (a non-nesting emergence or false crawl) and will typically select another site either later that night or the next night (Miller *et al.* in press). If the turtle receives favorable visual cues, and if undisturbed, she will emerge from the water and ascend the beach.

For development, sea turtle eggs require a low-salinity, high-humidity, well-ventilated substrate that is not inundated by tidal overwash (Miller 1997). It has been suggested that abrupt changes in temperature, moisture, salinity, and/or beach slope along an ocean-to-dune gradient may aid in nest site selection (Stoneburner and Richardson 1981, Wood and Bjorndal 2000). Nest placement may also be influenced by local lighting conditions and/or the presence of structures on the beach. On urban beaches, where a bright sky glow is often present landward of the beach, Salmon *et al.* (1995a) found that females tended to concentrate their nests on the beach within the darker silhouettes of large condominiums, and nested with lower frequency in the more illuminated areas between the structures. Mosier (1998) and Bouchard *et al.* (1998) observed that nest densities in front of armoring structures were reduced relative to areas of natural dune vegetation.

Once a suitable site is found, the turtle will begin excavating a shallow body pit. At the rear of this depression, she will then excavate an egg chamber, which is about 60 cm deep (Ernest and Martin 1999). Into the egg chamber, the loggerhead female will usually deposit between 100

and 120 eggs (Ehrhart 1979, Raymond 1984, Ehrhart and Witherington 1987, Steinitz 1990, Broadwell 1991, Ernest and Martin 1993, Ehrhart 1995). Once egg-laying is complete, the female packs the top of the egg chamber with moist sand with her rear flippers then covers the entire body pit by throwing sand backwards with her front flippers. The turtle then crawls back to the ocean. The average time that a loggerhead turtle spends on dry land during the entire nesting process is 63.0 minutes (Hailman and Elowson 1992). The young receive no subsequent parental care.

Female sea turtles typically lay several clutches of eggs during each season that they nest (Ehrhart 1982, Murphy and Hopkins 1984). In a review of literature on loggerhead turtles, Ehrhart (1989) concluded that the estimate of 4.1 nests per female made by Murphy and Hopkins (1984) was the current best estimate of mean intraseasonal clutch frequency in this species. Renesting intervals vary among species but are generally approximately two weeks (Hirth 1980, Ehrhart 1982). Individuals usually return to the same general area to lay successive clutches (Carr 1967, Dodd 1988). Recent genetic evidence supports long-held beliefs that turtles exhibit a natal homing instinct (i.e., upon reaching reproductive age, sea turtles return to their natal beaches to nest) (Meylan *et al*. 1990, Bowen *et al*. 1993, Allard *et al*. 1994, Encalada *et al.* 1998).

Genetic research (mtDNA) has identified five distinct loggerhead nesting subpopulations/nesting aggregations in the western North Atlantic (Bowen 1994, 1995a, and 1995b, Bowen *et al*. 1993, Encalada *et al.* 1998, Pearce 2001):

- Northern (North Carolina, South Carolina, Georgia, and northeast Florida);
- South Florida (from 29°N latitude on Florida's east coast to Sarasota on Florida's west coast);
- Dry Tortugas, Florida
- Northwest Florida (Eglin Air Force Base and the beaches near Panama City); and
- Yucatan (eastern Yucatan Peninsula).

Data indicate that gene flow between these five regions is very low. If nesting females are extirpated from one region, dispersal from adjacent subpopulations will not be sufficient to replenish the depleted stock. The Northern Subpopulation has declined substantially since the early 1970s, but most of that decline occurred prior to 1979. No significant trend has been detected in recent years (TEWG 1998 and 2000). Adult loggerheads of the South Florida Subpopulation have shown significant increases over the last 25 years, indicating that the subpopulation may be recovering. Between 1989 to 1998, based on the State of Florida's Index Nesting Beach Survey program, loggerhead nesting in Florida appears to be stable or increasing (Witherington and Koeppel 1999). Nesting surveys in the Northwest Florida and Yucatan Subpopulations have been too irregular to date to allow for a meaningful trend analysis (TEWG 1998 and 2000). The Dry Tortugas Subpopulation has only recently been identified as a distinct management unit (Pearce 2001).

To date, it has not been possible to identify precise boundaries between the Northern and South Florida Subpopulations. Encalada *et al.* (1998) hypothesized that the break should occur somewhere between Amelia Island and Cape Canaveral, which includes St. Johns County.

Recent analyses of samples from Amelia Island and Volusia County do not resolve the issue (Pearce 2001). The Volusia County area may represent yet another distinct nesting subpopulation or an overlap of the two adjacent subpopulations.

From the time a female turtle crawls onto the beach until the time that egg laying begins, she may be disturbed by noises, lights, or movement on the beach (Hendrickson 1958, Dodd 1988). This may cause her to abort her nesting attempt and return to the ocean (Hailman and Elowson 1992). Disruption to the nesting process may place an energy burden, and hence a reproductive cost, on a female turtle, but this impact has not been quantified. The further into the nesting process she becomes, particularly with respect to digging activity, the greater the potential energy cost associated with the disruption. Repeated disruptions may cause a turtle to venture to a "safer" area or deposit her eggs in a suboptimal habitat (Murphy 1985). Excessive energy expenditures theoretically could reduce an individual's total reproductive output for the season. Salmon *et al*. (1995a) studied nesting preference in loggerheads on the urbanized beaches of Boca Raton, Florida. They report that nesting turtles showed a propensity for nesting in front of dark buildings and trees that block bright lights and urban glow. This indicated that light barriers might be effective in mitigating lighting problems. However, shading from light barriers may affect the incubation temperature of nests and result in skewed sex ratios of hatchlings produced.

During incubation, sea turtle nests can be impacted by a variety of natural and anthropogenic factors. Natural factors include tidal inundation, erosion, sediment accretion, root invasion, excavation by other turtles, and predation (Bustard and Greenham 1968, Stancyk 1982, Whitmore and Dutton 1985, Ehrhart and Witherington 1987, Ernest and Martin 1999, EAI 2001b). Human-related impacts include construction activities, stormwater and pool runoff, deliberate or incidental excavation of eggs, nest penetration by recreational equipment (e.g., beach umbrellas, volleyball posts), and excessive pressure above the nest caused by foot or vehicular traffic (Mann 1977, Witham 1982, Coston-Clements and Hoss 1983).

Sea turtle nests incubate for variable periods of time. The loggerhead turtle incubation period ranges from approximately 49 to 80 days for nests left *in situ* (in place) (Dodd 1988). The warmer the temperature of the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sediment temperatures prevailing during the middle-third of the incubation period also determine the phenotypic sex of sea turtles (Mrosovsky and Yntema 1980). Moisture conditions in the nest similarly influence incubation period, hatching success, and hatchling size (McGehee 1990). Sea turtle hatchlings do not typically emerge from the nest immediately after hatching from their eggs. Instead, they remain in the egg chamber for several days before ascending to the beach surface (Christens 1990). The inclusive time between the date a clutch of eggs is laid and the date the first hatchling emerges from the nest is termed the incubation period. The average incubation period for loggerhead nests along the central and south Florida east coast is typically between 49 and 54 days (Ehrhart and Witherington 1987, EAI 2000a and 2001b). In Volusia County, Florida, the incubation period for loggerheads is slightly longer and typically ranges between 47 and 73 days (EAI 2001a). Incubation periods for loggerhead nests in St. Johns County range between 46 and 76 days in 2001 (FWC *unpublished nesting* 2002).

Hatchlings emerge from their nests almost exclusively at night, presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al*. 1990). Nighttime emergences are beneficial, because the risks of predation and hyperthermia are reduced. An abrupt lowering of sand temperatures after nightfall apparently increases hatchling activity and elicits an emergence response. Even after the initial emergence of hatchlings from the nest, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Ernest and Martin 1993). The number of hatchlings leaving each nest is extremely variable. Ehrhart and Witherington (1987) reported that average emerging success (percentage of eggs that produce hatchlings which escape from the nest) of 85 nests in southern Brevard County was 63.7 percent. Thus, the average loggerhead nest (116 eggs) would produce about 74 hatchlings.

Emergence marks the beginning of the period of high activity during which hatchlings enter the sea and swim away from land in a "frenzy" (Wyneken and Salmon 1992). Hatchlings may use a variety of cues to guide them to the offshore, pelagic environments where they spend their early years (Carr 1987, Bolten *et al*. 1993, Witherington 1994, Bolten and Balazs 1995). Hatchlings first use light cues to find the ocean. On natural, undeveloped beaches, ambient light reflected off the ocean creates a relatively bright horizon compared to the dark dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Witherington 1992, Salmon *et al*. 1992), where they then begin orienting to waves (Wyneken *et al*. 1990). Salmon *et al*. (1995b) demonstrated scientifically the relationship between artificial lighting and disorientation.

Prevailing waves along Florida's east coast during the nesting season are typically from the east and southeast. By swimming into the waves, hatchlings are guided to offshore habitats. Upon entering the surf, hatchlings swim incessantly in an offshore direction for about 24 hours (Wyneken and Salmon 1992). During this period, they also may set an internal magnetic compass, which may account for their ability to accurately navigate over long distances in the world's oceans (Lohmann and Lohmann 1994). Cues hatchlings receive in the nest or between the time they leave the nest and arrive at offshore habitats may be critical to their ability to return to their natal beaches for nesting as adults.

Western Atlantic loggerheads are estimated to spend about ten years in the pelagic environment (Bolten and Balazs 1995). When loggerhead turtles reach the size of 40-60 cm (1.3-1.9 ft) straight carapace length, they move into various inshore estuaries or reef-system habitats in the shallow coastal waters of the western Atlantic (Carr 1986 and 1987). The nearshore regions where juvenile and subadult loggerheads live and forage have been termed developmental habitats. Loggerheads may reside in these developmental habitats either seasonally or year-round until they reach sexual maturity, which is estimated to occur between 20 to 30 years or more of age (Frazer and Ehrhart 1985, Klinger and Musick 1995, Parham and Zug 1997).

Hatchlings may be impacted by a variety of natural processes and human activities, both while in the nest and during their nest-to-sea migration. Prior to emerging from the nest, hatchlings are vulnerable to predation (by raccoons, ghost crabs, and other predators) and tidal inundation (Stancyk 1982, Ehrhart and Witherington 1987, Milton *et al*. 1994, Martin 1996). If water fills the nest and does not drain rapidly, the hatchlings may drown. Vehicles, beach cleaning equipment, foot traffic, and recreational equipment can cause physical disturbances above the

nest, which may crush hatchlings, prematurely remove them from the nest, or cause their premature emergence. Obstacles over the top of the nest may impede or prevent their emergence.

After hatchlings emerge from the nest, they may be attacked by a variety of nocturnal predators, including raccoons, ghost crabs, night herons, dogs, foxes, and cats (Stancyk 1982, Dodd 1988). In addition to mortality from predators, hatchlings also may be impacted by human activities.

Probably the single largest anthropogenic threat to hatchlings along Florida's nesting beaches is the impact of coastal lighting. Because hatchlings instinctively orient to the brightest horizon, they are frequently drawn toward illuminated buildings and roadways in urban areas (McFarlane 1963, Philibosian 1976, Mann 1977, Witherington 1992). False lighting cues can cause misorientation (hatchlings travel along a consistent course towards a light source) or disorientation (hatchlings are not able to set a particular course and wander aimlessly) (Witherington 1990). Both situations have potential for serious impacts.

Hatchlings attracted to lights near roadways may be run over by vehicles. Additionally, prolonged crawling on the beach depletes valuable energy stores that are intended to take the hatchlings on their offshore odyssey. Excessive crawling leads to exhaustion and extends a hatchling's period of vulnerability to terrestrial predators. Weakened hatchlings that eventually reach the ocean may be more vulnerable to marine predators, which are abundant in nearshore waters (Wyneken *et al*. 1994).

In addition to problems created by beachfront lights, hatchlings often must navigate through a variety of obstacles before reaching the ocean. These include natural and human debris, physical structures on the beach, recreational equipment, pedestrian and horse footprints, parked vehicles, and vehicle ruts. As with impacts associated with beachfront lighting, obstacles on the beach interfere with a hatchling's timely progress toward the ocean. Travel times of hatchlings from the nest to the water may be extended when traversing areas of heavy foot traffic or vehicular ruts (Hosier *et al*. 1981). Hatchlings may be upended and spend both time and energy in righting themselves. Although hatchlings may be capable of scaling the walls of some vehicular ruts, the walls often cast a shadow causing the hatchlings to move shore-parallel within the rut in the direction of the brightest light (Mann 1977, Arianoutsou 1988, LeBuff 1990, Cox *et al*. 1994, Hughes and Caine 1994).

3.5.2.1.1.1.2. Site-Specific Information on the Loggerhead Turtle

Between 1988 and 1992, St. Johns County's 42.0 mi of beach supported about 0.3 percent of the total loggerhead nesting in the State of Florida (Meylan *et al.* 1995). More recent data (1996-2001) indicate that an average of about 267.5 loggerhead nests are deposited in the County each season, yielding an overall nest density of 6.5 nests per mile (FWC *unpublished data* 2002; Table 3-5a and 3-5b). Between 1996 and 2000, the highest loggerhead nest densities were reported in Guana River State Park, North St. Augustine Beaches survey zone (actually the Vilano Beach area), and Ponte Vedra South survey zone (Table 3-5a; FWC *unpublished data* 2002). During the 2001 nesting season (new FWC survey zones were used), loggerhead nest densities were greatest in Vilano Beach, Guana River State Park, and Guana River South (Table

3-5b; FWC *unpublished data* 2002). Using another set of data from 1998-2001, the highest loggerhead turtle nesting densities occurred in Fort Matanzas South (Summer Haven), Guana River State Park, Guana River South, and Vilano Beach (Table 3-5c; FWC *unpublished data* 2002, Stoll *pers. comm.* 2002). The earliest recorded nesting by a loggerhead in St. Johns County was on May 1 (Table 3-7). The latest nest was recorded on September 26.

3.5.2.1.1.2. Green Turtle (Chelonia mydas)

3.5.2.1.1.2.1. Biological Information on the Green Turtle

In 1978, the breeding populations of the green turtle (*Chelonia mydas*) in Florida and on the Pacific Coast of Mexico were federally listed as endangered; all other populations were listed as threatened (43 FR 32800).

The green turtle is a circum-global species in tropical and subtropical waters. The major green turtle nesting colonies in the Atlantic Ocean occur on Ascension Island, Aves Island, Costa Rica, and Surinam (NMFS and USFWS 1991b). Nesting in the United States occurs in small numbers in the U.S. Virgin Islands and on Puerto Rico and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties.

Allard *et al*. (1994) concluded that the Florida nesting population of green turtles is genetically distinct, and Meylan *et al*. (1995) stated that the Florida green turtle nesting aggregation deserves recognition as a regionally significant colony. Between 1988 and 1992, Brevard County accounted for nearly 39.5 percent, the majority, of green turtle nesting in Florida (Meylan *et al*. 1995).

The nesting behavior and life history stages of green turtles are similar to those of loggerheads. However, green turtles typically do not begin nesting until late May. Estimates of the number of green turtle nests deposited each year in Florida range from several hundred to over 8,400 (FWC *unpublished data* 2002).

Like the loggerhead, green turtles lay multiple clutches of eggs during the nesting season. Based on research conducted in south Brevard County during 1991 and 1992, Johnson (1994) estimated that green turtles deposited one to seven clutches during the nesting season with an average of about three nests per female. However, he cautioned that, because of inherent biasing factors, the true mean probably lies between three and four.

The mean clutch size of green turtle nests is usually 110 to 115 eggs, but this mean varies among populations (NMFS and USFWS 1991b). Witherington and Ehrhart (1989) reported an average clutch size of 136 eggs for 130 clutches on the east coast of Florida. In south Brevard County, Johnson (1994) reported a mean clutch size of 131 eggs. When data from 1985 through 1992 were combined, Johnson (1994) estimated overall hatchling emerging success to be 56.7 percent; thus, the average nest yielded approximately 74.8 hatchlings. Incubation periods for green turtle nests range from approximately 48 to 70 days (Marquez 1990).

In the State of Florida, green turtle nesting appears to be increasing, at least in the last half of the twentieth century (Dodd 1982, Meylan *et al*. 1995). During the period from 1989 to present, green turtle nesting in Florida has shown a clear biannual periodicity, with relatively low nest numbers being recorded in odd-numbered years and high nest numbers being documented in even-numbered years (Witherington and Koeppel 1999, FWC *unpublished data* 2002).

3.5.2.1.1.2.2. Site-Specific Information on the Green Turtle

Between 1988 and 1992, St. Johns County Beaches supported about 0.1 percent of the State's green turtle nests (Meylan *et al.* 1995). Between 1996 and 2001, an average of 8.3 nests were deposited on County Beaches each year (FWC *unpublished data* 2002). This equates to about 0.2 nests per mile for the entire Plan Area (Table 3-5a and 3-5b). Between 1996-2000, green turtle nest densities were highest in GRSP, ASP, and the areas monitored by FMNM (Crescent Beach Ramp to Flagler County Line) (Table 3-5a). In 2001 when the new FWC survey zones revealed more detail in the nesting trends, green turtle nest densities were highest in Fort Matanzas South, Vilano Beach, and GRSP. Using another set of data from 1998-2001, the highest green turtle nesting densities occurred in Fort Matanzas South (Summer Haven) and Guana River State Park (Table 3-5c; FWC *unpublished data* 2002, Stoll *pers. comm.* 2002). The earliest recorded nesting by a green turtle in St. Johns County was on May 6, though this may be erroneous since green turtle nesting generally does not begin before late May in Florida. The latest nest was recorded on September 14 (Table 3-7).

3.5.2.1.1.3. Leatherback Turtle (Dermochelys coriacea)

3.5.2.1.1.3.1. Biological Information on the Leatherback Turtle

The leatherback turtle (*Dermochelys coriacea*), the largest of the extant species of sea turtle, was federally listed as an endangered species in 1970 (35 CFR 8491). Unlike other sea turtles, the carapace, or top shell, of the leatherback is not covered with bony plates. Rather, its carapace is composed of a black, oil-saturated, rubber-like tissue which is strengthened by a mosaic of thousands of small bones just below the outer skin of the carapace. The morphology of the leatherback is so distinct that it is placed in a separate family (Dermochelyidae) from other extant species of sea turtles (Cheloniidae) (NMFS and USFWS 1992).

Other unique characteristics include the leatherback's presence in cold waters, an internal temperature that exceeds ambient water temperature, and its ability, unique among reptiles, to be active at temperatures that have been reported to be as low as 0 degrees Celsius (Frair *et al*. 1972, Goff and Lien 1988). Whereas the other species of sea turtles tend to inhabit relatively shallow coastal waters where they feed on bottom dwelling plants and animals, leatherbacks tend to be pelagic (Pritchard and Trebbau 1984). They feed primarily on soft-bodied animals, such as jellyfish, that are abundant in the open ocean (Lazell 1980, Hendrickson 1980, Shoop and Kenney 1992).

Leatherback turtles travel great distances between their winter foraging and summer nesting grounds (Goff *et al*. 1994, Girondot and Fretey 1996). The leatherback turtle is found in the Atlantic, Pacific, and Indian Oceans and has been spotted as far north as the Barents Sea,

Canadian Maritime Provinces and Alaska, and as far south as Chile, the Cape of Good Hope, and New Zealand (Pritchard and Trebbau 1984).

Nesting grounds are distributed circum-globally (40º North to 35º South Latitude). The total population of mature females worldwide has been estimated to be about 34,500 (Spotilla *et al*. 1996). At present, two of the largest populations of leatherbacks occur in the Western Atlantic in French Guiana and Suriname (Spotila *et al.* 1996). In French Guiana, 4,500 to 7,500 females are estimated to nest annually, and 600 to 2,000 nesting females in Suriname (Girondot and Fretey 1996). Nesting occurs frequently, but in lesser numbers, from Costa Rica to Columbia and in Guyana and Trinidad (National Research Council 1990). Nesting in the United States occurs primarily in Puerto Rico, the U.S. Virgin Islands, and southeastern Florida.

Until recently, only about 16 to 31 leatherback turtles were thought to nest annually in Florida (Meylan *et al.* 1995, NMFS and USFWS 1992). However, that figure appears to have increased significantly over the last decade (Witherington and Koeppel 1999). The majority (more than 90 percent) of the leatherback turtle nests recorded in Florida between 1988 and 1992 occurred in St. Lucie, Martin, and Palm Beach Counties. During that same period, 0.9 percent occurred in St. Johns County (Meylan *et al*. 1995).

Leatherbacks are thought to migrate to their nesting beach about once every two to three years (NMFS and USFWS 1992, Miller 1997). Nesting by this species in Florida typically begins and ends earlier in the season than for the other species, with the first nests being recorded in late February or early March and the last nests in July (Meylan *et al.* 1995). Tucker (1989) and Tucker and Frazer (1991) reported that leatherback turtles nested an average of five to seven times per year, with a mean internesting interval of nine to ten days. The mean annual clutch size of leatherback turtles varies from 65 to 80 yolked eggs (Tucker and Frazer 1991, NMFS and USFWS 1992), and incubation periods vary from 55 to 75 days (NMFS and USFWS 1992).

On Hutchinson Island, Florida, in Martin and St. Lucie Counties, the average leatherback nest contains 76.8 yolked eggs and the average emerging success is 50.0 percent (EAI *unpublished data* 2001). Thus, a typical leatherback nest unaffected by predation or storms produces about 38 hatchlings. Incubation periods for leatherback nests in Florida are generally longer than for loggerhead and green turtle nests, because leatherbacks have a tendency to deposit nests earlier in the season when cooler temperatures prevail.

3.5.2.1.1.3.2. Site-Specific Information on the Leatherback Turtle

The bulk of leatherback nesting in Florida occurs south of St. Johns County in St. Lucie, Martin, and Palm Beach Counties (Meylan *et al.* 1995). Between 1988 and 1992, St. Johns County received about 0.9 percent of the State's leatherback nesting. Since 1985, a total of 17 leatherback nests have been documented in the County (Meylan et al. 1995). This equates to an average of 1.3 nests per year. The majority of all leatherback nests are deposited in the northern portion of the County in GRSP and Ponte Vedra South (FWC *unpublished data* 2002). Using data from 1998-2001, the highest leatherback nesting densities occurred in Fort Matanzas South (Summer Haven) and Guana River State Park (Table 3-5c; FWC *unpublished data* 2002, Stoll

pers. comm. 2002). The earliest recorded nesting by a leatherback in St. Johns County was on April 18 (Table 3-7). The latest nest was recorded on July 22.

3.5.2.1.1.4. Hawksbill Turtle (Eretmochelys imbricata)

3.5.2.1.1.4.1. Biological Information on the Hawksbill Turtle

The hawksbill turtle (*Eretmochelys imbricata*) occurs in all of the tropical and subtropical oceans. It was federally listed as endangered in 1970 (35 CFR 8491). Throughout their range, hawksbills typically nest at lower densities compared to green and loggerhead turtles (National Research Council 1990). The low numbers may be the direct result of long-term over fishing. Although they are regularly spotted in coastal waters and reefs off South Florida, few hawksbills nest on Florida beaches (Meylan *et al*. 1995). Most of the Western Atlantic nesting takes place on the Yucatan Peninsula, Belize, Nicaragua, Panama, Venezuela, Antiqua, and other Caribbean islands (NMFS and USFWS 1993). Hawksbills have an apparent preference for remote beaches with dense shrubbery on the landward side of the intertidal zone where offshore reefs or rock outcrops are in the vicinity (National Research Council 1990).

Hawksbills share many of the same life-history traits as loggerhead and green turtles. They are thought to migrate to their nesting beach about every three years, and nest about two to three times during the nesting season (Miller 1997). The average renesting interval is about 14.5 days. Hawksbills lay an average of 140 eggs per clutch, and the average incubation period is 59.2 days (NMFS and USFWS 1993).

3.5.2.1.1.4.2. Site-Specific Information on the Hawksbill Turtle

Between 1979 and 2000, only 20 hawksbill nests were reported in the State of Florida. These nests were documented in Broward, Dade, Martin, Monroe, Palm Beach, and Volusia Counties during the period from June through December (Meylan *et al.* 1995, FWC *unpublished data* 2002). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by monitoring personnel.

Although no hawksbill nests have been documented in St. Johns County, the turtles can probably be found during warmer months of the year in nearshore waters of the County. This is evidenced by occasional strandings of hawksbills on beaches within the Plan Area (FWC *unpublished data* 2001b).

3.5.2.1.1.4. Kemp's Ridley Turtle (Lepidochelys kempii)

3.5.2.1.1.4.1. Biological Information on the Kemp's Ridley Turtle

The Kemp's ridley sea turtle (*Lepidochelys kempii*) has received protection in Mexico since the 1960s and was listed as endangered under United States law in 1970 (35 FR 18320). Together with the olive ridley, it is the smallest of the extant species of sea turtles. The Kemp's ridley is also the rarest and most endangered of the sea turtles, with nesting primarily occurring in the Mexican states of Tamaulipas and Veracruz (USFWS and NMFS 1992, USFWS 2001).

Kemp's ridley distribution is mainly limited to the Gulf of Mexico and Western Atlantic with occasional sightings in the Eastern Atlantic. Adult turtles are thought to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the United States (USFWS and NMFS 1992). The Kemp's ridley is carnivorous, feeding on swimming crabs, mollusks, jellyfish, and fish, with blue crabs apparently a preferred food.

Breeding and nesting occur from April through August on sandy beaches during broad daylight. They may nest singly or in large groupings called *arribadas*. Once they have mated, the females wait for heavy surf and high northeast winds before emerging from the water to nest. Kemp's ridleys are thought to nest every one or two years, depositing an average of 2.5 clutches per nesting season (TEWG 2000). The renesting interval is between 20 and 28 days, and the mean clutch size is about 110 eggs (Miller 1997).

3.5.2.1.1.4.2. Site-Specific Information on the Kemp's Ridley Turtle

Only seven Kemp's ridley nests have been documented in the State of Florida from 1979 through 2001 (Johnson *et al.* 1999, FWC *unpublished data* 2002). The nests were found in Volusia, Pinellas, Sarasota, and Lee Counties in the months of May and June. While it is likely that Kemp's ridleys utilize the nearshore Atlantic waters of St. Johns County, there have been no documented nests on the County's beaches (Meylan *et al.* 1995, FWC *unpublished data* 2002). Generally, several Kemp's ridleys strand on the beaches of St. Johns County each year (FWC *unpublished data* 2001b).

3.5.2.1.2. Anastasia Island Beach Mouse (Peromyscus polionotus phasma)

3.5.2.1.2.1. Biological Information on the Anastasia Island Beach Mouse (AIBM)

The Anastasia Island beach mouse (*Peromyscus polionotus phasma* Bangs 1898) (AIBM) is one of eight subspecies of the oldfield mouse (*Peromyscus polionotus*) known collectively as "beach mice." Table 3-8 illustrates the status and type localities of each these subspecies, of which seven are still extant and dwell in the coastal dunes of Florida and Alabama. On May 12, 1989, the AIBM was determined to be an endangered species pursuant to the ESA of 1973, as amended on June 6, 1985 (54 FR 20598-20602). This subspecies is also listed as endangered by FWC (Table 3-4).

The oldfield mice, including beach mice, are the smallest of the North American *Peromyscus.* Adult AIBM characteristically weigh from 12 to 18 grams (0.4 to 0.63 ounces), but pregnant females may weigh 20 to 30 grams (0.70 to 1.05 ounces; Frank and Humphrey 1992). Frank and Humphrey (1996) found the overall mean body mass was 15.0 +/- 0.1 grams for adult male Anastasia Island beach mice and 14.8 +/- 0.1 grams for adult non-pregnant females. Interestingly, they also reported that the mean body mass of adult non-pregnant beach mice from ASP was greater than that of mice from FMNM.

All subspecies of *Peromyscus polionotus* are specialists of habitats in the early stages of vegetative succession. Additionally, all subspecies of beach mice, including the AIBM, preferentially inhabit the dynamic foredunes and transitional backdunes of coastal barrier islands.

They are found in the greatest numbers in areas characterized by open, bare patches of sparsely vegetated sandy sediments (Ivey 1949, Frank 1996, Frank and Humphrey 1992 and 1996, Wooten 2001). AIBM prefer areas scantily vegetated with sea oats (*Uniola paniculata*), though they also have been trapped in sandy areas with broomsedge (*Andropogon sp*.) (Frank and Humphrey 1992).

Hurricanes and winter storms occur at semi-predictable intervals along the east coast of Florida. Since the AIBM are the only small mammal uniquely adapted to thrive in the foredunes, it stands to reason that they are also naturally adapted to deal with periodic storm events. According to Frank (1996), "Beach mice live in a very dynamic and unpredictable habitat, and they depend on their ability to recolonize habitats after a disturbance to persist." Many storms along Florida's east coast are characterized by tidal inundation, storm surge, washover events, and high winds and rain. These storm features threaten the very survival of beach mice, yet also sustain their preferred habitat.

Beach mice populate some of the most geologically active barrier islands in Florida, including Perdido Key (Perdido Key beach mouse), Santa Rosa Island (Santa Rosa beach mouse), Shell Island (Choctawatchee beach mouse), and Anastasia Island (AIBM). The constantly shifting shorelines of these islands have undergone remarkable geological changes over the last century (see Figures 3-5 for changes to Anastasia Island; Johnson and Barbour 1990, Pilkey *et al.* 1984). Beach mice rely on these geological changes and periodic storms to overwash and/or erode the dune system, thereby pruning vegetation and maintaining their habitat in early succession. But, beach mice also rely on the availability of the backdune transitional zone, where they can temporarily retreat during storm events. These backdune areas are commonly altered or eliminated by beachfront development, thereby threatening the ability of beach mice populations to persist through sequences of intermittent storms.

The AIBM and all *Peromyscus polionotus* are nocturnal rodents. The nocturnal habits of the AIBM have not been studied specifically; however they are expected to behave similarly to the Santa Rosa beach mouse. Santa Rosa beach mice were trapped more commonly on nights with half to new moons and cloudy skies, and they were observed to rarely leave their burrows during full moons (Blair 1951). According to Wooten (2001), "Recent radio tracking studies indicate that while active throughout the night, peaks of activity occur shortly after dusk and again after midnight."

All oldfield mice construct and maintain burrows. Blair (1951) documented that an individual Santa Rosa beach mouse may use up to 20 burrows, but generally 4 to 6 burrows is more common (Wooten 2001). Burrows are usually located on the well-drained sloping side of a dune and typically consist of: a) an entrance tunnel up to 1 m (3.28 ft) deep (mean depth of 53 cm (1.7 ft); Smith 1966, as cited in Wooten 2001), b) a nest chamber at a depth of 0.6 to 0.9 m (2 to 3 ft) (Blair 1951, as cited by USFWS 1993), and c) an escape tunnel. The escape tunnels generally rise from the nest chamber to just below the exterior of the dune, typically within 2.5 cm (1 inch) of the surface (USFWS 1993). These escape tunnels are extremely vulnerable to crushing via trampling by humans, horses, or other animals and provide reason to limit dune access in areas where AIBM burrows are evident.

Peromyscus polionotus are generally omnivorous rodents, but their diet mostly consists of seasonal seeds of dune plants, such as sea oats and dune panic grass (Gentry and Smith 1968, Smith 1971, Moyers 1996, as cited in Wooten 2001). However, they may also consume small invertebrates (Blair 1951, Ehrhardt 1978, as cited in USFWS 1993). According to USFWS (1993), AIBM in particular are noted to eat the seeds of sea oats, railroad vine, and prickly pear cactus.

The following excerpt from Frank and Humphrey (1996) indicates that AIBM commonly scavenge through trash receptacles in search of food.

> Beach mice regularly used refuse containers placed directly on the beach above the high tide line at ASP. We observed mouse tracks and small burrows entering the drainage holes in the bottoms of 50-gallon drums used as trash barrels on the beach at ASP. To determine the identity of the rodent species using the barrels, traps were set directly in the trash barrels among the refuse. Trapping of this type resulted in beach mouse captures only, but it was quickly discontinued due to loss of traps and possibly of beach mice by aluminum can collectors. In contrast, beach trash containers at FMNM were elevated aboveground on wooden frames and equipped with sealed lids, preventing mice from entering the interior of the containers and using refuse as a food source. However, judging from the regular presence of mouse tracks at the trash containers at FMNM, beach mice also foraged in the vicinity of trash containers at this site.

Researchers had formerly hypothesized that the refuse containers near the dunes would attract the exotic house mouse (*Mus musculus*), which might compete with the AIBM. Frank and Humphrey (1996) concluded that house mice are probably not a serious threat to the persistence of beach mice in undisturbed dune habitats where beach mice are uniquely adapted.

The age structure demonstrated by the AIBM populations sampled by Frank and Humphrey (1996) is characterized by a conventional Type III survivorship curve, indicating extensive early mortality of newborn offspring with very few individuals surviving to adulthood (Pearl 1928, Deevey 1947, as cited in Begon *et al.* 1996). Wooten (2001) reports, "The average life span of *Peromyscus polionotus* in natural populations is less than nine months, although it is not uncommon to encounter mice that are one year of age. Captures of mice known to be two years old have been reported, and captive *P. polionotus* have reached four-plus years of age." The mean longevity of AIBM (from both ASP and FMNM), including all age classes and sexes, is 80 days (ranging from 20 to 593 days), though the mice appear to live significantly longer at FMNM than at ASP (Frank and Humphrey 1996).

Survivorship tends to decrease from spring through autumn and then experience an increase during the months of autumn and winter (Frank and Humphrey 1996). Peak population densities tend to occur in the winter (January) at both ASP and FMNM, followed by low recruitment and low population numbers in April (Frank and Humphrey 1996). Additionally, other studies have shown that juvenile Alabama beach mice that dispersed greater than 160 m from their natal site exhibited a significantly longer persistence time (Swilling and Wooten 2002 *in press*).

The reproductive potential and reproductive output of all beach mice is generally high (Ehrhardt 1978, as cited in USFWS 1993). The subspecies of *Peromyscus polionotus* are similar to all other mice in this genus in that they are extremely prolific, yet differ from most others by forming monogamous pairs (Blair 1951, Smith 1966, Foltz 1981, Swilling and Wooten 2002 *in press*, as cited in Wooten 2001). Breeding facilities have found that reproduction is optimized, when animals are continuously retained in breeding pairs (Wooten 2001).

Young *Peromyscus* reach sexual maturity at six to eight weeks of age (Frank and Humphrey 1992, as cited in USFWS 1993, Wooten 2001). At peak reproduction, serial litters are born at 26- to 30-day intervals, and beach mice are capable of producing 80 or more young in their lifetime (Bowen 1968, as cited in USFWS 1993, Wooten 2001). Female oldfield mice enter postpartum estrus about 12 hours after a litter is delivered and then may re-mate (Wooten 2001). According to USFWS (1993), "Smith (1996) reported that one captive female beginning at 118 days of age gave birth to 26 consecutive litters (139 young) with an average inter-litter interval of 30 days." Litter sizes for beach mice normally range from 6 to 8 offspring (Caldwell and Gentry 1965, Carmon *et al.* 1967, as cited in Wooten 2001).

As has been documented for most oldfield mice, the subspecies of beach mice generally reproduce throughout the year and display continuously high recruitment. Both the ASP and the FMNM populations of the AIBM appear to undergo a significant increase in reproductive activity between April and July (Frank and Humphrey 1996). However, the beach mice of ASP exhibit consistently high turnover rates, while the mice of FMNM display more seasonal recruitment (Frank and Humphrey1996). These slightly different reproductive strategies between the populations at ASP and FMNM may be partially explained by the disparities between the two populations in body mass and survivorship. According to 1989-1990 data, ASP mice weigh more than FMNM mice, perhaps due to more available food at ASP; FMNM mice live longer than ASP mice, perhaps due to less cat predation at FMNM (Frank and Humphrey1996). However, more recent information reveals a decrease in cats at ASP (due to the State Park's predator control program) and an increase in cats at FMNM (Bard *pers. comm.* 2002).

For management purposes, it is important to understand the size and use of home ranges of the AIBM in order to estimate how much spatial area is required for the population's persistence through time. Data is not available for this particular subspecies, so we must assume that the AIBM behave similarly to other subspecies of *Peromyscus polionotus*. The following excerpt is taken from Wooten (2001):

> Davenport (1964), using trapping data, estimated mean home range size to be 1,376 m^2 (0.34 acre) for oldfield mice, while Novak (1997) reported a substantially larger value of 3,168 m^2 (0.78 acre) for home ranges of *Peromyscus polionotus allophrys* on Shell Island, Florida. Average values reported by Lynn (2000) for Alabama beach mice, *Peromyscus polionotus ammobates*, were 4,086 to 5,512 m^2 (1.00 to 1.36 acre) from trapping data and 6,783 to 7,000 m^2 (1.67 and 1.73 acre) from telemetry data. Values as small as 389 m^2 (0.02 acre) and as large as 29,330 m^2 (7.24 acre) have been observed (Lynn 2000).

Young mice typically move an average of 432 m (1,415 ft) before establishing a home range (USFWS 1993). Then, as seen above, these mice inhabit home ranges that may greatly vary in size from one individual to another.

The size of an individual's home range seems to be correlated with food and burrow site availability (Smith 1971 and Lynn 2000, as cited in Wooten 2001) and may vary according to season and reproductive state of the mice (Wooten 2001). Wooten (2001) found that populations of other subspecies of *Peromyscus polionotus* do not appear to display intraspecies competition with increasing densities, but do display an increased compaction of home ranges. Wooten (2001) viewed the compaction of home ranges as resulting in the formation of spatial "neighborhoods" within populations. "For Alabama and Perdido Key beach mice, the approximate size of these spatial units is 550 m (0.34 mi) (linear) with occupancy of 40 to 70 mice" (Wooten 2001). In contrast, Frank (1996) did report density-dependent intraspecific competition, as expressed in the AIBM's habitat occupancy of the primary dune system. Frank (1996) found that the mice favor open sandy areas, but will use dense grassy regions intermittently, particularly when populations become dense.

With a typical r-selected life history, the AIBM repeatedly produces a large number of offspring with a small chance of surviving to adulthood (Begon *et al*. 1996). Because they dwell in such unpredictable and vulnerable habitats, their reproductive strategy is generally tailored to quickly recover from natural catastrophic events during which part of the population may be suddenly annihilated. In some cases, however, severe hurricanes have been blamed for regional extirpations of pockets of beach mice along the Gulf Coast of Florida and Alabama. For example, Meyers (*unpublished data*; as cited in Holler *et al.* 1989) suggested that Hurricane Frederic in 1979 was the impetus for the regional extirpation of the Perdido Key beach mouse (*P. p. trissyllepsis*) from the Gulf Shores National Seashore. Holler *et al.* (1989) viewed Hurricane Elena in 1985 as the cause for a substantial population decrease of the Perdido Key beach mouse at Gulf State Park.

Generally, scientists believe that AIBM populations are capable of substantial rebounds following storm events. Hurricanes typically strike during the autumn months, and populations tend to reflect hurricane losses as evidenced by recessed population levels during the following spring. But, during the summers following hurricanes, seed production by sea oats is unusually excellent due to fertilization from the previous storm's overwash (Holler *et al.* 1989). This extraordinary abundance of food resources prompts a restorative population boom, and the subspecies continues to prosper through catastrophic storm events.

Frank (1996) estimated the densities of the AIBM in 1989-1990 through live-trapping surveys, estimated their habitat area (by digitizing aerial maps and using GIS techniques to calculate the area of selected polygons), and multiplied the densities by the habitat areas to estimate the size of the AIBM population. Frank determined beach mouse densities on Anastasia Island ranged from a mean low of 10 mice per ha (about 4 mice per acre) to a mean high of 75 per ha (about 30 per acre), with an overall average of 30 per ha (about 12 per acre). His final estimates of the total population size in 1989-1990 ranged from a low of 1,719-1,755 individuals to a high of 12,891-13,165 individuals, with an annual mean of 5,157-5,266 individual beach mice in St. Johns County (Frank 1996).

The minimum number of individuals required for a population not to decline into extinction is a highly debated topic in conservation biology. Frank (1996) cited a chapter written by Soule and Wilcox (1981) in which the authors followed theoretical principles to calculate that approximately 500 individuals may constitute a viable population over the long term (Franklin 1981, as cited in Frank 1996). Frank (1996) stated, "Clearly the AIBM population exceeds this threshold and, without catastrophic storms, is probably a viable population" (Frank 1996). Frank viewed this population of 500 as the *effective population*, which would not include males nor non-breeding females (Frank *pers. comm.* 2002). However, recent estimates are more conservative when calculating the minimum number of individuals in a viable population. Meffe and Carol (1997) claim that populations of 1,000 to 10,000 individuals "are often said to be adequate to ensure long-term persistence." They continue by warning, "Such numbers can, however, at best be viewed as very general guidelines. The evolutionary record tells us that populations of 10,000 or more will almost certainly go extinct eventually, even though the expected persistence time is very long. Also, populations that appear to be safe for many years may suddenly decline," if their numbers drop below a required threshold or catastrophe strikes (Meffe and Carol 1997).

The Population Viability Analysis (PVA) constructed and manipulated by Frank during his dissertation work was, like most models, based on the very limited scientific evidence available and riddled with assumptions. But, Frank's PVA is the only model that simulates how the AIBM population will fail or prosper in response to specific circumstances (Frank 1996). Frank's unexpected result was that the long-term survival of AIBM populations were more threatened by a series of frequent, less severe storms (i.e., Category I hurricanes that, in the model, killed an estimated 10 percent of the population), than by a few catastrophic storms (i.e., Category 5 hurricanes that eliminated 95 percent of the population in simulations). In summary, the modeling scenario that forced a 10 percent reduction in the AIBM population each time a 10-year Category I hurricane hit St. Augustine Inlet drove the entire subspecies to extinction within an alarming 40 years.

In the scenarios where the AIBM survived to the end of the PVA's 50-year simulation period, the population generally reached a plateau at around 8,000 individuals (Frank 1996). Similarly, Frank estimated the total carrying capacity of Anastasia Island at around 8,500 individuals (this parameter may be necessarily arbitrary). Carrying capacity is an idealized concept used to describe the maximum population size that a given environment can support indefinitely (and an essential parameter in the PVA) (Begon *et al.* 1996). Perhaps, a total population of approximately 8,000 to 8,500 could be used as a management target, with the understanding that a greater number of individuals would be preferred to buffer against natural environmental, demographic, and genetic stochasticity. As stated earlier, Frank (1996) estimated the population size to unpredictably range between approximately 1,700 to 13,000 individuals, centering around a fluid mean of 5,200 individuals. Bard (*unpublished data* 2001) estimates the total AIBM population to range between 2,204 and 16,553 (these numbers only include mice in the State parks and national monument). However, it may be misleading to compare these two countywide population estimates. Due to the differing sampling methods used in each study, the difference between these two estimates may not necessarily represent an increase in AIBM over the last decade. Due to increased anthropogenic pressures and habitat loss since Frank's initial surveys in 1989-1990, the actual population numbers of AIBM may be lower today.

3.5.2.1.2.2. Site-Specific Information on the Anastasia Island Beach Mouse

The historical range of the AIBM probably included most of the beaches of St. Johns County. Their former range is thought to have stretched north to at least Mickler's Landing (Ivey 1949 and 1959, as cited in Frank and Humphrey 1992 and 1996), or perhaps as far north as the Duval County Line (USFWS 1993). The southern end of their range historically and presently extends to Matanzas Inlet (Ivey 1949 and 1959, Frank and Humphrey 1992 and 1996, USFWS 1993). The length of their total historical habitat consisted of about 50 linear mi of beach (USFWS 1993).

Today, the AIBM occupies a much reduced range consisting of about 14 linear miles of beach, of which only 3 mi may support viable populations (USFWS 1993). The current distribution of AIBM is limited to two barrier islands in St. Johns County—Anastasia Island and the unnamed barrier island north of St. Augustine Inlet. On these two barrier islands, the AIBM distribution can be further subdivided into four geographical regions—GRSP, ASP, FMNM, and the private properties north of FMNM.

Because each of these four geographical regions falls under a different regulatory authority, each is described separately. Yet, it is important to point out that these four regions represent *three distinct populations* of the AIBM that are incapable of natural genetic exchange. The first genetically isolated population resides within the boundaries of ASP. The beach mice at ASP have been cut off from the rest of Anastasia Island by a section of intense beachfront development in St. Augustine Beach. Within this approximately one-mile strip of the beach, the former dune system has been largely eliminated due to a critically eroding shoreline (see Figure 3-4) armored by a rock revetment seaward of a concrete seawall (Figure 3-8b) (Frank 1996).

The primary dune system reappears south of the St. Augustine Beach revetment and stretches largely uninterrupted south to the Matanzas Inlet at FMNM. FMNM serves as a second population nucleus for the beach mice, but there is reason to believe that AIBM also utilize the wide, hospitable dune system found on the private lands of Crescent and Butler Beaches to the north. In 1989-1990, Frank (1996) trapped beach mice along the entire length of Anastasia Island, and biologists periodically see beach mice sign (e.g., footprints, burrows, etc.) in the foredunes of Crescent Beach (EAI 2001c; Miller *pers. comm.* 2001).

The third genetically distinct population is now found at GRSP. GRSP falls within the historical range of the AIBM, though they appear to have been regionally extirpated from this barrier island sometime between the late 1950s (Ivey 1949, 1959) and the early 1980s (Humphrey *et al.* 1987). A population was re-introduced to GRSP in 1992 and supplemented in early 2000 (Miller *pers. comm.* 2001). The population at GRSP is isolated from the mice at ASP by the St. Augustine Inlet, which is a fast-flowing inlet about 300 m (984 ft) wide that beach mice are unlikely to traverse (Frank 1996).

Anastasia Island, St. Johns County

Anastasia State Park

ASP, located at the northern end of Anastasia Island, contains 10.8 linear km (6.7 mi) of shoreline, with 4.0 km (2.5 mi) of Atlantic Ocean shoreline. ASP falls within the State park system and is managed by the Florida Department of Environmental Protection. Beach mice predominantly inhabit the wide undisturbed dune system in the northern portion of the park locally known as Conch's Island. Since Conch's Island was only formed about 50 years ago (Figure 3-5), Frank and Humphrey (1996) assert that "the topography of Conch [sic] Island differs from the rest of Anastasia Island. The transition zone is wide, and a stable dune zone is absent. Instead, the transition zone adjoins salt marsh to the west." In order to maintain this early stage of vegetative succession, the State Park Service has initiated an ongoing habitat restoration project in a large section of Conch's Island (Miller *pers. comm.* 2001). The Park Service is using a variety of methods, including mowing, herbicide, and fire, to curb the growth of wax myrtle stands in the interdunal swales (Mulholland *pers. comm.* 2001). This will retain open sandy patches of sea oats, the preferred habitat of beach mice.

Frank (1996) estimated the amount of habitat available to the AIBM by digitizing aerial photographs of Anastasia Island. He calculated that beach mouse habitat in ASP was approximately 124.7 ha (308 acres). He estimated that the carrying capacity of the State park to be around 5,000 beach mice. From his trapping surveys conducted in 1989-1990, Frank estimated that the population size of AIBM at ASP ranged from 1,247 to 9,352 individuals (Frank 1996). Bard (*unpublished data* 2001) used Frank's estimates to calculate that the population at ASP in 2001 ranged from 1,600 to 12,000 beach mice.

Fort Matanzas National Monument

FMNM is located at the southern end of Anastasia Island and is managed by the National Park Service of the U.S. Department of the Interior. The Monument is spatially much smaller than ASP, including 2.9 km (1.8 mi) of continuous dunes and a calculated habitat area suitable for beach mice of 7.3 ha (18 acres) (Frank 1996). The following excerpt is taken from Frank and Humphrey's report (1996), "Vegetation at the two sites is generally similar, with the exception that the transition zone at FMNM has a greater abundance of woody species, shrubs, and dense swales than at ASP, and the transition zone at FMNM borders stable dunes vegetated by oak forest to the west." Frank (1996) estimated that FMNM has a carrying capacity of approximately 500 beach mice, and an estimated population size ranging from 73 to 547 individuals. Currently, there are no beach mice monitoring programs underway at FMNM. Bard (*unpublished data* 2001) calculated the 2001 population size to range from 200 to 1,518 AIBM in FMNM.

Private property north of FMNM

South of the seawall and revetment at St. Augustine Beach are 13.7 km (8.5 mi) of continuous dunes that stretch south to FMNM with a calculated beach mouse habitat area of about 79.8 ha (197.1 acre) (Frank 1996). This zone has only been systematically trapped for AIBM once—during a transect trapping study conducted by Phillip Frank in 1989-1990. In 1989, Frank found

AIBM at 100 percent of sampled sites (Frank and Humphrey 1996). In 1990, AIBM were present at 87 percent of sites trapped (Frank and Humphrey 1996). Though this stretch of land has not been trapped since 1990, beach mouse sign is sporadically seen in the foredunes of Crescent and Butler Beaches, including at Frank B. Butler Park (County-owned and managed) (Bard *pers. comm.* 2002, EAI 2001c, Miller *pers. comm.* 2001).

Although this area consists of mostly private lands, it is believed to support a significant and important portion of the AIBM population. Frank (1996) estimated that the density of beach mice on these lands was one-half the density on the public lands of ASP and FMNM, and the carrying capacity of the dunes along Crescent and Butler Beaches may approach 2,000 individuals. Under these assumptions, the estimated population size of AIBM ranged from 399 to 2,992 mice. Frank and Humphrey (1996) explain, "Despite the poor conditions of the unprotected habitat, large numbers of beach mice still occur there, and this habitat has an important function in maintaining demographic and genetic fitness of the beach mouse population as a whole. Demographically, the connectivity provided by this strip of habitat allows recolonization of patches of habitat that otherwise might remain vacant. Thus, distribution of beach mice along the length of the island also decreases the probability of extinction in the event of a catastrophic event such as a major hurricane."

Guana River State Park

In 1949 and 1959 publications, Ivey documented the presence of the AIBM on two East Coast barrier islands—Anastasia Island and the unnamed barrier island stretching from St. Augustine Inlet north to the St. Johns River (Jacksonville Beach). By the 1980s, it appeared that the range of AIBM was reduced to Anastasia Island (Humphrey and Barbour 1981, Humphrey *et al.* 1987). In 1992, Frank trapped transects the length of GRSP and did not document the presence of any AIBM (Frank 1996). According to Frank (1996), "Why the Anastasia Island beach mouse was extirpated from the northern portion of the range was not documented, but severe hurricanes such as Donna in 1960 and David in 1979 that passed through the area may have contributed." The USFWS Recovery Plan (1993) for the AIBM dictated that a management priority should be to establish at least two more viable populations. In 1992 and 1993, the USFWS funded the re-establishment of a population of beach mice on this unnamed northern barrier island at GRSP (Frank 1996).

Within four months after the initial release of AIBM into GRSP in 1992, they were detected to be present throughout the entire 6.7 km (4.2 mi) of contiguous undeveloped dune grassland within park boundaries (Frank 1996). Researchers are hopeful that the AIBM will persist in GRSP, because human disturbance is low and feral and free-ranging house cats are uncommon. Frank (1996) estimated that the carrying capacity of GRSP was approximately equivalent to the estimated population size—both projected to be 1,000 beach mice (Frank 1996).

Frank's early estimates may have been overly optimistic. The Guana River population grew initially after introduction, but has dwindled since then (Bard *unpublished data* 2001). In a trapping study conducted in 1992, 34 beach mice were captured, and the population was estimated to total only 220 individuals (USFWS 1993). Bard (*unpublished data* 2001) estimated the GRSP population in 2001 to be increasing to a range between 404 and 3,035 individuals,

though the actual number is likely much lower according to recent and historic capture success. Bard (*unpublished data* 2001) estimated a minimum of 0.60 mice per km (0.97 mice per mi) in GRSP.

The GRSP population may have plummeted due to impacts from Hurricane Floyd (September 1999) and Hurricane Irene (October 1999). The foredunes at GRSP are generally low (compared to the foredunes on Anastasia Island), and the dune platform at GRSP commonly overwashes during storm events, as was the case during Hurricanes Floyd and Irene. These particular overwash events at GRSP in 1999 were devastating for the AIBM, as they caused severe scarping of the dune system. This eliminated both the habitat and food (i.e., sea oats) of beach mice and contributed to an unusually slow post-storm recovery (Miller *pers. comm.* 2001).

In addition to the population at GRSP, Frank (1996) believed that "the population had almost certainly expanded beyond the park boundaries onto private properties both north and south of the park. Suitable habitat is available and beach mice were captured at the park boundaries." Thus, the AIBM may also inhabit private properties adjacent to GRSP.

3.5.2.1.3. American Alligator (Alligator mississippiensis)

3.5.2.1.3.1. Biological Information on the American Alligator

The American alligator (*Alligator mississippiensis*) is a relatively large resident reptile that is designated by the Federal government as a threatened species due to its similarity of appearance with the American crocodile (*Crocodylus acutus*). Due to a large increase in their numbers, alligators have been "down-listed" by the State of Florida to a species of special concern.

The American alligator is likely the most well-known reptile found in Florida. Alligators eat fish, turtles, snakes, small mammals, and birds. They build elevated nests in wetland areas during early summer and lay 30-50 eggs. Nests are guarded by females, incubation is approximately 70 days, and hatchlings will generally stay together for their first year. Alligators can live in close proximity to mankind, but if repeatedly fed by humans, they may lose their fear of man and become a nuisance and potential threat.

Alligators can be found in suitable open-water and wetland habitats throughout most of peninsular Florida but are less abundant in the Panhandle. They inhabit forested and herbaceous wetlands and may be found in high quality natural habitat areas, impacted wetlands, man-made canals, and stormwater treatment retention/detention areas.

3.5.2.1.3.2. Site-Specific Information for St. Johns County on the American Alligator

Within or adjacent to the Plan Area, the presence of alligators has been documented only at ASP and GRSP. In these areas, the preferred habitat is freshwater wetlands.

3.5.2.1.4. Bald Eagle (Haliaeetus leucocephalus)

3.5.2.1.3.1. Biological Information on the Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large bird of prey that is designated as a threatened species by both the Federal government and the State of Florida. In addition to protection afforded by the Federal Endangered Species Act and the Florida Wildlife Code, the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act also protect eagles. Although the Federal government is considering "de-listing" the bald eagle, the legal protections are currently still in effect, and there has been no parallel effort to reduce the protection by the State of Florida.

Bald eagles are Florida's largest birds of prey, reaching 3 ft in length with a wingspan of 7 ft. The adult birds have a distinct white head and tail; the entire body is blackish-brown, and the beak and feet are yellow. Immature birds are a chocolate brown with some white on the breast and tail. Florida's bald eagle population has increased since the 1970s, due in part to the ban on DDT, which caused "thin egg shell" syndrome. The population of bald eagles in Florida consists of some year-round individuals and some part-time winter residents that migrate to Florida from more northerly latitudes. Florida has more resident bald eagles than any other state in the country except Alaska. Bald eagles are found throughout the State, particularly along the coasts and near major rivers and lakes. The official nesting season runs from October 1 through May 15. The birds build large bulky nests primarily in tall pine or cypress trees, and add to the nest every year. There are over 1,000 occupied eagle nesting territories in Florida (FWC *unpublished data* 2001d).

3.5.2.1.3.2. Site-Specific Information for St. Johns County on the Bald Eagle

The bald eagle population in St. Johns County can be separated into three distinct groups: 1) resident eagles that nest along the St. Johns River, 2) resident eagles that nest in eastern portions of the County, and 3) migratory eagles that nest in other areas but which spend part of the year in the County. The FWC documented nine occupied eagle nesting territories during 1999-2000 (FWC *unpublished data* 2001d). Of these nine, the majority (seven) were located near the St. Johns River in western St. Johns County. These birds likely feed primarily in the St. Johns River. There are no reported eagle nests within the Plan Area, although two nests were documented in the eastern portion of the County. One nest is known to be located on Bird Island in the Matanzas River, and issues concerning the protection of this nest are being coordinated through the State and Federal wildlife agencies.

Migratory eagles that winter in Florida do not defend territories and may be found virtually anywhere in the County. Because fish are eagles' primary food item, this species is most often observed at or near large areas of open water, including the Matanzas River and the Atlantic Ocean.

Similar to other areas in Florida and the southeastern U.S., the population of eagles in St. Johns County appears to be increasing. This is likely the result of the protection afforded to them through the Federal Endangered Species Act and the Florida Wildlife Code. Additional factors that provide a favorable outlook for bald eagles include: 1) bald eagles are relatively long-lived

(generally 30-50 years) and will return to successful nesting territories on an annual basis; 2) juvenile eagles are known to return to the general area of their hatching when they enter reproductive status; and 3) bald eagles in Florida appear to be demonstrating an increasing ability to exist in proximity to humans.

3.5.2.1.4. Piping Plover (Charadrius melodus)

3.5.2.1.4.1. Biological Information on the Piping Plover

The piping plover (*Charadrius melodus*) is a relatively small migratory shorebird that is designated as a threatened species by the Federal government and the State of Florida. Piping plovers have been documented to occasionally occur within the Plan Area.

Piping plovers are one of several closely related members of the plover family (Charadriidae). Although the killdeer and Wilson's plover are year-round residents that nest in Florida, most members of this family, including the piping plover, are highly migratory. Some species migrate thousands of miles annually to and from breeding grounds in the Arctic tundra. At approximately 7 inches in length and having a wingspread of approximately 15 inches, the piping plover is one of the smallest members of the plover family. There are three distinct nesting populations of piping plovers: a coastal population that nests from Virginia northward through Maine, a Great Lakes population that nests in northern Michigan, Wisconsin, and eastern Minnesota, and a Midwestern population that nests in the Dakotas, Manitoba, and Saskatchewan. All subpopulations nest on sandy areas, including beaches, riverine sand bars, and alkali wetlands. After summertime nesting seasons, piping plovers fly south to spend winters in more southerly latitudes, including Florida, the Gulf of Mexico, and the Caribbean.

In Florida, piping plovers typically arrive in August or September, and some individuals may remain as late as April or May before returning to northern breeding areas. While in Florida, piping plovers most often are observed on sandy, low-wave-energy beaches, where they are present either singly or in small groups, often in proximity to other small shorebirds (e.g., sanderlings, semi-palmated plovers). Their diet consists primarily of invertebrate prey, including the small amphipods that are typically abundant in the shoreline wrack and at the water's edge. Piping plovers are often distinguished from other small shorebirds by their characteristic behavior of darting across the beach, stopping suddenly, and then sprinting off again. With close observation, piping plovers can be differentiated from other plovers by differences in plumage, bill length, and leg color.

3.5.2.1.4.2. Site-Specific Information for St. Johns County on the Piping Plover

In 1991, 1996, and 2001, wintertime censuses were conducted throughout the southeastern U.S. to document the presence/absence of piping plovers. These censuses are coordinated by the USFWS and are typically conducted by volunteers, many of whom are associated with a local Audubon Society or birding club.

Because piping plover habitat consists of sandy beaches, the majority of the beachfront within the Plan Area is *potential* wintering habitat for piping plovers. However, the high wave-energy

conditions that are typical of St. Johns County make the east-facing beaches relatively poor habitat for piping plovers, which prefer areas sheltered from the wind and waves. Two such areas occur within the Plan Area: 1) the sandy beach areas on the north and south sides of the St. Augustine Inlet (including ASP), and 2) the sandy beaches and sand bars in the vicinity of Matanzas Inlet.

Three piping plovers were observed during the 1991 piping plover census. During a 6-mile survey, two of these individuals were observed at Matanzas Inlet and the FMNM west of State Road A1A. The third piping plover was observed in ASP at the St. Augustine Inlet during an 8-mile survey. Database queries have not indicated that any piping plovers were observed during the 1996 census. In the 2001 survey, one piping plover was reportedly observed in the Matanzas Inlet area.

3.5.2.1.5. Wood Stork (Mycteria americana)

3.5.2.1.5.1. Biological Information on the Wood Stork

The Wood stork (*Mycteria americana*) is a relatively tall wading bird that is designated as an endangered species by both the Federal government and the State of Florida. The only species of stork that is native to North America, the wood stork is present in relatively sparse numbers in wetland areas of Florida and southeastern Georgia. Wood storks are large, white, long-legged wading birds with black wings and tail feathers. They average approximately 85-115 cm (35-45 inches) in head-to-tail length and have a wingspread of approximately 150-165 cm (60-65 inches). They typically nest in cypress swamps, mangrove forests, and islands where they are relatively free from predators. Wood storks forage for small fish and aquatic organisms in shallow ponds, flooded pastures, and ditches. Their annual nesting success is highly dependent on hydrologic regimes and their ability to obtain prey during the springtime dry season. Nesting failures are typically associated with water levels being either unusually low or high.

The results of field surveys suggest that the population of wood storks in Florida consists of 3,000-6,000 individuals. The range of wood storks appears to be expanding somewhat, to include both a more northerly population and establishment of nesting colonies in coastal areas. These changes may be a result of the continued impacts to the seasonally flooded, isolated wetlands that are being lost due to development throughout much of peninsular Florida. Wood storks have no major natural threats, and loss of wetlands and modifications to natural hydrological cycles are the primary threats to their continued existence.

3.5.2.1.5.2. Site-Specific Information on St. Johns County on the Wood Stork

Although wood storks are observed in St. Johns County on a fairly regular basis, their presence in the coastal areas within the HCP boundaries is comparatively rare. The FNAI database does not identify any known wood stork nesting areas within the Plan Area, although a nesting rookery was documented west of SR A1A within GRSP in 1976 and again in 1978. However, wood storks have been observed foraging in the Plan Area along the shoreline at Porpoise Point in Vilano Beach north of St. Augustine Inlet. This behavior is not typical for wood storks, as they are more successful foraging in shallow, isolated wetland areas.

3.5.2.1.6. Eastern Indigo Snake (Drymarchon corais couper)

3.5.2.1.6.1. Biological Information on the Eastern Indigo Snake

The eastern indigo snake (*Drymarchon corais couper*) is a relatively large, dark-colored snake that is designated as a threatened species by both the Federal government and the State of Florida. These snakes occur in southeastern Georgia and throughout Florida, including the Florida Keys. In peninsular Florida, indigo snakes may be found in a variety of habitats, including mangrove swamps, wet prairie, tropical hammocks, xeric pinelands, and scrub.

Eastern indigo snakes sometimes appear iridescent black and have a reddish or coral-colored throat. They are comparatively mild-tempered, smooth-scaled snakes. Although the average length of the adult eastern indigo snake is approximately five to 6 ft, individuals over 8 ft have been recorded, making them potentially one of the largest snakes in North America.

Eastern indigo snakes are active primarily during daylight hours. They have a diverse diet, preying upon small mammals and birds, as well as frogs, lizards, and other snakes, including venomous species. During warmer months, they range widely, with individuals actively utilizing 125-250 acres or more. During the winter months, indigo snakes usually stay fairly close to some deep shelter (e.g., gopher tortoise burrow, stump hole, land crab burrow). Their winter activity area is usually less than 25 acres.

Due to their comparatively large size, indigo snakes have few natural enemies. However, because of their passive demeanor, they were heavily collected for the pet trade. Federal and State protection as a threatened species has diminished this threat. Presently, the single leading threat to their continued existence is the loss and fragmentation of habitat.

Due to the large territorial range of indigo snakes, they are particularly susceptible to habitat fragmentation and hazardous road crossings. Land development activities can endanger indigo snakes not only by direct impact but also by destroying gopher tortoise burrows, a favorite habitat and refuge for this species. Thus, environmental disturbance that threatens the survival of gopher tortoises may likewise affect indigo snakes. Indigo snakes shed their skins approximately every 30-45 days, and typically become inactive for a period of 10-14 days, immediately before shedding. During this period, they may not be able to quickly respond and escape from impending danger.

3.5.2.1.6.2. Site-Specific Information for St. Johns County on the Eastern Indigo Snake

Habitat that is suitable for indigo snakes is widespread throughout St. Johns County. Within the Plan Area, the Coastal Strand, Coastal Grassland, and Maritime Hammock communities all potentially harbor this species. However, the open beach provides relatively poor habitat for indigo snakes. The FNAI database includes three documented sightings of indigo snakes within the Plan Area. These sightings have all been on State or Federal lands—one each at GRSP, ASP, and FMNM.

3.5.2.1.7. Florida Manatee (Trichechus manatus latirostris)

3.5.2.1.7.1. Biological Information on the Florida Manatee

The Florida manatee (*Trichechus manatus latirostris)* is a large, air-breathing aquatic mammal that is designated as an endangered species by the Federal government and the State of Florida.

Manatees utilize both estuarine and ocean waters adjacent to the Plan Area. Adult manatees range from 2.8-3.5 m (9.2-11.5 ft) in length and weigh approximately 400.0-900.0 kg (888.9-2000.0 lbs). Newborn calves weigh approximately 20.0-30.0 kg (44.4-66.7 lbs) and are 1.0-1.5 m (3.3-4.9 ft) in length. Manatees inhabit both freshwater and saltwater and consume large amounts of aquatic vegetation, including seagrasses, bank vegetation, overhanging plants, and submerged, rooted, or floating vegetation. They are warm-blooded, display seasonal movement patterns, and congregate during the wintertime at sites in south Florida and thermal refugia (i.e., springs, power plant discharges) in north Florida.

Scientists with the State of Florida and the Federal government have been involved with manatee tracking and population censuses for over 20 years. These investigations have included aerial surveys, and the tracking of individual manatees that have been fitted with radio or satellite antennas. Although the precise number of manatees in Florida is not known, aerial censuses conducted in 2001 documented the population to be at least 3,276 individuals (FWC *unpublished data* 2001c).

The population of manatees in Florida has been separated into four subpopulations. These include an Atlantic (east coast) population (approximately 47 percent of the Statewide population), a St. Johns River population (approximately 4 percent of the Statewide population), a southwest Florida population (approximately 37 percent of the Statewide population), and a northwest population (approximately 12 percent of the Statewide population).

Manatees are relatively long-lived mammals, with estimates of maximum life expectancy reaching approximately 60 years. Females enter their reproductive cycle at three to four years of age, and the mean age when they first give birth is five years. The gestation period is 11-14 months, and a calf remains dependent on its mother for approximately 1-2 years.

Manatees have no natural predators. Subsequent to their designation as an endangered species, efforts have been underway to recover the carcass of each deceased animal to determine the cause of mortality. Statewide, although the largest percentage of manatee deaths cannot be linked to a specific cause, a substantial proportion of manatee mortality has been determined to be related to human activities, particularly boat collisions.

3.5.2.1.7.2. Site-Specific Information for St. Johns County on the West Indian Manatee

Manatees in the waters of St. Johns County may be part of either the Atlantic or St. Johns River subpopulations. Manatees using the nearshore waters closest to the Plan Area are, however, most likely from the Atlantic population. Analyses conducted by manatee researchers suggest that the number of manatees in this region has remained fairly steady or decreased slightly during recent

years. Aerial surveys suggest that manatees use the Intracoastal Waterway (ICW) as the primary corridor to move from more northerly latitudes during the summer to more southerly areas during the colder winter months. Manatees have also been observed in the Atlantic Ocean, and it is thought that their north and south travels may include excursions along the coast after having been carried through inlets by tidal currents.

Surveys by the State of Florida and Federal government have documented numerous sightings of manatees in the coastal areas of St. Johns County. The vast majority of these sightings have been of individuals in the Tolomato and Matanzas Rivers and the ICW. Carcasses of deceased manatees have been recovered from the coastal waters of St. Johns County and from various locations along the beachfront.

3.5.2.1.8. Other Marine Mammals

3.5.2.1.8.1. Biological Information on Other Marine Mammals

Five species of whales that are designated as endangered species by the Federal government and the State of Florida have been documented to occur in the Atlantic Ocean along the coastline of St. Johns County (Table 3-4). These include the northern right whale *(Eubalaena glacialis),* sei whale *(Balaenoptera borealis),* fin whale *(Balaenoptera physalus),* humpback whale *(Megaptera novaeangliae),* and sperm whale *(Physeter catadon macrocephalus*).

Northern right whales are large, generally uniformly dark-colored baleen whales that reach lengths of approximately 15.2 m (50.0 ft). They are present in the North Pacific and North Atlantic Oceans, although the population is small or nonexistent in the eastern Atlantic. In the western Atlantic, however, right whales are known to range from eastern Canada in the summer to southeastern Florida and the Gulf of Mexico during the winter. Because calving grounds appear to be off the coasts of Georgia and northeast Florida, these areas have been designated as "critical habitat" for this species. In 1991, the National Marine Fisheries Service estimated the population of right whales in the North Atlantic was at least 350 individuals.

Sei whales are large baleen whales that are dark on their dorsal side and paler on their ventral side and reach lengths of approximately 15.2 m (50.0 ft). They range from warm-temperate to subarctic waters and are not restricted to nearshore coastal areas. It is believed that members of the Nova Scotia population migrate to northeast Florida, where they spend winters. Sei whales are thought to be comparatively shallow divers that feed primarily by skimming plankton at the surface. In 1991, the National Marine Fisheries Service estimate the population of sei whales in the North Atlantic was at least 4,000 individuals.

Fin whales are large baleen whales that are also dorsally dark and ventrally paler and reach lengths of approximately 22.9 m (75.0 ft). They are distributed worldwide but are less common in tropical waters than in cooler oceans. Similar to other baleen whales, fin whales are highly migratory, spending summers in polar waters and winters as far south as the Gulf of Mexico and the Caribbean. In 1991, the National Marine Fisheries Service estimated the population of fin whales in the North Atlantic was approximately 17,000 individuals.

Humpback whales are baleen whales that are dorsally dark and have large variable patches of white on their underside. They reach body lengths of approximately 13.7 m (45.0 ft). Characteristic features of this whale are the large white flippers that extend approximately one-third of the body length. Humpback whales are more coastal than many other species, and there is a single stock that summers along the New England coast and winters in the Caribbean. In 1991, the National Marine Fisheries Service estimated the population of humpback whales in the North Atlantic was approximately 5,800 individuals.

Sperm whales reach lengths of approximately 16.8 m (55.0 ft) and are dark gray to black. The dorsal fin is hump-like. Sperm whales are distributed worldwide, from polar to tropical waters, and most winter in equatorial regions and summer in more northerly latitudes. They typically inhabit the deep waters along the edge of the continental shelf. In 1991, the National Marine Fisheries Service estimated the population of humpback whales in the North Atlantic was approximately 190,000 individuals.

3.5.2.1.8.1. Site-specific Information on Other Marine Mammals

Protected species of marine mammals use the nearshore waters of St. Johns County as evidenced by their stranding on the beaches of the HCP Plan Area. Between 1992 and 2001, a wide variety of marine mammals stranded in St. Johns County, including the endangered humpback, northern right, and sperm whales (Hubbs-Sea World Research Institute *unpublished data* 2002).

3.5.2.1.10. State-Listed Species in the Plan Area

The species described above are animals that are listed by both the Federal government and the State of Florida as endangered or threatened. Additionally, there are a number of wildlife species that are designated as endangered, threatened, or species of special concern by the State of Florida but are not federally listed (Table 3-9).

3.5.2.1.10.1. Gopher Tortoise (Gopherus polyphemus)

The gopher tortoise *(Gopherus polyphemus)* is a medium-size terrestrial turtle with an average adult carapace (shell) length of 23.1-28.3 cm (9.0-11.0 inches). These reptiles have stumpy, elephantine hind feet and flattened, shovel-like forelimbs that are adapted for digging. The shell is domed and oblong; coloration is generally tan, brown, or gray. The head is wide and scaled.

Gopher tortoises excavate burrows, averaging 4.5 m (14.8 ft) in length and 2.0 m (6.6 ft) in depth. These burrows provide protection from temperature extremes, fire, desiccation, and predators, and serve as refuges for a variety of other animals. An individual tortoise may use more than one burrow and may excavate new burrows at any time during its life. Generally, feeding activity is confined to within 45.7 m (150.0 ft) of the burrow. Principal foods include grasses, legumes, and grass-like plants of the sedge and aster families. Fruits such as blackberries, pawpaws, gopher apples, and saw palmetto berries are also consumed. Gopher tortoises lay 3-12 eggs in one clutch from mid-May to mid-June. The incubation period varies from 80-110 days, and predation on nests and hatchlings is heavy.

Although still widely distributed in Florida, the gopher tortoise population is continuing to decline. Thus, the gopher tortoise is listed by the State as a species of special concern. Although tortoises still occur in all of Florida's 67 counties, their distribution in the southern peninsula is limited and fragmented by unsuitable habitat and increased urbanization. Gopher tortoise burrows provide protection for numerous vertebrate and invertebrate species including other protected species such as the eastern indigo snake, Florida mouse, gopher frog, and Florida pine snake. Thus, impacts to tortoise burrows may also affect these species.

In addition to the preferred longleaf pine sandhills habitat, gopher tortoises also inhabit sand pine scrub, coastal strands, live oak hammocks, dry prairies, pine flatwoods, and mixed hardwood-pine communities. Disturbed habitats, such as roadsides, fencerows, clearings, and old fields, often support relatively high densities as well. Although gopher tortoises are not typically found on the open beach, their burrows are present in the Coastal Strand, Coastal Grassland, and Scrub areas within the HCP Plan Area.

3.5.2.1.10.2. Florida Pine Snake (Pituophis melanoleucus mugitus)

Listed as a species of special concern by the State of Florida, the Florida pine snake *(Pituophis melanoleucus mugitus)* is a comparatively large, stocky snake with dark brown to reddish blotches on its light gray to sandy-colored back. Adults range from 0.9-2.3 m (3.0-7.5 ft) long. They occupy dry habitats, and radio-tracked individuals suggest that they have home ranges of 12.1-97.2 ha (30.0-240.0 acres). Prey items include ground-dwelling birds, eggs, mice, pocket gophers, small rodents, and small mammals. They lay 4-8 large white eggs from June to August. Within the Plan Area, Florida pine snakes have been documented to exist in the Coastal Strand community in the Vilano Beach area.

3.5.2.1.10.3. Wading Birds

Several species of medium-sized wading birds that occur within the Plan Area are listed as species of special concern by the State of Florida. These include the roseate spoonbill *(Ajaia ajaja)*, little blue heron (*Egretta caerulea)*, reddish egret (*Egretta rufescens)*, snowy egret (*Egretta thula)*, tri-colored heron (*Egretta tricolor)*, and white ibis (*Eudocimus albus)*. Adults of these species all vary in height from 59.1-82.3 cm (23.0-32.0 inches) and have wingspans of 92.6-128.6 cm (36.0-50.0 inches). Although color varies significantly among species, and even between juveniles and adults within some species, they share several critical features. All species are wetland dependent, and small fish and aquatic organisms constitute the majority of their prey. All species are colonial nesters, and most nest in mixed flocks with one another. Although no nesting rookeries of any of these species are known to occur within the Plan Area, sightings are frequent, especially in large publicly owned parcels such as GRSP and ASP.

3.5.2.1.10.4. Arctic Peregrine Falcon (Falco peregrinus tundrius)

The Arctic peregrine falcon *(Falco peregrinus tundrius)* is a large bird of prey that is designated as an endangered species by the State of Florida. At lengths of 41.4-51.4 cm (16.0-20.0 inches) and wingspans of 90.0-110.6 cm (35-43 inches), peregrines are the largest member of the falcon family found in Florida. They are extremely fast fliers, and their primary prey items are other

birds, which they typically strike from the air. Although there are several sub-species of peregrine falcons, their plumages are very similar. Most peregrines are highly migratory, spending summertime breeding seasons as far north as the arctic tundra, and returning to Florida and other areas further south to spend winters. Peregrines have been sighted in GRSP, and one was observed on the beach near St. Augustine Inlet at ASP during a field survey on October 12, 2001 (EAI 2001c).

3.5.2.1.10.5. American Oystercatcher (Haematopus palliates)

The American oystercatcher *(Haematopus palliates)* is a medium-sized, distinctly colored black and white bird that is typically found in coastal areas near oyster bars, mud flats, and riverine sand bars. This species is listed by the State of Florida as a species of special concern. They have stout, brightly colored orangish-red bills that are used to slice into oysters or to forage for benthic organisms. During periods of extremely high tides, oystercatchers seek refuge on sandy beaches. Oystercatchers are year-round residents in northeast Florida, nesting on the ground from March through July. Although they have been observed in GRSP and ASP, there has been no documented nesting within the Plan Area.

3.5.2.1.10.6. Brown Pelican (Pelecanus occidentalis)

With wingspreads of approximately 2.1 m (7.0 ft), brown pelicans *(Pelecanus occidentalis)* are unmistakable as they dive for their prey of live fish. Listed by the State as a species of special concern, pelicans are generally brown in color, though the head and neck change color during the nesting season. Juveniles are nearly all brown and generally have adult plumage by their third year. Feeding exclusively on fish, brown pelicans are common in coastal areas in Florida, where they often fly in long lines over the beach. Although pelicans are often observed resting on the beach, no nesting rookeries have been documented within the Plan Area.

3.5.2.1.10.7. Black Skimmer (Rhynchops niger)

The unusual foraging style differentiates this medium-size water bird from any other species. Black skimmers *(Rhynchops niger)* fly just above the water with their orange and black bottom mandible extended just below the water surface. The State of Florida has designated this species as a species of special concern. A member of the tern family, black skimmers are dorsally black and white on their underside. They are approximately 46.3 cm (18.0 inches) in length and have a wingspan of approximately 113.1 cm (44.0 inches). Although skimmers that nest as far north as coastal New England may move southward during the winter, most skimmers in Northeast Florida are year-round residents. Black skimmers are ground-nesting birds and will often nest in small groups with others of their kind and with least terns. Black skimmers require calm seas when foraging, and therefore are more frequently observed in the ICW, Tolomato River, and Matanzas River than over the open ocean. The only location within the Plan Area where black skimmers have been documented to nest is at the northern tip of ASP on the south side of the St. Augustine Inlet.

3.5.2.1.10.8. Least Tern (Sterna antillarum)

Designated as a threatened species by the State, the least tern (*Sterna antillarum)* is Florida's smallest member of the tern family, having a length of 23.1 cm (9.0 inches) and a wingspan of approximately 51.4 cm (20.0 inches). Although their gray and white plumage is similar to other terns, the least tern's yellow bill, legs, and feet differentiate it from other species. Additionally, although many other species of terns are wintertime residents, least terns reside in Florida during the summertime. Returning from wintering areas in South America, they arrive in March and April, nest on barren, sandy beaches during the summer, and return south in the fall. Least terns will return to the same nesting areas year after year, if previous nesting attempts have been successful. However, even successfully used nesting areas will be forsaken, when/if vegetation becomes established and covers the ground surface. During the last several years, there has been documentation of successful nesting by least terns on rooftops. Flat tar-and-gravel roofs near open-water foraging areas appear to offer alternate nesting areas. These new nesting sites are becoming increasingly important, as natural nesting areas on the beach become more and more susceptible to human disturbance.

Within the Plan Area, least terns have been documented to nest in the vicinity of the St. Augustine and Matanzas Inlets, as well as within GRSP (FNAI 2001; Appendix D). Between 1987 and 2002, least terns nested on the beaches within GRSP (Owen *pers. comm.* 2002). Owen remarked, "The fate of each year's nesting has varied significantly through the years, and, generally speaking, nesting success has been low due to high tides washing over nests." During the summer of 2002, there were between 20-30 nests and probably just less 20 successful nests that produced fledglings (Owen *pers. comm.* 2002). Each year, the park staff at GRSP have roped off and monitored the nesting area and posted it with appropriate signage.

U.S. Park Rangers at FMNM, in cooperation with biologists from FWC, perform least tern surveys at least once a year and have designated a bird sanctuary at FMNM west of the A1A Bridge as an important least tern nesting area. In the late 1990s, this bird sanctuary, also designated as a Florida Critical Wildlife Area by the FWC, was one of the largest least tern nesting colonies on the east coast of Florida (Rich *pers. comm.* 2002). However, the area west of the A1A Bridge is highly ephemeral, and during 2002 least terns began utilizing a newly roped area east of the A1A Bridge (Rich and Van Ghent *pers. comm.* 2002).

A bird sanctuary (delineated by signs and posts interconnected by twine) also exists at ASP south of the St. Augustine Inlet. Least terns have historically nested in this area, but have not returned to nest during the past several years (Miller *pers. comm.* 2002). Although the reasons why least terns have abandoned ASP are not fully understood, the nesting habitat appears intact, and local biologists have speculated that the terns may return to nest at ASP in the future (Miller *pers. comm.* 2002). During the summers of 2001 and 2002, least terns were also observed nesting along Summer Haven south of Matanzas Inlet (Rich *pers. comm.* 2002).

3.5.2.1.10.9. Common Snook (Centropomus undecimalis)

The common snook *(Centropomus undecimalis)* is a powerful, streamlined, silvery-green fish that is tolerant of wide ranges in salinity. Snook are listed as a species of special concern by the State

of Florida. They are a highly prized recreational game fish, most often caught in estuaries, inlets, and along the beach in waters adjacent to the Plan Area. Peak spawning season is June and July, and juveniles live primarily in small brackish water streams, canals, and ditches. Although growth rates are highly variable, most become sexually mature by two to three years of age at lengths of approximately 33.4 cm (13.0 inches). Mature snook can reach lengths of over 102.9 cm (40.0 inches) and may weigh 22.5 kg (50.0 lbs) or more. Snook are carnivores, preying mainly on small fish, especially fingerling mullet. Their diet also includes shrimp and crabs.

3.5.2.1.11. Other Rare Species of Wildlife

The species described above include those which are designated as endangered, threatened, or species of special concern by the Federal and/or the State government. Several non-regulatory, science-based entities have developed independent lists of species that they believe are in danger or potential danger of extinction. For instance, the FNAI tracks the reported occurrences of other rare species of wildlife, such as the eastern diamondback rattlesnake, which is known to occur within the Plan Area. FNAI's response to a request for information, which includes these non-regulatory listings, is included in Appendix D.

3.5.2.2. Listed Plant Species

The plant names provided below are consistent with the nomenclature in the *Guide to the Vascular Plants of Florida* by Richard P. Wunderlin (1998).

3.5.2.2.1. State-Listed Species in the Plan Area

Both the Federal government and the State of Florida have used their authority to designate plants as endangered or threatened. Over 50 plant species that occur in Florida have been designated by the Federal government as endangered or threatened. Although there are no federally listed plant species known to occur within the Plan Area, 11 plant species listed by the State of Florida as endangered, threatened, or commercially exploited have been documented within or adjacent to the Plan Area (Table 3-9).

3.5.2.2.1.1. Sand-dune Spurge (Chamaesyce cumulicola)

The sand-dune spurge *(Chamaesyce cumulicola)*, also known as the coastal dune sandmat, is one of several species of *Chamaesyce* that are present within the Plan Area. This species of spurge is listed by the State of Florida as threatened. It is low growing, as opposed to other more erect species, blooms in spring, summer, and fall, and is found in dunes and scrub. Within the Plan Area, it appears to be fairly common in areas where the groundcover is discontinuous.

3.5.2.2.1.2. Coastal Vervain (Glandularia maritima)

Designated as an endangered species by the State of Florida, coastal vervain *(Glandularia maritima)*, which is also known as coastal mock vervain (*Verbena maritima*), is a small, lavender-flowered member of the Verbenaceae (Vervain) family. It inhabits dunes and coastal pinelands

and is found primarily on Florida's east coast. It blooms intermittently throughout the year and has been documented near the south boundary of GRSP.

3.5.2.2.1.3. Crested Coralroot (Hexalectris spicata)

Crested coralroot *(Hexalectris spicata)*, which is also known as spiked crested coralroot, is a small, ground-dwelling member of the orchid family. Crested coralroot is listed as endangered by the State of Florida. Crested coralroot is known to inhabit calcareous hammocks and shell middens, and it blooms in the spring and summer. It has been documented within ASP.

3.5.2.2.1.4. Angle Pod (Matelea gonocarpa)

Also known as angular milkvine, angle pod *(Matelea gonocarpa)* is a perennial, twisting vine that is found in hammocks. It is listed as a threatened species by the State and is a member of the milkweed (Asclepiadaceae) family. Angle pod flowers have yellow or greenish-brown petals, when it blooms during the spring and summer. The resulting seedpod is smooth and angled, without wings or spines. Within or adjacent to the Plan Area, it is only known from GRSP.

3.5.2.2.1.5. Pygmy-pipes (Monotropsis odorata)

Members of the heath (Ericaceae) family, pygmy-pipes *(Monotropsis odorata)* are a State-listed endangered species. These small perennial herbs are conspicuous for their lack of chlorophyll, for which they compensate by being parasitic on underground fungi associated with tree roots. When blooming in January and February, an individual stem 1.5-5 inches tall will have several small white or lavender bell-shaped flowers.

3.5.2.2.1.6. Prickly Pear Cactus (Opuntia stricta)

Members of the Cactaceae family, several species of *Opuntia* are present within the Plan Area. Of these, only *Opuntia stricta*, the erect or shell mound prickly pear is listed as threatened by the State of Florida. It is abundant within the Plan Area, where it can be found in most undeveloped backdune areas. It blooms throughout the year, and the dark purple fruits are edible.

3.5.2.2.1.7. Giant Orchid (Pteroglossapsis ecristata)

A large terrestrial member of the orchid (Orchidaceae) family, the giant orchid *(Pteroglossapsis ecristata)* inhabits dry habitats throughout much of peninsular Florida. It is a perennial herb that may reach heights in excess of 1.5 m (5.0 ft) when blooming. The terminal bloom spike may have 5-30 small, yellowish green flowers. Within the Plan Area, the giant orchid has only been documented in GRSP.

3.5.2.2.2. Other Rare Species of Plants

As described previously, in addition to the classification of "endangered" and "threatened," the State of Florida also has a designation of "commercially exploited." Collectors typically seek these species, and their populations could be jeopardized by continued harvest from the wild.

The three such species, one orchid and two ferns, that have been documented to occur within or adjacent to the Plan Area are identified in Table 3-9 and described below.

3.5.2.2.2.1. Green-fly Orchid (Encyclia conopseum)

A member of the orchid family, the green-fly orchid *(Encyclia conopseum)* is a small, epiphytic plant that is found in swamps and moist hammocks. Due to its epiphytic growth form, collectors easily remove this species from the wild. Within the Plan Area, the green-fly orchid has only been reported from GRSP.

3.5.2.2.2.2. Cinnamon Fern (Osmunda cinnamomea) and Royal Fern (Osmunda regalis)

The only members of the royal fern family (Osmundaceae), both the cinnamon fern *(Osmunda cinnamomea)* and the royal fern *(Osmunda regalis)* are wetland indicator species that are immediately distinguished from other ferns during their reproductive stage. Instead of producing spores in sporangia located on the underside of the leaves, these two ferns produce specialized, fertile, cinnamon-colored leaves that hold the sori. These species are typically understory plants in forested wetlands, and are therefore likely to occur west of the CCCL.

Chapter 4. FACTORS AFFECTING LISTED SPECIES IN PLAN AREA

Sea turtles nesting on the County's beaches, as elsewhere in Florida, face a variety of natural and human-related threats (NMFS and USFWS 1991a and b). Natural threats include nest depredation and beach erosion. Various anthropogenic threats to nesting habitat include beach armoring, beach nourishment, coastal construction, artificial lighting, increased human presence on the beach at night, beach cleaning, recreational beach equipment, beach vehicular driving, and poaching. Threats to turtles in the water include oil and gas exploration, dredging, marina and dock development, debris entanglement, commercial fisheries, boats, power plant entrapment, and ingestion of marine debris (National Research Council 1990). Most pertinent to this HCP are impacts associated with beach vehicular driving.

The populations of AIBM dwelling in the dunes of St. Johns County routinely encounter both natural and anthropogenic threats. The most serious natural threats to the subspecies' long-term persistence include the overwash and habitat loss due to storm events. Humans negatively influence AIBM through beach driving, trespassing and littering in the dunes, alteration or elimination of habitat through coastal development and construction, shoreline protection measures, artificial lighting, and the release of predatory feral and free-roaming cats.

Additionally, a wide variety of natural and human-induced impacts potentially occur to threatened, endangered, and migratory birds along the beaches of St. Johns County. Factors, such as erosion of nesting habitats and anthropocentric disturbances such as pedestrian, horseback, or vehicular traffic, free-roaming domestic cats and dogs, and habitat loss due to beachfront development, can negatively affect birds. Birds utilizing the HCP Plan Area might also be affected by trash on the beach, artificial lighting, and the eggs or young may be unintentionally crushed by traffic in nesting areas.

This section first describes the methods and programs utilized within the Plan Area to monitor for protected species. Subsequently, the natural and human-related activities that have been documented to, or may potentially, impact sea turtles, AIBM, and birds along the beaches of St. Johns County are discussed.

4.1. MONITORING PROGRAMS IN ST. JOHNS COUNTY

4.1.1. Sea Turtle Nest Monitoring Program in St. Johns County

Sea turtle monitoring personnel conduct daily surveys of all County Beaches during the sea turtle nesting season. At present, monitoring is conducted by seven independent groups, each coordinated by a person possessing a valid Marine Turtle Permit from FWC. This Principal Permit Holders (PPH) may be assisted by up to 24 additional personnel, each of whom is also listed on the permit. Survey methodologies vary among PPHs. Monitoring personnel initiate their surveys between 5:30 and 9:00 AM and generally finish anywhere from 15 minutes to 2 hours later. Monitors generally begin surveying daily sometime between May 1 and 15 and continue at least through August 15. Some groups continue until the last nest emerges, which may be in October. Nests deposited before monitoring officially begins in May are usually noted by the public or County beach staff and reported to the PPHs for marking and monitoring. Since

the leatherback turtle is typically the first species to begin nesting, the large size of their tracks and nest would probably not go undetected. Sea turtles rarely nest after August 15 in St. Johns County, however both loggerhead and green turtle nests have been recorded in September (see Table 3-7). As for early season nests, late season nests are generally noted by the public or County staff, and the appropriate PPH is called to mark and monitor the nest. However, both early and late season nests may potentially go undetected and remain unmarked throughout their incubation period.

Another scenario leading to an unmarked nest is when monitoring personnel fail to recognize a new nest on the beach during the daily morning survey. In order to determine which species came ashore and whether or not it nested, the distinctive tracks left on the beach at night by turtles are interpreted the following morning. However, sometimes these tracks can be misinterpreted or go undetected. In an assessment of data generated by permitted and trained turtle surveyors throughout Florida, FWC determined that 7 percent of the crawls marked for study were incorrectly recorded as false crawls (non-nesting emergence) when they were actually nests (Schroeder 1994). In other cases, natural elements or human activity on the beach may obscure a turtle's tracks and cause a nest to be missed. Rain and wind obscure tracks, while wavewash can completely erase a track, particularly during storms or abnormally high tides. In some cases, wavewash may obliterate all signs that a turtle has been on the beach. Humans on the beach can also obscure signs of nesting. Sometimes tracks are intentionally obliterated, either maliciously or in misguided efforts to protect the nest from human tampering. Typically, however, heavy foot traffic is responsible, particularly at locations where crowds gather to watch a turtle nest. As a result of such various factors, some nests are likely to be missed, even by the most experienced personnel.

Missed nests are usually identified by signs of hatchling emergences in areas where no nest was previously documented. Anecdotally and based on hatchling tracks, monitors typically recount one missed nest every few years on County Beaches (Miller *pers. comm.* 2002). However, signs of hatchling emergence are very easily obliterated by the same elements that interfere with detection of nests. Thus, it is likely that some missed nests go completely undetected, and these nests are at the greatest risk of impact from vehicles on the beach. The loss of nest markers due to tides or vandalism is another means for a nest to be placed at risk to vehicular impacts.

4.1.2. AIBM Monitoring Programs in St. Johns County

In ASP and GRSP, quarterly trapping surveys for AIBM have been conducted by Florida Park Service personnel since 1989 (Miller, Bard, and Mulholland *pers. comm.* 2001). Due to lack of personnel and resources, FMNM staff are not able to perform frequent transect trapping studies for beach mice. U.S. Park Rangers from FMNM have sporadically conducted cooperative studies with FDEP Park Service district biologists and the biologist from GRSP (Rich *pers. comm.* 2002).

The following methods are utilized during FDEP surveys:

> Quarterly monitoring protocol at GRSP and ASP follows that of Humphrey and Frank (unpub.): at GRSP, three transects were established at the north, central,

> and south portions of the park in primary dune habitat. At ASP, two transects were established in primary dune habitat in the central and south portion of the park. Each transect consists of 20 stations spaced at 10 m intervals with two traps per station. Trapping is conducted for two to three consecutive nights per transect. Traps are baited with either sunflower seeds or peanut butter and oats and opened shortly before sunset; the traps are checked at sunrise and closed. Mice are handled immediately upon detection; standard morphometric measurements are recorded at that time. Mice have been ear-tagged at ASP for mark-recapture purposes since 1994; GRSP mice have been ear-tagged following the commencement of this augmentation project [1992]. Following ear-tagging, the mice are released at the point of capture (Bard *unpublished data* 2001).

Additionally, Park Service personnel have taken blood and tissue samples from mice in ASP and GRSP for DNA microsatellite determination by geneticists at the University of Illinois (Bard p*ers. comm.* 2001). Unfortunately, these samples have not yet been processed due to a lack of funding. Park personnel would also like to take blood and tissue samples from AIBM taken in potential future trapping at FMNM. The benefits of such a study would include elucidation as to whether genetic drift has occurred between the population at ASP and the population at FMNM, which are assumed to be genetically isolated due to the seawall and rock revetment at St. Augustine Beach. This important data would assist scientists in determining how often and how many mice should be exchanged between ASP, GRSP, and FMNM to maintain genetic fitness.

4.2. NATURAL EVENTS

4.2.1. Natural Events Affecting Sea Turtles in Plan Area

4.2.1.1. Depredation

Depredation of sea turtle eggs and hatchlings by natural and introduced species occurs on almost all nesting beaches. The most common predators in the State of Florida are ghost crabs (*Ocypode quadrata*), fire ants (e.g., *Solenopsis invicta*), raccoons (*Procyon lotor*), feral hogs (*Sus scrofa*), foxes (e.g., *Urocyon cinereoargenteus*) and armadillos (*Dasypus novemcinctus*). The following predators have been implicated to negatively impact sea turtle nests on the beaches of St. Johns County: gray foxes (e.g., *Urocyon cinereoargenteus*), raccoons (*Procyon lotor*), domestic dogs *(Canis familiaris)*, ghost crabs (*Ocypode quardrata*), and fire ants (e.g., *Solenopsis invicta*) (FWC *unpublished data* 2002).

The data reported on depredation of sea turtle nests in St. Johns County between 1996 and 2001 was examined (FWC *unpublished data* 2002; Table 4-1). The precise extent of depredation on County Beaches could not be determined, because of inconsistent data reporting. Consequently, the following analysis provides only a general characterization of depredation trends and patterns.

From 1996 to 2001, the lowest predation rates appeared to be in the monitoring zones of Ponte Vedra North, Vilano Beach (formerly North St. Augustine Beach), and St. Augustine Beach (formerly South St. Augustine Beach). The areas of highest nest depredation typically occurred

within GRSP and ASP. During this six-year period, depredation impacts in GRSP were recorded at 17 out of 257 nests (approximately 6.7 percent of the nests). These depredation events resulted in the damage of approximately 277 sea turtle eggs. Depredation reached the highest rates during the 2001 nesting season, when 9 of 51 nests were lost to foxes or raccoons, and another 3 nests were impacted by fire ants. Thus, in GRSP, 23.5 percent of nests deposited in 2001 were negatively impacted by depredation; 17.6 percent of the nests were totally lost.

The other area of relatively heavy nest depredation has been ASP. Park staff at ASP placed self-releasing cages on all of their nests between 1996 and 2001 in response to past heavy predation by gray foxes (Miller *pers. comm.* 2001). During these years, raccoons and gray foxes attempted to raid nests, but were generally unsuccessful in penetrating the cages to reach the eggs (Miller *pers. comm.* 2001). Predation on post-emergence hatchlings also appears to be a notable problem for sea turtle hatchlings in ASP. In 2000 and 2001, ghost crabs, foxes, raccoons, and birds preyed on hatchlings leaving the nest; those disoriented by lights appeared to be particularly susceptible to this type of predation.

Ghost crabs have been recorded to negatively impact sea turtle nests and/or hatchlings from GRSP south to the Flagler County Line. However, the extent to which these crabs are invading nests, depredating eggs and hatchlings, and/or affecting reproductive success is not known. Ghost crabs appear to depredate emergent hatchlings, as indicated by hatchling tracks terminating at crab burrows and crab tracks adjacent to dead hatchlings on the beach. Ghost crabs (*Ocypode quadrata*) appear to have the greatest impact on sea turtle nests in the southern portions of St. Johns County beaches. The northernmost record of ghost crab depredation is in GRSP in 2000, where ghost crabs damaged two eggs in one loggerhead nest (Table 4-1).

Fire ants (e.g., *Solenopsis invicta*) have only recently been documented as a problem for sea turtle eggs and hatchlings (Wilmers *et al*. 1996, Moulis 1997). During recent years, the presence of fire ants at nest sites was reported throughout the County. Often times, they were observed inside the nest during nest excavation or on hatchlings at the surface of the nest. However, as for ghost crabs, the extent of damage to eggs and hatchlings directly attributable to ants cannot be reliably quantified.

Although not considered a typical form of predation, roots of sea oats (*Uniola paniculata*), railroad vine (*Ipomoea pescapre*), and other dune plants sometimes invade the nest cavity and penetrate incubating eggs. This occurs primarily in nests laid high on the beach at, or landward of, the toe of the dune. From 1996 through 2001, monitoring personnel in Ponte Vedra South reported that two of the excavated nests had roots above or inside the egg chamber.

4.2.1.2. Tidal Inundation

Erosion, inundation, and accretion appear to be the major abiotic factors negatively affecting incubating egg clutches (NMFS and USFWS 1991a). Short-term erosion events (e.g., storms) are a natural phenomenon throughout the tropics and subtropics where both the number of turtle nests and the amount of storm activity vary considerably from year to year. Turtles have evolved a strategy to offset episodic impacts to hatchling productivity by laying large numbers of eggs and distributing their nests both spatially and temporally (Milton *et al.* 1994). Thus, rarely is the

total annual reproductive output affected by a storm that impacts a nesting beach. However, chronic erosion exacerbated by human activities along the coastline can result in a permanent reduction in both the quantity and quality of available nesting habitat leading to long-term impacts to productivity (Milton *et al.* 1994). During erosion events, nests deposited closest to the water's edge may be completely washed out. Nests incubating higher on the beach can be uncovered or inundated with seawater during unusually high tides, both of which can reduce reproductive success.

Similar to the case with depredation, the data records of nests overwashed and/or washed out appear to be patchy and may not have been consistently reported. However, using best available data, it appears that approximately 12 percent of all nests deposited between 1998 and 2001 in St. Johns County were washed out by tides (this data was generally not reported for 1996-1997; FWC *unpublished data* 2002; Table 4-2). The vast majority of damage from tidal inundation occurred during two separate years. In 1999, Hurricanes Dennis, Floyd, and Irene all impacted the coast of St. Johns County, causing considerable erosion and beachfront damage. During 1999, 14.1 percent of all nests were reportedly washed out. The nests deposited during 2001 were even more severely impacted by Tropical Storm Gabrielle, which directly hit St. Johns County. Tropical Storm Gabrielle caused serious erosion throughout the County, even creating a new inlet through the barrier island at Summer Haven (this inlet has since been filled in). During 2001, about 28.6 percent of the nests in St. Johns County were reportedly lost to tidal inundation. The survey zones with the highest proportion of nests washed out during 2001: Vilano Beach (44.4 percent), Guana River South (41.7 percent), Ponte Vedra North (35.7 percent), GRSP (35.3 percent), Beach Club Dr. North (33.3 percent), St. Augustine Beach (33.3 percent), and Fort Matanzas North (33.3 percent).

Nests that are not washed out of the beach may suffer reduced reproductive success as the result of tidal inundation. Eggs saturated with seawater are particularly susceptible to embryonic mortality (Bustard and Greenham 1968, Milton *et al*. 1994, Martin 1996). Accretion of sand above incubating nests may also result in egg and hatchling mortality. Although occasional overwash of nests on Hutchinson Island, Florida, appeared to have had minimal effect on reproductive success, prolonged or repeated exposure to tidal inundation resulted in fewer emergent hatchlings (Ernest and Martin 1993). Ehrhart and Witherington (1987) reported that 17.5 percent of the loggerhead nests deposited in their Brevard County study area did not emerge due to erosion, accretion, and storm surge.

From available data, it is difficult to ascertain the effects of wave overwash on sea turtle nests in St. Johns County. On Hutchinson Island, Florida, nests overwashed at least once incubated on average about 1.5 days longer than those on dry sections of beach (EAI 2001a). The effect was even more pronounced for those nests experiencing multiple days of overwash. Longer incubation periods may increase susceptibility of eggs to depredation.

To reduce the negative effects of erosion and tidal overwash, nests that are deposited low on the beach are sometimes moved to "safer" locations higher on the beach. Survey monitors in St. Johns County reported that nests were most commonly relocated, because they were laid at, or seaward of, the current high tide mark (FWC *unpublished data* 2002; Table 4-4). The greatest percentage of all relocated nests between 1996 and 2001 occurred in ASP (20.3 percent) and St.

Augustine Beach (formerly South St. Augustine Beach; 11.7 percent). Nest monitors in all survey zones relocated some nests between 1996 and 2001, with the lowest percentage of nest relocations occurring in GRSP (2.3 percent).

4.2.1.2.1. Post-hatchling Washback Sea Turtles

In addition to those direct impacts associated with tidal overwash, storm events during the nesting season may cause hatchlings that have already entered the water to wash back up on the beach with algae and flotsam. In some instances, these hatchlings may have been at sea for weeks or months. Stranded post-hatchling washbacks, as they are referred to, are vulnerable to being accidentally run over by vehicles on the beach. Washback hatchlings are generally dealt with in St. Johns County by personnel from the Volusia Turtle Patrol, Beach Management Division, State Park Service, and the National Park Service. The appearance of washback hatchlings typically coincides with late summer and autumn storms. Collected post-hatchlings are dealt with in accordance with FWC Marine Turtle Conservation Guidelines (Miller *pers. comm.* 2002, Rich *pers. comm.* 2002, and Williams *pers. comm.* 2002).

Between 1992 and 2001, 78 Stranding Reports of washback post-hatchlings were filed with FWC (1 in 1997, 2 in 1998, 73 in 1999, 0 in 2000, and 2 in 2001; FWC *unpublished data* 2001b). About 97 percent of the recorded washbacks occurred during the month of October; the remaining few occurred in September. Approximately 94 percent of the washbacks reported to FWC occurred during a red tide event documented in mid-October 1999.

Additionally, 1996-2001data records regarding washbacks between Crescent Beach and the Flagler County Line were searched (Rich *pers. comm.* 2002). In this area, post-hatchlings washed back onto Crescent Beach on November 22, 1998 (1 loggerhead), July 10, 2000 (2 loggerheads), August 19, 2000 (1 loggerhead), and October 11, 2001 (1 loggerhead) (Rich *pers. comm.* 2002). The water conditions at the time of each washback event were not recorded.

4.2.1.3. Ephemeral Escarpments and Other Natural Obstructions

Escarpments caused by erosion are extremely common along the foredunes throughout the beaches of St. Johns County, particularly during the winter months. During a fall survey conducted by EAI in November 2001, the escarpments ranged from 2 to 6 ft in height along South Ponte Vedra, North Beach, and Vilano Beach (EAI 2001c). Escarpments reaching maximum heights of 15-16 ft were measured along a small stretch of beach in South Ponte Vedra (Figure 4-1). Escarpments on the South Beaches (ASP south to Marineland) generally ranged between two and nine feet in height with a maximum of 14 ft recorded just north of the Summer Haven revetment. Natural dune escarpments have been reported to negatively impact sea turtles during the nesting season (R.E. Martin *pers. comm.* 2002). Nests at the base of a scarp are generally more susceptible to tidal inundation and/or being washed out by high tides. Additionally, the escarpment can collapse, thereby placing additional sand on top of the nest. In both of these cases, the nest may be lost completely or exhibit reduced reproductive success. Although unlikely, it is also possible that a steep escarpment may collapse on a nesting female causing increased stress and/or burial.

Another natural obstruction to nesting female sea turtles and emergent hatchlings is exposed Anastasia rock formations. Such rock formations are periodically exposed on the south side of Matanzas Inlet and in the vicinity of the Town of Marineland. The beaches in both of these areas are intermittently scattered with pieces of broken Anastasia rock. In Martin County, Florida, exposed Anastasia rock formations annually cause problems for sea turtles (R.E. Martin *pers. comm.* 2002). Nesting females have become trapped within the rock formations; they have also fallen from steep outcroppings when returning to the sea after nesting. Such rock formations may also prompt false crawls, thereby increasing the total energy expenditure required for a sea turtle to successfully nest. Jagged rock formations may also trap emerging hatchlings during their crawl to the sea. Sometimes these rock formations are covered by sand when the female turtle emerges to nest, but are later exposed to pose obstacles for emerging hatchlings. Monitoring personnel in St. Johns County have documented sea turtle tracks winding around exposed Anastasia rock formations and false crawls occurring at the rock formations just south of Matanzas Inlet and near the Town of Marineland (Rich *pers. comm.* 2002).

Additionally, dense sprawling vegetation may trap female sea turtles before or after a nesting attempt (R.E. Martin *pers. comm.* 2002). However, the cases when vegetation has acted as a natural obstruction to nesting turtles have been extremely rare. Such an event is most likely to occur when a female unintentionally crawls landward of the dune system because the dune has been altered to an unnatural state or she is disoriented by lights or other cues.

Encounters with natural escarpments or physical obstructions, such as seawalls, may cause a female turtle to abort her nesting attempt (i.e., false crawl). To potentially identify areas where false crawls are most common, nesting success was examined for each of the survey zones in St. Johns County (Table 4-3). Between 1996 and 2001, the highest nesting success (percentage of all crawls resulting in nests) were documented in Ponte Vedra North (78.8 percent), followed by GRSP (70.2 percent), St. Augustine Beach (formerly South St. Augustine Beach) (68.9 percent), and Fort Matanzas National Monument (including both Fort Matanzas North and South (67.8 percent) (FWC *unpublished data* 2002). The lowest nesting success occurred in ASP (62.7 percent) and Beach Club Drive South (61.9 percent). Overall nesting success in the County was 67.1 percent (FWC *unpublished data* 2002). In Florida, loggerhead sea turtles typically deposit eggs on about 50 percent of their emergences onto the dry beach (Trindell *et al.* 1998). Thus, the relatively high nesting success values for St. Johns County suggest that obstructions on the beach are not demonstrating a substantial problem.

4.2.2. Natural Events Affecting AIBM in Plan Area

4.2.2.1. Natural Predation

The Recovery Plan for the AIBM states that the predators of this species include "snakes, bobcats, foxes, raccoons, skunks, owls, and feral cats and dogs" (USFWS 1993). Since feral and free-roaming cats and dogs are considered exotic species, they are classified as unnatural predators and are discussed in section 4.11 of this HCP. The levels of predation by natural predators were monitored and documented during a two-year study of AIBM within GRSP and throughout Anastasia Island (Frank and Humphrey 1996). The following excerpts track Frank's observations and constitute the only published records of predation on AIBM:

> Snakes were the most abundant native predators observed in beach mouse habitat. The eastern coachwhip *(Masticophis flagellum)* was the most commonly observed snake, and once a large individual was seen entering a beach mouse burrow and consuming 4 juvenile beach mice. Black racers *(Coluber constrictor)* were also commonly observed and on 2 occasions were seen to capture beach mice that had been released from traps during early morning. Eastern diamondback rattlesnakes *(Crotalus adamanteus)* were frequently observed in dune habitat and probably also prey on beach mice.
>
> Avian predators observed in beach mouse habitat include great horned owls *(Bubo virginianus)*, northern harriers *(Circus cyaneus)*, and kestrels *(Falco sparverius)*. Other owl species (barred owls *(Strix varia)*, screech owls *(Otus asio)*, and barn owls *(Tyto alba)*) that are potential beach mouse predators occur on Anastasia Island, but were not observed in beach mouse habitat. Great blue herons *(Ardea herodias)* were frequently observed in the dunes at night at ASRA [ASP], and probably prey on beach mice opportunistically.

Additionally, raccoons, opossums, and bobcats are present on Anastasia Island and may occasionally prey upon AIBM. However, the impacts of natural mammalian predators are thought to be insignificant (Frank and Humphrey 1996).

4.2.2.2. Competition

Beach mice are the only mammal endemic to the dune systems of Florida; hence there are no natural competitors who exhibit a similar size, food habits, or habitat requirements (Frank and Humphrey 1996). However, low levels of competition may occur with the exotic house mouse *(Mus musculus)*. When factors depress AIBM populations, house mice are more likely to colonize the area. Elegant trapping studies conducted by Frank and Humphrey (1996) concluded that house mice are probably not a serious threat to the persistence of beach mice in undisturbed dune habitats where beach mice are uniquely adapted. Results are summarized below:

> House mice were present in low densities at ASRA [ASP] during a period of low beach mouse density (1989), but following a period of high beach mouse density in January 1990, probably as a result of cat removal, house mouse densities decreased to zero. In contrast, house mice exhibited a broad distribution over Anastasia Island during the summers of 1989 and 1990 in disturbed habitat adjacent to houses and commercial development, where feral cats were common and beach mouse densities were low.

Thus, house mice appear to invade and flourish in areas disturbed by humans or near human structures that provide shelter, but are outcompeted my the native AIBM in an intact, natural dune system.

4.2.2.3. Escarpments, Tidal Inundation, and Storm Overwash

Because the AIBM has lost most of its historical habitat and populations have been isolated from one another, one of the greatest threats to the survival of AIBM is recurring tropical storms (USFWS 1993). The Recovery Plan for AIBM (1993) indicates, "The remaining viable populations could be exterminated by a single tropical storm, with much of the habitat destroyed at the same time. Contingency plans should be prepared to take Anastasia Island beach mice into captivity if populations drop to a level at which chances of survival in the wild decrease significantly."

The reproductive strategy of AIBM is generally tailored to quickly recover from severe storm events. However, hurricanes have been blamed for regional extirpations of Gulf Coast beach mice. As explained in section 3.5.2.1.2.1., a Population Viability Analysis (PVA) model revealed that the long-term survival of AIBM populations were more threatened by a series of frequent, less severe storms (i.e., Category I hurricanes that, in the model, killed an estimated 10 percent of the population), than by a few catastrophic storms (i.e., Category 5 hurricanes that eliminated 95 percent of the population in simulations) (Frank 1996). In summary, the modeling scenario that forced a 10 percent reduction in the AIBM population each time a 10-year Category I hurricane hit St. Augustine Inlet drove the entire subspecies to extinction within 40 years.

Though AIBM populations naturally exhibit considerable fluctuations, their continued survival is contingent upon available back dune habitat into which they can retreat when the primary dunes are overwashed (Frank and Humphrey 1996, Miller *pers. comm.* 2001). Thus, AIBM depend not only on the conservation of the line of primary dunes, but also sufficient back dune (scrub habitat) in order to survive episodic storm events and avoid extinction.

4.3. HUMAN BEACH ACTIVITIES

4.3.1. Effects of Human Beach Activities on Sea Turtles in Plan Area

4.3.1.1. Beach Visitors

Until a nesting sea turtle begins laying eggs, she may be frightened back into the ocean by human activity and lighting on the beach (McFarlane 1963). It is not known if the fright response has a long-term negative effect on nesting success. Once a turtle leaves the beach, she may return to the same location or select a new site later that night or the following night. However, repeated interruption of nesting may cause a turtle to place her nest in a sub-optimal incubation environment (Murphy 1985). The extent to which heavy nighttime beach use by humans may cause a turtle to abandon its historical nesting range is not known.

Little information is available on the potential impacts of typical beach visitors on adult and hatchling sea turtles on the beaches of St. Johns County. Visitors using flashlights or lanterns on the beach at night during the nesting season can cause nesting turtles to leave the beach and hatchlings to become temporarily disoriented. Direct harassment may also cause adult turtles to abandon nesting efforts (Johnson *et al*. 1996). Monitoring personnel reported beachgoers were caught trying to put a sea turtle in the back of a pick-up truck in Vilano Beach (Reed *pers. comm.*

2001). Although illegal, handling, playing with, or collecting hatchling sea turtles, may also occur on County Beaches. This may cause desiccation and fatigue and reduce the survivorship of hatchlings once they are released into the surf.

It is unlawful for beach visitors to be in the dune vegetation or to disturb sea turtle nests, hatchlings, or adults. Nevertheless, uninformed beachgoers, particularly children, have been reported digging into nests on other Florida beaches in search of eggs and/or hatchlings, presumably out of curiosity. On other Florida beaches, human poaching of turtle nests has been a problem (Ehrhart and Witherington 1987). However, between 1996 and 2001 on the beaches of St. Johns County, there has been only one confirmed case of poaching and four cases of nest vandalism (FWC *unpublished data* 2002). The poaching incident occurred in St. Augustine Beach in 1999. In Vilano Beach, three nests were vandalized in 1997, and one was vandalized in 1999 (the details of these acts of vandalism were not reported to FWC).

More often, however, impacts of visitors to sea turtles on the beaches of St. Johns County are indirect. Research has shown that human footprints on the beach can interfere with the ability of hatchlings to reach the ocean (Hosier *et al*. 1981), and heavy pedestrian traffic may possibly compact sand over unmarked nests. Visitors are generally sympathetic to hatchlings that are having difficulty crawling to the ocean and may pick them up and release them into the surf. Monitoring personnel reported that on two occasions in 1997 disoriented hatchlings in St. Augustine Beach were returned to the ocean by the public (FWC *unpublished data* 2001e). The negative impacts of this activity may include some loss of imprinting to the beach (LeBuff 1990) and an inability to establish a seaward direction during the hatchlings' offshore migration (Lohmann 1994). Minimization of each of these potential impacts will be addressed primarily through the County's educational and public awareness programs, as addressed in Chapter 7 of this HCP.

Hatchling and adult sea turtles may become trapped in large holes commonly dug by beach visitors along the beach, particularly in St. Augustine Beach (Holmberg *pers. comm.* 2002). Although Florida Statute 161.052 prohibits "excavation" on the beach throughout the sea turtle nesting season can only be performed if permitted by the FDEP, it is doubtful that its legislative intent was to restrict traditional beach activities, such as building sand castles. However, if these activities are taken to extreme (such as people using shovels to dig craters or deep holes in the beach), the holes created pose hazards for nesting or emergent sea turtles. If lifeguards or law enforcement officers observe visitors excavating deep holes in the beach during the sea turtle nesting season, they should instruct them to fill them in. Holes are also removed through St. Johns County's rut removal program (Williams *pers. comm.* 2001). However, minimization of such human impacts is most likely to come from public educational and awareness programs.

4.3.1.2. Recreational Beach Equipment

Damage to dune vegetation caused by the improper storage of recreational equipment on the beach is a violation of section 161.053 Florida Statutes. Additionally, the use and storage of lounge chairs, cabanas, umbrellas, catamarans, sailboats, and other types of recreational equipment on nesting beaches can hamper or deter nesting by adult females and trap and/or impede hatchlings during their nest to sea migrations. The recovery plan for Atlantic

loggerhead turtles (NMFS and USFWS 1991a) indicates "the documentation of false crawls at these obstacles is becoming increasingly common as more recreational beach equipment is left in place nightly on nesting beaches." The recovery plan cites documented reports of adult turtles being trapped under heavy wooden lounge chairs, eggs being destroyed by equipment (e.g., beach umbrellas) penetrating the egg chamber, and hatchlings being hampered during emergence by equipment inadvertently placed on top of the nest.

In St. Johns County, private landowners sometimes improperly store boats and other equipment in, or at the toe of, the dunes (Figure 4-2). This equipment might cause problems for adult nesting turtles each year and less frequently for hatchlings. Recreational equipment is placed on the beach during daylight hours seaward of condominiums along North Beach, Vilano Beach, and South Ponte Vedra, and at the Holiday Inn in St. Augustine Beach (Lardner, Stam, and Stauber *pers. comm.* 2002). A stranded sea turtle that washed onto the beach at Ponte Vedra Beach reportedly died after being entrapped in a beach chair (Stoll *pers. comm.* 2002). Monitoring personnel stated that recreational equipment is generally not a problem for sea turtles in St. Johns County, although such equipment (e.g., boats and/or volleyball nets) on the beach has reportedly caused an occasional false crawl in the South Ponte Vedra survey zone (Stam *pers. comm.* 2002).

4.3.1.3. Special Beach Events

St. Johns County beaches are host to a small number of special events each year. These events temporarily increase the number of people and/or vehicles in a given area on the beach (Williams *pers. comm.* 2001). St. Johns County's Beach Code (Ordinance 97-34) defines special events as follows:

A. Any use, activity or event conducted or promoted on the beach that would, if not permitted hereunder, constitute a violation of any provision of the Beach Code or any rule or regulation issued under the authority of the Code; or
B. Any activity or event that is organized and promoted to attract, and is likely to attract, a crowd of more than 50 persons to a certain place on the beach at a certain time under circumstances that are likely to interfere with the public's right of access and use of the beach or create a need for additional services or other resources; or
C. Any activity or event on the beach that is promoted or sponsored by commercial interests and will advertise or promote private commercial interests.

St. Johns County's Division of Beach Management can grant permits for events that fit one of the categories above. Special events in St. Johns County have historically included, but are not limited to, weddings, paddleball competitions, and volleyball tournaments. The permits are issued at no charge to the applicant. Organizers of such events must apply for and be granted this free permit in order to hold the special event on the beach. The County does not organize these events but will assist with scheduling, logistics, and details such as helping organizers schedule events to avoid high tides.

The County grants permits for both Small and Large Special Events on the beach. A Small Event is considered one that includes less than 200 people; a Large Event involves more than 200 people (Williams *pers. comm.* 2001). Organizers of Small Events must fill out a permit application form and submit it to the Supervisor of Beach Management of St. Johns County. Large Events must first be approved by the Recreation Advisory Board and then by the Board of County Commissioners. On both permit applications, the event organizers must specify if they will be using any additional structures (such as a tent or other props) or require additional law enforcement officers (for a fee). Events can be permitted to occur into the night. However, no lights or vehicles are allowed on the beach during nighttime events permitted by the County during the sea turtle nesting season (Williams *pers. comm.* 2001). A special event organizer is required to obtain a FDEP permit for any special event that involves excavation on the beach, the use of lights at night, or overnight storage of equipment on the beach during the sea turtle nesting season.

The largest and most popular special event that occurs on the beaches of St. Johns County is the public viewing of the annual Fourth of July fireworks display (section 2.4.3.4.). Citizens are allowed to drive onto the beach at night between the north side of the Vilano Ramp and the St. Augustine Inlet (Porpoise Point; Figure 4-9). To accommodate this event, the County suspends enforcement of its general prohibition against night driving by allowing vehicular access to Porpoise Point between the hours of 5:00 AM on July 4 until 1:00 AM on July 5 (Ordinance 96-48). Additionally, two supplementary County staff persons are assigned to the Porpoise Point Region during July 4-5. These additional County staff persons patrol the beach all day and clear the beaches of all public vehicles after the fireworks display is concluded.

The viewing of the annual Fourth of July fireworks display by car has the potential to negatively impact nesting sea turtles and/or emerging hatchlings. However, monitoring personnel cannot recall a sea turtle nest ever being present within the Porpoise Point region during the period surrounding the Fourth of July (Reed and Lardner *pers. comm.* 2001). In recent years, monitoring personnel have patrolled Porpoise Point under their own initiative during this special event in order to protect any female turtles that might crawl onto the beach to nest (Lardner *pers. comm.* 2001); no nesting female turtles have ever been observed to emerge from the ocean at Porpoise Point during the fireworks display.

No known incidental take of sea turtles has been documented on County Beaches as a result of a special beach event. Nevertheless, special events that occur within the nesting season could potentially impact nesting sea turtles and/or emergent hatchlings.

4.3.1.4. Commercial and Recreational Fishing

In 2001, 164 individuals based in St. Johns County possessed a Saltwater Products License issued by the State of Florida (FWC *unpublished data* 2001f), and 128 of these commercial fishers were recorded to have landed fish that same year (FWC *unpublished data* 2001g). A small number of commercial fishermen prefer to travel to and from their fishing spots in four-wheel drive vehicles. In order to estimate the number of commercial fishermen that drive on the beach, those with Saltwater Products Licenses were sorted by gear types that could be used from the surf zone (i.e., hook and line and cast net). There were 45 commercial fishermen that landed

fish using hook-and-line, 16 using a cast net, and 3 using both. However, some of the fish landed by hook-and-line fishermen in 2001 included species that are typically caught offshore in deeper waters, such as wahoo, dolphin, and tuna, which suggests that they were not fishing from the beach. On the other hand, two commercial fishermen in St. Johns County reported landing pompano, a species that is generally caught from the shore. Without conducting an extensive survey, it is not known exactly how many commercial fishermen drive on the beach and to what extent each depends on that activity for their livelihood.

Anecdotal information regarding commercial fishing activities in St. Johns County was provided by Bill Sabo, who has been writing a fishing column for the *St. Augustine Record* for the past 18 years. According to Mr. Sabo, commercial fisherman typically fish off the beach for pompano, whiting, and mullet, and to a lesser extent, flounder, shark, and red and black drum. All of these species can be caught year-round; however pompano and whiting are best caught during the spring, summer, and fall. Silver and black mullet are targeted during September and October. Fishermen for mullet typically will follow the schools of fish along the beach in their vehicles and catch them via cast nets. The majority of commercial fishing, according to Mr. Sabo, is done in the vicinity of the Matanzas Inlet by fishermen who access the beach at the public beach access at Fort Matanzas Ramp. Due to restrictions on beach driving and lighting, commercial fishing at night is a rarity.

Recreational anglers on St. Johns County beaches far outnumber commercial fisherman (Sabo, Gassman, and Delaney *pers comm*. 2002). The number of recreational fishermen in St. Johns County is not known, but some would estimate the number to range between 12,000 to 15,000 individuals (Delaney *pers. comm.* 2002). Generally, recreational surf fishermen are targeting the same species as commercial fishermen (described above) along County Beaches. Recreational fishing is most popular around St. Augustine and Matanzas Inlets, however all beaches of the County are utilized. From Duval County to Porpoise Point, surf fishing for drum, whiting, pompano, sheepshead, and bluefish is popular. Cast netting for mullet is also popular, particularly between May and the first week of December (Gassman and Delaney *pers. comm.* 2002). Surf fishermen also drive on the beach between "A" Street and FMNM. In this area, pompano, whiting, jack, and red drum are caught every month of the year, and bluefish are caught between May and October (Delaney *pers. comm.* 2002). Fishermen, many from Palatka, often fish on the north shore of the Matanzas Inlet, where flounder, pompano, redfish/channel bass, mullet, and whiting are commonly taken (Delaney *pers. comm.* 2002). Fishermen seldom fish on the west side of the A1A Bridge at Matanzas Inlet, because this area is heavily utilized by families and jetskiers (Delaney *pers. comm.* 2002). Surf fishing along the beaches of Summer Haven ("Short Beach") is also popular: drum, whiting, pompano, sheepshead, and bluefish are typically targeted (Delaney *pers. comm.* 2002).

Both commercial and recreational fishermen can impact sea turtles by driving on the beach to and from their fishing destination. Additionally, fishing debris (e.g., improperly discarded line) can entangle sea turtles, and occasionally sea turtles are foul-hooked or caught by hook-and-line fishermen. No known incidental take of turtles related to fishing activities on County Beaches has been reported in St. Johns County.

4.3.2. Effects of Human Beach Activities on AIBM in Plan Area

4.3.2.1. Beach Visitors

Frank and Humphrey (1996) cited "the most apparent problem caused by human activities is physical damage to dune structure and vegetation caused by walking on the dunes." The beaches of St. Johns County are visited by large numbers of people, particularly during the summer season, and foot traffic through the dunes can occur. Although a large majority of beach visitors utilize dune walkovers from their private residences, commercial establishment, or public access points, there are footpaths through the dunes in various locations along Anastasia Island (EAI 2001c). Each of these footpaths may represent habitat fragmentation for the AIBM.

Like all oldfield mice, AIBM construct and maintain burrows along the primary dune system. Because the escape tunnels of these burrows generally rise from the nest chamber to just below the surface of the dune, they are extremely vulnerable to crushing via trampling by humans, horses, or other animals (USFWS 1993).

Frank and Humphrey (1996) describe another human impact on the dune system that has potential to negatively impact AIBM and other dune-dwelling species:

> Another situation contributing to habitat damage in the parks at ASRA [ASP] and FMNM is a lack of public restroom facilities. To use a public restroom at ASRA [ASP] or at FMNM requires either walking or driving [prohibited at ASP since 2000] to the beach entrance ramp where public facilities are located. Instead, many people simply take a quick walk over the dunes and relieve themselves out of view of the public, often displaying enough forethought to bring their own toilet tissue. Solutions to this problem involve either placing temporary facilities (portable toilets) on the beach or erecting a more permanent structure behind the dunes, with walkways over the dunes for access from the beach.

Beach mice experts consider the deposition of urine, defecation, and soiled diapers in the dunes by beach visitors to be a serious threat to beach mice. Researchers cite vehicular beach access as a contributor to this problem, because vehicular access often allows people to reach remote beaches that may be a considerable distance from a portable toilet or a public facility, and beach visitors may be disinclined to drive back to a restroom (Frank *pers. comm.* 2002). These incident reports are anecdotal and not well documented.

4.3.2.2. Recreational Beach Equipment and Special Beach Events

Negative impacts to AIBM due to the presence of recreational equipment or special events on the beach have not been documented in St. Johns County. Damage to dune vegetation caused by either of these activities (a violation of Chapter 161.053 Florida Statutes) could contribute to habitat loss or degradation. Additionally, special events that are permitted by St. Johns County and take place during the night may disturb the nocturnal activities of AIBM. Any such disturbance might qualify as harassment—an incidental take, which is prohibited under the Endangered Species Act.

4.3.2.3. Commercial and Recreational Fishing

Impacts to AIBM associated with commercial or recreational fishing have not been monitored or documented in St. Johns County. If fishermen drive on the beach to and from their fishing spot, they have the potential to negatively impact AIBM as any other beach driver (Table 4-6).

4.4. HORSEBACK RIDING ON BEACH

Horseback riding on the beaches of St. Johns County is regulated through several different County codes and ordinances. Where horseback riding can occur on the beach is addressed in the St. Johns County Land Development Code Article 4 (June 12, 2001), which states that "horseback riding on the beach during Nesting Season [May 1 to October 31] shall be allowed only seaward of the most high-tide line on the beach during times when such riding is otherwise allowed" (section 4.01.08). Further details of when and where horseback riding is permitted are addressed in Ordinance No. 2001-5 (amendment to the Beach Code, Ordinance 97-34). This amendment states that no hoofed animals will be permitted "on any portion of the beach between the southern boundary of the Surfside Beach Access Ramp extending south to the southern boundary of St. Johns County from May 1 to October 31 of each year and during county recognized spring break periods…" (section 1(3.02a)). This amendment has been further altered by Resolution No. 2001-5, which additionally allows horseback riding on *all* beaches of the County between November 1 and April 30 of each year. A permit is not presently needed to ride a horse on the beaches of St. Johns County, and the numbers of people who engage in this beach activity are not tracked. Personal observations by County staff suggest that several hundred horseback riders use the beach on a fairly regular basis (Williams *pers. comm.* 2002). Horseback riding on the beach within the municipal boundaries of St. Augustine Beach is prohibited throughout the year (St. Augustine Beach Code of Ordinances Chapter 5. Article I. section 5-12.).

In 2002, there were two organizations who conducted guided horseback rides along Plan Area beaches—Palm Valley Stables and Sawgrass Stables (Green *pers. comm.* 2002). Both of these stables only conducted rides along Ponte Vedra Beach (McDonald and Lehman *pers. comm*. 2002). Horseback tours for paying customers are conducted year-round by both organizations. Rides are conducted in the mornings (starting as early as sunrise and lasting for several hours) as well as in the evenings (starting between 5 PM to 6 PM and lasting until dark). Approximately once per month, riders from Sawgrass Stables partake in a moonlight ride (typically around the time of the full moon), which begins at sundown and can last for several hours into the night. Group size can vary from 3 to 7 horses, including guides. Representatives from both of the stables indicated that they follow voluntary guidelines as to where the horses walk along the beach (McDonald, Lehman, and Stoll *pers. comm*. 2002). These guidelines are additional to the mandatory guidelines outlined in County ordinances. Under these voluntary guidelines, horses walk seaward of the most recent high tide line and do not approach within 20 feet of a marked sea turtle nest. The horses are trained to follow a guided lead horse, such that inexperienced riders do not stray from the wetted portion of the beach.

4.4.1. Effects of Beach Horseback Riding on Sea Turtles

The impacts of horses on sea turtles are not documented in the literature. However, there are several potential ways in which a horseback riding on the beach could impact sea turtles. Due to the considerable pressure concentrated on their hooves, horses could cause harm to incubating eggs if the nest were stepped on. Horse hoof prints on soft sand can create deep depressions that could entrap emergent hatchling sea turtles as they make their way to the ocean. Horse feces can be washed by high tides close to the toe of the dunes, where sea turtle nests are most commonly laid (Stoll *pers. comm.* 2002). The ecological impacts derive from the bacterial decomposition of the horse feces, which would be greatest if the feces is near or on top of a sea turtle nest. However, the impact this may have is not known. Horses on the beach after dark could also potentially cause a nesting female to abort her nesting attempt or unintentionally trod on a hatchling turtle.

In St. Johns County, anecdotal evidence indicates that occasionally horseback riders have led their horses close to or through dune vegetation (Charest and Stoll *pers. comm.* 2002). There have been three reported incidents where a horseback rider guided the horse close enough to a sea turtle nest to potentially result in negative impacts (Stoll *pers. comm.* 2002). Each of these cases occurred in Ponte Vedra Beach north of Mickler's Landing beach access point. In this area of the beach, sea turtle nests are not barricaded with stakes and flagging tape, and the horse prints were within inches of the clutch of eggs. However, these have been the only recorded interactions between horseback riders and sea turtle nests.

4.4.2. Effects of Beach Horseback Riding on AIBM

As stated in section 4.3.2.1., the burrows and escape tunnels of AIBM are extremely vulnerable to crushing via trampling by humans, horses, or other animals and provide reason to limit dune access in AIBM habitat. In St. Johns County, horse prints have been observed through dune vegetation, which could result in degradation or loss of beach mouse habitat.

4.5. BEACH MANAGEMENT ACTIVITIES

The following section describes pre-HCP beach management practices and procedures in St. Johns County. Because the County has not developed a formal beach management plan, the following information was derived from numerous conservations and interviews with Dave Williams, the County's Supervisor of Beach Management.

4.5.1. Law Enforcement, Fire Rescue, and Ambulances

Public safety functions on the unincorporated beaches of St. Johns County are the joint responsibility of the Sheriff and the Supervisor of Beach Management (Beach Code section 5.01). The Supervisor of Beach Management and the on-duty Deputy Sheriffs work closely and rarely take action without the other's consent (Williams *pers. comm.* 2001). During the summer season, St. Johns County provides four Deputy Sheriffs to patrol the 10.6 mi of general public driving beaches, and St. Augustine Beach provides two City Police Officers to patrol their 1.8-

mile portion of the beach (from "A" Street Ramp to Ocean Trace Road Ramp; Bandy *pers. comm.* 2002).

In the rare event that fire rescue is needed on the beach, only County service is available. When an emergency is reported on the beach, the St. Johns County Fire Department will ask the County beach staff for an assessment of the current beach conditions (Williams *pers. comm.* 2001). All the logistics are worked out while the fire rescue is en route to the scene. If the County reports that beach conditions are favorable, the firemen may drive on the beach directly to the scene. The Supervisor of Beach Management prefers not to bring fire vehicles, especially hook-and-ladder trucks, onto the beach unless absolutely necessary (to spare any potential damage to the vehicles; Williams *pers. comm.* 2001). In the past, the County has sent hook-and-ladder trucks to emergencies on the wide, hard-packed sand of the South Beaches. If the County reports that conditions are unfavorable for fire rescue trucks or ambulances on the beach (e.g., high tides or soft sand), then the County staff and emergency rescue personnel will work together to perform a "patient transfer." In this way, County staff brings the patient to the closest beach access ramp and transfers him/her to the emergency rescue personnel.

4.5.2. Lifeguards and Lifeguard Towers

A total of 65 lifeguards were employed by the County in 2001. The actual number of lifeguards on the beach per day is weather-dependent and ranges during the year between 12 and 27 (Williams *pers. comm.* 2002). The beach patrols of lifeguards are generally curtailed during winter months. Beginning April 1, the number of lifeguards on duty begins to be incrementally increased as weather improves and beach visitation increases. The lifeguard staff will grow to maximum level by Memorial Day weekend and remain at maximum staff through Labor Day weekend. After Labor Day weekend, the number of lifeguards will again be gradually reduced to the minimum year-round staff.

All County lifeguards are required to take a 110-hour training course (Williams *pers. comm.* 2001). This course consists not only of emergency training, but also training on code enforcement and marine species. The lifeguard training manual addresses marine species, such as sea turtles, but does not contain information on the endangered AIBM.

The lifeguard "truck patrol" relieves the staff on the towers at the end of their work shift and drops off the next shift of lifeguards (Williams *pers. comm.* 2002). The truck patrol may consist of one to several four-wheel drive trucks. There is one quad-ATV available to County lifeguards, but it is normally not used. The ATV is only used for special patrols of the North Beaches, where the truck patrol may get stuck in the soft sand.

Lifeguards in St. Johns County typically watch over beach visitors from 14 portable towers. These towers are placed along the most popular beaches during the summer season (i.e., March 1 through Labor Day weekend). The towers are moved throughout the day to follow the tides, are rested next to the dunes at night (but not seaward of a marked sea turtle nest), and are removed from the beach in advance of severe storms and during the winter season.

4.5.3. Traffic Control

The County utilizes a variety of structures to regulate traffic on the beach. Public vehicular access is controlled through designated access points or beach ramps. At present, locked gates at these control points prevent the public from accessing the beach after 10:00 PM and prior to 5:00 AM between May 15 and October 15. This period is defined as the sea turtle nesting season in all County ordinances that deal with beach driving (Ordinance 96-48; Ordinance 97-34 section 5.05). Previously, all ramps in the County were blocked with locked chains, reflectors, and signs. Between October 2001 and January 2002, the County Recreation and Parks Division replaced the locked chains across all 12 vehicle access ramps with steel, crash-resistant barricades. These barricades should prevent violators from using chain cutters or driving small cars under the chains to unlawfully drive on the beach at night, as has occurred in the past.

Lifeguards hold the responsibility of locking the gates at night at 10:00 PM. For the very limited beach staff in St. Johns County, clearing the 14.7 mi of total drivable beaches (including general public driving and four-wheel drive permit driving) of all vehicles is a daunting and time-consuming task. Beginning at about 9:00 PM, the truck patrol uses a PA system to instruct drivers to vacate the beach (Williams *pers. comm.* 2001). However, only one vehicle is used for this task, and the truck patrol may not finish clearing the beach of vehicles until after 10:00 PM. From the time all of the gates have been locked at night until 5:00 AM the next day, the Deputy Sheriff on duty in that area will respond to calls from citizens regarding headlights on the beach. The penalty for being caught driving illegally on the beach at night depends on the type of citation issued. The violator may be charged with a violation of the Beach Code, resulting in a fine up to $58.00 (Clark *pers. comm.* 2002). The violator could also be cited for vandalism or other charges that could bring the charges up to a felony level. Generally, the local Deputy Sheriffs issue warnings, not citations, to violators of the night driving prohibition. Instances of vehicles on the beach after 10:00 PM are uncommon, and typically pertain to vehicles that have become stuck in the sand (Clark *pers. comm.* 2002).

Deputy Sheriffs are tasked with reopening vehicle access gates each morning at 5:00 AM. However, the time the gates are actually reopened varies greatly—depending on the availability of the on-duty Deputy Sheriffs. Occasionally, anxious beach drivers may resort to unlawful means to enter the beach at 5:00 AM, if the gate is not opened on time (Williams *pers. comm.* 2001). Such means have included driving through the dunes around the locked gate or, very infrequently, cutting the chain with gate cutters (not possible with new crash-resistant barricades).

Traffic control is also maintained by the presence of tollbooths and tollbooth keepers at 10 of the 12 vehicular access ramps (section 2.4.3.3.; Figure 2-9). Additionally, tollbooth staff give educational flyers to beach drivers when the toll booths are in operation. During the 2001 sea turtle nesting season, about 5,000 flyers were handed out containing information on sea turtles. Throughout the year, permanent signs are posted at all ramps and access points (Figure 4-3), and temporary laminated signs are posted on trash cans that instruct beach users to avoid disturbing nesting female turtles, nests, and eggs between May 1 and October 31.

Once on the beach, orderly public vehicular traffic is maintained in part through appropriately placed signage and traffic cones. One large sign is placed at each vehicle access ramp to outline driving instructions, speed limits, beach rules, prohibited activities, and other warnings (Figure 4-4). Additionally, speed limit signs and stop signs are placed daily on the beach at high-volume traffic areas. As outlined below in Ordinance 97-34 section 5.01, the Supervisor of Beach Management and the Sheriff share the responsibility for the daily designation of driving lanes and parking areas on the drivable beaches:

> (b) The Supervisor of Beach Management and the Sheriff are to provide that the parking area be placed as far to the west as sand conditions permit allowing for a conservation zone, and that drivers shall be directed to park their cars in an orderly fashion to conserve parking spaces. The traffic lanes adjacent to the parking lanes shall be as compactly defined as is reasonable. The Supervisor of Beach Management and the Sheriff shall have the discretion to move these designated areas according to the circumstances on the beach.
> (c) When the westerly row of parking has been filled, and provided that tidal conditions permit, the Supervisor of Beach Management and the Sheriff may allow parking on the east side of the traffic lanes.

In areas congested with beach users, the driving lanes are segregated from the seaward pedestrian zones through the placement of cones on the eastern side of the driving lanes (Appendix G). Before 9:00 AM, a truck patrol of County staff set cones about 25 yards apart along straight stretches of the beach and about every 10 yards near vehicle access ramps. Depending on beach conditions, the cones are set varying distances from the water's edge and about 50 feet (15 m) from the toe of the dunes. Generally, public beach drivers follow the tire tracks made by the County truck earlier in the day (Williams *pers. comm.* 2001).

The northern boundary of the special driving area for North Beach Vehicular Access Permit holders is delimited by a sign on the beach at the southern boundary of Guana River Marsh Aquatic Preserve (section 2.4.3.5.; Figure 4-5). At the Vilano Ramp, one sign at the ramp and one sign on the beach indicate that northbound vehicles are authorized to drive on the beach by special permit only (Figure 4-6). At Usina Beach Ramp, signage also indicates that beach driving is authorized for permit holders only (Figure 4-7). During the summer season (between March 1 and Labor Day weekend), one St. Johns County Deputy Sheriff is assigned to specifically patrol the North Beaches driving zone (Williams *pers. comm.* 2001). During the winter season, the enforcement responsibility is assigned to the Deputy Sheriff tasked with patrolling the upland zone along the North Beaches.

Traffic rules are posted at each vehicle access ramp (Figure 4-4). The speed limit on all beaches in St. Johns County is 10 mph, except for emergency vehicles responding to an emergency (displaying full lights and sirens), which abide by a 30-mph speed limit. The County Deputy Sheriffs and the City of St. Augustine Beach Police Officers patrolling the beaches have the authority for all traffic enforcement, including speed limits (Ordinance 97-34 section 5.01).

Vehicle access ramps at either end of the two-way driving zone, namely Ocean Trace Road Ramp and Crescent Beach Ramp, can become congested on some summer days. These ramps

are also two of the most popular ramps in the County, probably because they are the most accessible to major thoroughfares leading from inland areas to the beaches (ATM 2001); Ocean Trace Road Ramp is near Route 312, and Crescent Beach Ramp is close to Route 206. Traffic congestion is controlled by Deputy Sheriffs and Public Service Assistants (PSAs). PSAs are civilians that are trained to direct traffic flow and assist in congested areas on the beach (Williams *pers. comm.* 2001). Since PSAs may be assigned to work throughout the County, the number of PSAs sent to patrol the beach varies daily and seasonally. Typically, during the summer season, four to six PSAs per day assist the Deputy Sheriffs on the beaches of St. Johns County (Williams *pers. comm.* 2002). The PSAs generally patrol the beach on quad-ATVs, and they possess the authority to write citations for code violations.

4.5.4. Conservation Zone

Section 7.01 of the St. Johns County Beach Code (Ordinance 97-34) outlines a Conservation Zone (CZ) along unincorporated County Beaches:

> St. Johns County Code section 5-61. Conservation Zone. (a) A conservation zone shall be established along the entire Atlantic Ocean beach in the unincorporated areas of St. Johns County. The purpose of this zone is to encourage the natural growth of both dune and beach, to protect the beach from destructive influences and to provide for the protection of species existing in the area. This conservation zone shall be established fifteen (15) feet seaward from the seaward toe of the most seaward dune, dune scarp, sea wall, or line of permanent vegetation, or half the distance to the mean high-water level, whichever is the lesser. (b) All vehicle and pedestrian activities within the conservation zone is prohibited, except at vehicle approaches and pedestrian walkways and walkovers. (c) The disturbing or removing of existing natural vegetation is prohibited. Additional natural vegetation may be planted and maintained for these areas when necessary and or beneficial and as approved by a state or county agency.

The CZ is generally accepted as 15-feet wide, but as currently defined, may actually fluctuate considerably in width. As the Mean High Water line is periodically redefined by State agencies, the CZ in St. Johns County is likewise redefined. In so far as the Mean High Water line is an invisible line on the beach, the eastern boundary of the CZ is not easily determined.

Along the South Beaches of the County, the beach is normally wide during the summer, and the Conservation Zone is generally accepted as 15 feet in width. The CZ is not currently marked along any County Beaches, though the St. Johns County Recreation and Parks Division has tried repeatedly to place posts in the sand demarcating the zone. Over time, the County has set over 2,000 posts with signs along the CZ's seaward boundary, and all of them have been washed out by waves and lost (Williams *pers. comm.* 2001).

Generally, the unmarked CZ is self-regulated (Williams *pers. comm.* 2001). In 2001, the County moved all trash cans and portable toilets from the dune to the seaward edge of the CZ along the 9.9 mi of drivable beaches on Anastasia Island, (i.e., 15 ft seaward of the toe of the dune). This action was intended to inhibit pedestrians from entering the CZ, because they no longer have a reason to venture beyond the trash can or portable toilet towards the dunes.

Lifeguards and Park Rangers also instruct beachgoers to stay out of both the CZ and the dunes (Williams *pers. comm.* 2001). Lifeguards cannot issue tickets for violations of the CZ, but they do advise, warn, and contact law enforcement. The Beach Code gives the Sheriff's Department the authority to enforce the CZ, though they have never issued a citation for a violation of the CZ (Williams *pers. comm.* 2001, Clark *pers. comm.* 2002).

Because the CZ width varies over time and is not currently marked, beach drivers may unwittingly park their vehicles, walk, play, or sunbathe in the CZ. However, the prohibited act of physically driving through the dunes in St. Johns County is rare, except in the vicinity of Porpoise Point (section 2.4.3.4.; Figure 4-9; Williams *pers. comm.* 2001). The escarpments in most areas are prohibitively high and make accessing the dunes in a vehicle impossible in many areas. Dune driving occasionally occurs adjacent to the vehicle access ramps (Williams pers. comm. 2001), at Porpoise Point, and along the North Beaches (Clark and Mathis *pers. comm.* 2002). Driving along the seaward side of the dunes and within the CZ can be common during high tides along eroded areas of the coast (Figure 3-4), such as the North Beaches (Williams *pers. comm.* 2001, Clark and Mathis *pers. comm.* 2002).

4.5.5. Traffic Barricades

For a number of reasons, all or portions of beaches within St. Johns County may be closed to public traffic by use of barricades. In the past, traffic has been barricaded due to the wash-up of rafts of illegal aliens, hazardous materials, or turtle nests in the driving lanes (Williams *pers. comm.* 2002). When a turtle nest occurs in a traffic lane and traffic cannot be reasonably maneuvered around the marked nest, it is customary to block traffic through that area (Williams *pers. comm.* 2001). The County will also block traffic when a vehicle access ramp becomes severely eroded. Occasionally, traffic is diverted from upland roadways onto the beach. County employees generally place the traffic barricades on the beach, and the driving prohibition is enforced by Deputy Sheriffs. Traffic has never been barricaded in St. Johns County, due to a lack of on-beach parking (section 2.4.3.3.; Williams *pers. comm.* 2001). For example, in the summer of 1997, the County diverted traffic from Highway A1A onto the beach in order to carry out roadway construction (Williams *pers. comm.* 2001).

Typically four to five times during the summer season, extremely high tides created by storm events or astronomical conditions may interfere with beach traffic flow (Williams *pers. comm.* 2001). In a joint decision made by the Supervisor of Beach Management and the Sheriff, the number of cars allowed on the beach may be limited during high tide events.

4.5.6. Tow Trucks

Several areas of the beaches of St. Johns County contain patches of soft sand, including the North Beaches and the zones adjacent to vehicular access ramps. Vehicles can have difficulties maneuvering in these areas. An estimated 1,000 cars per year get stuck in the sand, which constitutes approximately one-third of all yearly citizen assists (Williams *pers. comm.* 2001). This is equivalent to 0.8 percent of the average total 125,311 beach drivers that purchased daily and seasonal passes each year between 1995 and 2000 (ATM 2001). When a vehicle becomes immobilized on the beach, the County will assist without physically towing the vehicle out of the

soft sand. The County also airs television public service announcements entitled "How to Drive in Soft Sand." Instructions on how to drive in soft sand are also printed on the back of every daily beach pass. If a vehicle is seriously stuck, then County staff will assist the driver by calling a private towing company (at the driver's expense).

4.5.7. Bicycles and Mopeds

In Florida, bicycles and mopeds are legally defined as motor vehicles (Florida Statutes 316.2065 and 316.208). Bicyclists and moped operators, on and off the beach, generally have the same rights and responsibilities as drivers of typical motor vehicles. Accordingly, bicyclists and moped riders must observe all traffic laws and can receive citations for traffic violations from the Deputy Sheriffs patrolling the beaches of St. Johns County.

A growing number of moped rental companies are opening near the beaches of St. Johns County, and renting and driving a moped on the beach is becoming increasingly popular (Williams *pers. comm.* 2001). Since mopeds are motorized, street-legal vehicles, their drivers must buy a beach pass, which permits them to drive on the same beaches that are open to other public vehicular traffic (Figure 2-9). The County does not perceive the increasing number of mopeds on their beaches as a problem, but will be closely monitoring the situation in the future (Williams *pers. comm.* 2001).

Bicycles are permitted on any of the beaches of St. Johns County. However, bicycle riding is most popular on the wide, flat South Beaches. Bicyclists tend to avoid the North Beaches, where there is soft sand and a steep beach profile. Bicyclists are not required to obtain a beach pass, and the County does not deem it necessary to regulate their access (Williams *pers. comm.* 2001).

4.5.8. Unauthorized Vehicles

The St. Johns County Beach Code outlines the types of vehicles that are prohibited on all beaches of the County. Unauthorized vehicles include the following:

1. Wind-powered land vehicles (Beach Code section 5.02a);
2. "Any vehicle not customarily used on public streets and highways, including, but not limited to, go-carts, all-terrain vehicles (ATVs), and other similar vehicles" (Beach Code section 5.03j);
3. Buses (except for permitted special beach events) (Beach Code section 5.04b);
4. Truck tractor or tandem trailer trucks (except those authorized for construction or repair) (Beach Code section 5.04b);
5. "Any vehicle or vehicle and trailer combination of any description longer than 33 feet" (except those authorized for construction or repair) (Beach Code section 5.04b).

However, since May 15, 2000, the Division of Beach Management has granted North Beach Parking Permits to two ATVs and one dune buggy (Division of Beach Management *unpublished data* 2002).

4.5.9. Noise

Permitted noise levels on County Beaches are specifically addressed in the St. Johns County Code of Ordinances. Section 5-43 provides that no audio device (except equipment used by law enforcement, rescue, or beach safety personnel) shall exceed a noise level of 60 decibels. An audio device is further prohibited "that makes noise which is unreasonable, considering the nature and purpose of the user's conduct, location on the beach, time of day or night, impact on other beach users and other factors that would govern the conduct of a reasonably prudent person under the circumstances." St. Augustine Beach Code of Ordinances generally addresses noise in Appendix A. Land Development Regulations, section 9.01.00 Noise. Within the municipal boundaries of St. Augustine Beach, maximum permissible sound levels during the daytime shall not exceed 60 decibels in residential areas and 65 decibels in commercial areas. The on-duty Deputy Sheriffs enforce the noise ordinances in both unincorporated St. Johns County and St. Augustine Beach.

4.5.10. Portable Toilets

Five public beach access points along the coastline of St. Johns County have permanent restroom facilities: Mickler's Landing Beach Access, ASP Ramp & Park, St. Johns County Pier Park, Frank B. Butler Park East, and Crescent Beach Park. Two rented portable toilets (i.e., "Port-o-Lets") are also present year-round in the parking lot at South Ponte Vedra Park. The County is aggressively trying to build new, and refurbish the old, public restroom facilities at beach access points (Williams *pers. comm.* 2001).

Because the number of public restrooms at beach access points is not adequate to meet demand, St. Johns County rents 19 portable toilets that are placed on the beach during the summer season (i.e., March 1 through Labor Day weekend) (Williams *pers. comm.* 2002). Each of these portable toilets is secured with wooden stakes. Generally, portable toilets are placed at each vehicle access ramp, with two usually placed at the most heavily utilized ramps. Additional portable toilets are placed on the beach at select locations with high beach usage, in areas isolated from access ramps or pedestrian beach access points where restroom facilities are present.

Portable toilets are serviced four times per week (Friday, Saturday, Sunday, and Monday) between 9:00 AM and 12:00 noon. The portable toilets are serviced from the wetted portion of the beach by a ¾- to 1-ton tanker truck using a long hose. The tanker truck generally cannot approach the portable toilets too closely, because of soft sand conditions (Williams *pers. comm.* 2002).

4.5.11. Trash Collection and Beach Maintenance

A total of about 250 trash receptacles are spatially distributed along County Beaches in relation to beach use patterns. These trash receptacles are open blue plastic barrels with several drainage holes in the bottom. They are placed directly on the sand. The County previously mounted the barrels on posts in the sand (Figure 4-8), but they were commonly run into or over by vehicles (Goodwin *pers. comm.* 2002). Also, the sand around the mounted trash cans tended to become

heavily eroded by the end of the summer season, and then the receptacles were too high off the ground for people to reach (Goodwin *pers. comm.* 2002). Since 2001, the County has made an effort to move the trash receptacles seaward to the edge of the 15-foot CZ. By March 2002, all trash receptacles had been placed as far from the dunes as possible and encircled by three wooden stakes. The wooden stakes are expected to prevent the receptacles from being blown, washed, or pushed over, which would cause a garbage spill (Goodwin *pers. comm.* 2002).

All trash pick-ups are performed by a private contractor. Trash collection varies seasonally (Goodwin *pers. comm.* 2002). During the summer, from about March 15 through Labor Day weekend, trash is collected from the receptacles every day using a four-wheel drive, one-ton pick-up truck pulling a trailer. During the winter (i.e., after Labor Day weekend until March 15), trash is picked up three times per week using the same pick-up truck with trailer. On these same days, loose trash on the beach is also collected by one person on an ATV. Trash collection generally starts in the early morning between 6:30 and 7:00 AM at the Fort Matanzas Ramp. From the Fort Matanzas Ramp, it proceeds north to ASP. On weekends and Mondays, it may take as long as four hours to complete trash collection on the South Beaches. Then, the truck with trailer and ATV continue collecting trash on the beach from the Vilano Ramp south around Porpoise Point. North of Vilano Ramp, trash collection personnel generally do not drive on the beach, but pick up trash via established public pedestrian access points (i.e., public dune crossovers) (Goodwin *pers. comm.* 2002).

The County's contractor also deals with large pieces of debris on the beach (Goodwin *pers. comm.* 2002). A front-end loader may be brought onto the beach for this purpose. If a stranded boat is broken into pieces, trash collection personnel can remove the debris. If the boat is larger, the Coast Guard and County generally get involved (Goodwin *pers. comm.* 2002). In the case of a large derelict vessel, the Supervisor of Beach Management must apply to FWC's Grant Removal Program, which generally takes a year and a half before the vessel is removed from the beach (Williams *pers. comm.* 2001). St. Johns County utilized this program in 1994-1995 (Williams *pers. comm.* 2002).

Trash collection vehicles may also be used to assist in the recovery of stranded marine animals. After dead stranded sea turtles are examined and marked with spray paint, trash collection personnel may be asked to remove the dead turtle from the beach or bury it by the dunes (such beach excavation is not permitted during the sea turtle nesting season). Authorized agents of NMFS are contracted to recover and remove beached whales from the beach.

4.5.12. Ramp Grading

In St. Johns County, one grader is owned by the County and used to grade each of the active vehicular access ramps (Williams *pers. comm.* 2002). During the summer season, ramp grading is a daily task beginning at about 8:00 AM and continuing until about 5:00 PM. Generally, it takes the grader operator a full day to grade two or three ramps. By the time all 12 public vehicle access ramps are graded, it is time to start over again. During the winter season (after Labor Day weekend until March 1), the ramps are graded as needed, which is usually once a week.

In accordance with FDEP Rules and Procedures 62B-33.004, ramp grading in St. Johns County is exempt from FDEP permitting requirements (Nelson *pers. comm.* 2002). These regulations outline that a FDEP permit is not required for certain low impact activities, including "the removal of windblown sand from paved road and parking areas, beach access ramps, pools, patios, walkways or decks, not involving a change in the general grade and provided that any beach quality sand is returned to the beach and dune system seaward of the coastal construction control line." This exemption is provided such that "such activities shall be conducted so as not to disturb marked marine turtle nests or known nest locations or damage existing native salt-tolerant vegetation" (FDEP Rules and Procedures 62B-33.004, effective December 31, 2001).

4.5.13. Effects of Beach Management Activities on Sea Turtles in Plan Area

4.5.13.1. Law Enforcement and Fire Rescue

Public safety, law enforcement, and other emergency vehicles are provided unlimited access to all beaches within the Plan Area. Both routine and emergency operation of vehicles on the beach have the potential to impact sea turtle eggs, adults, and hatchlings, as summarized in Table 4-5.

4.5.13.2. Lifeguard Towers

There is potential for lifeguard towers to impact hatchling or nesting female sea turtles. Towers pose obstacles to nesting turtles, and portable towers may be placed over unmarked nests, which may harm incubating eggs or trap hatchlings. There are no documented cases of a sea turtle abandoning her nesting attempt due to interactions with a lifeguard tower in St. Johns County; however one turtle nested under a lifeguard tower in Ponte Vedra Beach on June 26, 2002 (Williams, Stam, Hester, Stoll, Lardner, Crawford, Miller, Stauber, and Parker *pers. comm.* 2002).

4.5.13.3. Traffic Control

As explained in section 4.5.3., public vehicular access to the beach is prohibited between the hours of 10:00 PM and 5:00 AM between May 15 and October 15. This poses a risk to nesting female sea turtles and emerging hatchlings. Nesting females may emerge from the ocean and hatchlings may emerge from their nest any time after dark and before sunrise. A nesting female or emerging hatchling on the beach during the crepuscular is not an uncommon event. At the beginning (May 15) and end of the nesting season (October 15), days are the shortest, and the potential for interactions between vehicles on the beach and sea turtles is the greatest. On May 15, 2002, sunrise was 6:32 AM, and sunset was 8:11 PM (U.S. Naval Observatory *unpublished data* 2002). On October 15, 2002, sunrise was 7:27 AM, and sunset was 6:55 PM. Thus, during the fall (pre-HCP) there is about a 2.5-hour period before sunrise and a 3-hour period after sunset when vehicles and turtles may potentially be on the beach at the same time.

The potential for interactions between sea turtles and public vehicles is exacerbated by a lack of adequate staff to clear the beach by posted closing times. As explained in section 4.5.3., only one vehicle with two lifeguards is presently responsible for clearing all the driving beaches of

vehicles. The lifeguards rarely finish clearing the beaches of vehicles until well after 10:00 PM; it generally takes 3 to 4 hours to ensure that all vehicles are off the beach.

4.5.13.4. Conservation Zone

Conceptually, the Conservation Zone should have a positive impact on sea turtles by protecting a majority of sea turtle nests from vehicular and pedestrian traffic and allowing the dune to build. However, the value of the CZ in St. Johns County was presently limited, because it was not clearly marked or regularly enforced.

4.5.13.5. Traffic Barricades

Traffic barricades and signs have the potential to interfere with nesting female sea turtles or emerging hatchlings, if left on the beach overnight. However, traffic barricades are not left on the beaches overnight in St. Johns County, and no such interactions have been documented (Williams, Stam, Hester, Stoll, Lardner, Crawford, Miller, Stauber, and Parker *pers. comm.* 2002).

4.5.13.6. Tow Trucks

When vehicles become stuck in soft sand, the use of a tow truck can create large tire ruts or craters in the sand (Lardner *pers. comm.* 2002). These can interfere with nesting female sea turtles and trap emergent hatchlings as they crawl to the ocean.

4.5.13.7. Bicycles and Mopeds

Bicyclists may ride on the beach anytime and anywhere in St. Johns County, thus exhibiting potential to impact sea turtles or fresh nests during hours of darkness. Since mopeds are treated like any other public vehicle, they can impact sea turtles in much the same ways as vehicles (see Table 4-5). However, no interactions have been documented between a bicycle or moped and a sea turtle in St. Johns County (Williams, Stam, Hester, Stoll, Lardner, Crawford, Miller, Stauber, and Parker *pers. comm.* 2002).

4.5.13.8. Unauthorized Vehicles

Similar to any other public vehicle, unauthorized vehicles can impact sea turtles in the same ways that authorized vehicles can (see Table 4-5). Since unauthorized vehicles include dune buggies and ATVs, there may be more potential for these kinds of vehicles to impact sea turtles, because they might be able to enter soft sand areas where other public vehicles cannot.

4.5.13.9. Noise

There has been very little research to elucidate how sea turtles may be impacted by noise. It is possible that females may be discouraged from emerging from the ocean to nest or frightened back into the ocean by high levels of noise. In St. Johns County, nest monitors have not

documented any noise-related impacts (Williams, Stam, Hester, Stoll, Lardner, Crawford, Miller, Stauber, and Parker *pers. comm.* 2002).

4.5.13.10. Portable Toilets

Portable toilets have the potential to interfere with nesting female sea turtles. They might also be an obstacle to hatchlings and/or trap hatchlings if placed on top of an unmarked nest. No such interactions with portable toilets have been documented in St. Johns County (Williams, Stam, Hester, Stoll, Lardner, Crawford, Miller, Stauber, and Parker *pers. comm.* 2002).

4.5.13.11. Trash Collection and Beach Maintenance

Trash collection and beach maintenance activities have the potential to impact sea turtles because vehicles are used. Such vehicles might impact sea turtles or nests as described in Table 4-5. These impacts may be greater than those described for general beach driving, because larger equipment is sometimes required on the beach, particularly during emergency events such as a beached whale or grounded vessel. Heavy vehicular equipment can create large tire ruts that may hinder hatchlings in their crawl to the sea. However, nest monitors have not documented impacts to sea turtles related to trash collection or beach maintenance in St. Johns County (Williams, Stam, Hester, Stoll, Lardner, Crawford, Miller, Stauber, and Parker *pers. comm.* 2002).

4.5.13.12. Ramp Grading

Ramp graders are large vehicles that can impact sea turtles or nests as described in 4-5. Additionally, this kind of heavy equipment can create large tire ruts in the beach that may hinder hatchlings in their crawl to the sea. Ramp grading can sometimes create shallow depressions at the base of the ramps (Williams *pers. comm.* 2002). During high tides, wavewash reaching the ramps can collect in these "pools." If ramp grading results in a continuous corridor between the ramps and the ocean that is lower in elevation than the adjacent beach, tidal flooding is exacerbated, and any sea turtle nest deposited in this corridor might be more vulnerable to washover or being washed out. For this reason, PPHs generally chose to relocate nests laid in vehicular access ramps (Stauber *pers. comm*. 2001).

4.5.14. Effects of Beach Management Activities on AIBM in Plan Area

4.5.14.1. Trash Collection and Beach Maintenance

Garbage on the beach may attract beach mice away from the dune and onto portions of the beach where vehicles are present, thus placing the mice at risk. Competitors and/or predators of beach mice might also be attracted to discarded food on the beach. Consequently, it is important that appropriate receptacles be provided, so beach users can properly dispose of their trash. Furthermore, these receptacles need to be routinely serviced and maintained. If receptacles are placed directly on the beach, beach mice may enter the cans through drainage holes cut in the bottom. Mice entering the receptacles may be crushed by heavy trash or may be inadvertently killed, injured, or removed from their habitat during trash pickup. Additionally, beach mice

"will take refuge under the cans, if the cans are not mounted on a post, which is also not necessarily a desirable behavior. The cans are an attractive nuisance for them" (Bard *pers. comm.* 2002). Sealed and elevated trash receptacles could eliminate many of these potential threats.

4.6. SHORELINE PROTECTION

4.6.1. Effects of Shoreline Protection on Sea Turtles in Plan Area

4.6.1.1. Coastal Armoring

In an effort to protect coastal properties from storm-related erosion, property owners may petition the State of Florida to construct concrete and metal seawalls, rock revetments, and other types of shoreline protection devices. Collectively, these hard structures are referred to as armoring. Coastal armoring is known to have both direct and indirect effects on nesting and hatchling sea turtles (National Research Council 1990). In general, the quality of nesting habitat is degraded by the presence of these structures on the beach. Over 21 percent (145 mi) of Florida's beaches are armored (NMFS and USFWS 1991a and b).

Considerable anecdotal information exists to suggest that permanent armoring structures can diminish the quality of sea turtle nesting habitat. However, there have been few experimental studies designed specifically to assess the impacts of these structures on sea turtle nesting. Mosier (1998) and Mosier and Witherington (2000) recorded the behavior of nesting turtles in front of seawalls and adjacent unarmored sections of beach. Both studies reported that fewer female sea turtles crawled out of the surf onto beaches fronted by seawalls than on beaches where similar structures were absent. Of those turtles that did emerge in the presence of seawalls, proportionally fewer nested. Additionally, turtles on armored sections of beach tended to wander greater distances than those that emerged on adjacent natural beaches. It is unknown if this additional energy expenditure might reduce reproductive output.

Studies by Mosier (1998) and Mosier and Witherington (2000) indicate that seawalls may create suboptimal nesting habitat for sea turtles by diminishing nesting success. Seawalls can effectively eliminate a turtle's access to upper regions of the beach/dune system. Consequently, nests on armored beaches in Brevard and Indian River Counties were generally found at lower elevations than those on non-walled beaches. Lower elevations subject nests to a greater risk of tidal inundation and can potentially alter thermal regimes, an important factor in determining the sex ratio of hatchlings (Mrosovsky and Provancha 1989, Mrosovsky 1994, Ackerman 1997, Delpech and Foote 1998).

High tides frequently reach the base of armoring structures, particularly during spring tides and storm events. Thus, nests deposited in front of these structures are often subject to tidal inundation. For this reason, nests on some armored nesting beaches have to be relocated each year to a more suitable incubation environment (EAI 2000b). The negative effects of seawalls become more pronounced the closer the seawalls are to the surf zone. Thus, the quality of beach habitat seaward of armoring structures on eroding sections of coastline can be expected to diminish as the shoreline recedes.

In addition to those effects discussed above, impacts can occur if the installation of structures takes place during the sea turtle nesting season. Unmarked nests can be crushed or unearthed by heavy equipment. Vibrations and water runoff from jetting operations during installation of structures can also damage nests. In other regions of Florida, there have been reported incidents of nesting turtles and hatchlings caught in construction debris or trapped in excavations at the construction site.

Once a structure is in place, it can continue to cause problems for sea turtles (FWC *unpublished data* 2001b). For example, along other Florida coasts, hatchlings have been trapped in holes or crevices of exposed riprap and geotextile tubes. Both nesting turtles and hatchlings have been entangled or entrapped in the debris of failed structures. There have also been reports of injuries to nesting turtles that have been able to climb onto a seawall via adjacent properties and have subsequently fallen off.

As the extent of armoring on beaches increases, the probability of a nesting turtle encountering a seawall or depositing a nest in sub-optimal habitat increases. Additionally, the displacement of nests from armored locations may increase the density of nests in a dwindling number of suitable nesting sites, thereby increasing the potential for density-dependent nest mortality (e.g., turtles digging up existing nests). However, this effect is most likely to occur on higher density nesting beaches than those in St. Johns County.

In Volusia County, where detailed information is maintained regarding obstacles encountered by turtles during their nesting activities, loggerhead turtles contacted seawalls, rock revetments, or other types of armoring structures on 16.7 and 22.8 percent, respectively, of all crawls during 1999 and 2000 (EAI 2000b and 2001b). Ninety-one (91.0) and 83.0 percent, respectively, of those encounters resulted in the turtle returning to the ocean without nesting. Overall, armoring was responsible for nearly one-third of all non-nesting emergences (false crawls) on Volusia County's beaches. Nesting success was particularly low in the southern portion of the county where armoring was prevalent.

4.6.1.2. Sand Fences

Sand fences have been known to trap hatchling turtles and act as barriers to nesting turtles (National Research Council 1990). All sand fences are permitted by FDEP, and property owners must adhere to their guidelines to avoid negative impacts to turtles. Sea turtle monitoring personnel in St. Johns County report an occasional false crawl attributable to sand fences (Lardner *pers. comm.* 2001, Rich *pers. comm.* 2002).

4.6.1.3. Dune Restoration, Dredged Material Beach Disposal, and Beach Renourishment

Although beach nourishment is generally viewed as a more environmentally benign solution to shoreline protection than armoring, it too has potential for impacting sea turtles. It can affect the sea turtle reproductive process in a variety of ways. Although nourished beaches may provide a greater quantity of nesting habitat, the quality of that habitat may be less suitable than pre-existing natural beaches. Sub-optimal nesting habitat may decrease nesting, place an increased energy burden on nesting females, result in abnormal nest construction, and reduce the

survivorship of eggs and hatchlings. A thorough review of the processes associated with each of these potential effects was presented by Crain *et al.* (1995).

Most nourishment projects on heavily nested beaches are planned to proceed outside of the main portion of the nesting season to minimize incidental take of turtles. Nevertheless, construction impacts can occur. Unmarked nests may be crushed by construction equipment or buried during deposition of dredged materials on the beach. Nests relocated out of harm's way may experience reduced reproductive success (Moody 1998).

Nourished beaches tend to differ in several important ways from natural beaches. They are typically wider, flatter, more compact, and the sediments are more moist than those on natural beaches (Nelson *et al.* 1987, Ackerman *et al.* 1991, Ernest and Martin 1999). On severely eroded sections of beach, where little or no suitable nesting habitat previously existed, nourishment can result in increased nesting (Ernest and Martin 1999). However, on most beaches, nesting success typically declines for the first one or two years following construction, even though more habitat is available for turtles (Trindell *et al.* 1998). Reduced nesting success on nourished beaches has been attributed to increased compaction of sediments, scarping, and changes in beach profile (Nelson *et al.* 1987, Crain *et al.* 1995, Davis *et al.* 1994, Lutcavage *et al.* 1997, Steinitz *et al.* 1998, Ernest and Martin 1999). Compaction presumably inhibits nest construction, while scarps often cause female turtles to return to the ocean without nesting or deposit their nests seaward of the scarp where they are more susceptible to tidal inundation.

Beach nourishment can affect the incubation environment of nests by altering the moisture content, gas exchange, and temperature of sediments (Ackerman *et al.* 1991, Ackerman 1997, Parkinson and Magron 1998). The extent to which the incubation environment is altered is largely dependent on the similarity of the nourished sands and the natural sediments they replace. Consequently, results of studies assessing the effects of nourishment on reproductive success have varied among study sites.

As elsewhere in Florida, all beach nourishment and sand transfer projects in St. Johns County are regulated through State and Federal permitting programs. The USACE, the Federal agency responsible for issuing permits, will undergo section 7 consultations with other Federal agencies to address listed species issues for Federal projects. The USACE permit issued for these projects will specify measures to be implemented to minimize and mitigate impacts to turtles based on those consultations. Consequently, activities associated with beach nourishment and other federally permitted beach projects, including those involving the use of vehicles on the beach, are outside the scope of this HCP, and as such will not be covered under the ITP.

St. Johns County has recently conducted a relatively large beach nourishment project in St. Augustine Beach, and sediment from periodical dredging of the Intercoastal Waterway is placed on the beaches of Summer Haven (section 3.4; Table 3-3). Additionally, dune restoration projects have taken place at ASP in 1999 and Summer Haven in both 2002 and 2003. Dune restoration projects, such as these in St. Johns County, involve placement of additional sand on the beach and can have some the same effects as beach nourishment if performed during the nesting season.

Since 1999, nests have been relocated each nesting season due to various shoreline protection measures in St. Johns County (Table 4-4). In 1999, nests were relocated from St. Augustine Beach due to a USACE beach sand transfer project associated with inlet maintenance dredging (15.8 percent of nests were moved). In both 1999 and 2001, nests were relocated due to renourishment projects south of Matanzas Inlet (Fort Matanzas South survey zone). In 1999, 17.9 percent of the nests deposited in the Fort Matanzas National Monument survey zone were moved, and in 2001, 28.6 percent of the nests in the Fort Matanzas South survey zone were relocated. Additionally, 6.2 percent of the nests within the Fort Matanzas National Monument survey zone were moved in 2000 because of a seawall restoration project at Marineland.

4.6.2. Effects of Shoreline Protection on AIBM in Plan Area

Beach renourishment, sand transfer, and dune restoration projects have the potential to impact AIBM and negatively impact their habitat. The heavy equipment required during these projects may disturb the AIBM, crush burrows, degrade the primary dune system, and/or diminish food resources by disturbing natural dune vegetation. Due to expected negative impacts, the USFWS required that AIBM be trapped and relocated five days prior to renourishment and dune restoration activities conducted at ASP in 2002 (Miller *pers. comm.* 2002).

Coastal armoring can have long-lasting, harmful impacts on AIBM populations through habitat destruction and fragmentation, particularly if one group of mice becomes disconnected from another, thereby creating genetically isolated subpopulations. Frank and Humphrey (1996) summarize the potential impacts, "Habitat fragmentation resulting from the isolation of subpopulations can reduce population viability through both demographic and genetic mechanisms." For instance, the beach mice at ASP have been isolated from the rest of the Anastasia Island population by a section of shoreline protection along St. Augustine Beach, where the former dune system was replaced by a concrete seawall fronted by rock revetment (Figure 3-8b; Frank 1996).

4.7. ARTIFICIAL LIGHTING

4.7.1. Effects of Artificial Lighting on Sea Turtles in Plan Area

Both nesting and hatchling sea turtles are adversely affected by the presence of artificial lights near the beach (Witherington and Martin 2000). Experimental studies have clearly demonstrated that bright lights can deter adult female turtles from emerging from the ocean to nest (Witherington 1992). Thus, not surprisingly, many researchers have noted a relationship between the amount of lighted beach development and sea turtle nest densities. For example, Mattison *et al.* (1993) noted that emergences of nesting turtles in Broward County, Florida, were reduced in areas where lighted piers and roadways were near the beach. In areas where a glow of artificial light is present behind the dune, loggerhead turtles prefer to nest in the darker areas silhouetted by tall buildings and dune vegetation (Salmon *et al.* 1995a). Although there is a tendency for turtles to prefer dark beaches, many do nest on lighted shores. As noted by Witherington and Martin (2000), in doing so, they place the lives of their offspring at risk. Artificial lighting can impair the ability of hatchlings to properly orient to the ocean once they leave their nests.

Hatchling sea turtles exhibit a robust sea-finding behavior. A direct and timely migration from the nest to sea may be vital to their survivorship. Although the cues involved in sea finding are complex, hatchlings rely primarily on vision for proper orientation (Witherington and Martin 2000, Salmon *et al.* 1992, Lohmann *et al.* 1997). A combination of light and shapes is thought to be responsible. The extent to which one or the other drives the process may be a function of the relative strength of each stimulus.

Hatchlings have a tendency to orient toward the brightest direction. On natural undeveloped beaches, the brightest direction is almost always away from elevated shapes and their silhouettes (e.g., dune, vegetation, etc.) and toward the broad open horizon of the sea. On developed beaches, the brightest direction is often away from the ocean and toward lighted structures. Hatchlings, unable to find the ocean or delayed in reaching it, are likely to incur high mortality from dehydration, exhaustion, or predation (Carr and Ogren 1960, Witherington and Ehrhart 1987, Witherington and Martin 2000). Hatchlings lured into lighted parking lots or toward street lights are often crushed by passing vehicles (McFarlane 1963, Philibosian 1976, Peters and Verhoeven 1994, Witherington and Martin 2000).

Artificial lighting cues can cause either misorientation or disorientation (Witherington 1990). Hatchlings that are misoriented travel along a consistent course away from the ocean and toward a light source. Those that are disoriented are unable to establish a particular course and wander aimlessly. However, typically, the two behaviors are lumped under the term disorientation.

Hatchlings are frequently attracted to point source lights on buildings and roadways in urban areas (McFarlane 1963, Philibosian 1976, Mann 1978, Witherington 1992). Urban areas may also have a non-point source nighttime glow (sky glow), which may affect hatchling orientation on otherwise dark sections of beach (Witherington 1993).

Once disoriented, turtles often enter conflicting light environments as they head landward. As hatchlings approach buildings and roads, they encounter obstacles that may screen the source of artificial light (Salmon *et al*. 1995b). They may then re-orient themselves correctly toward the ocean or continue along the obstruction (e.g., seawall, deep ruts, buildings) until they can see the original or perhaps another source of artificial light. If the stimulus affecting disorientation is strong enough and continuous enough, hatchlings may remain on the beach overnight until the brightening sky at sunrise becomes a dominant influence and attracts them to the surf. Mann (1977) found that most turtles in artificial light-dominated areas oriented correctly on brightly moonlit nights. However, on moonless nights, hatchlings were easily disoriented by artificial lights.

Deviations from normal sea-finding behavior may result in excessive expenditure of energy stores, dehydration, and increased likelihood of predation (Witherington and Martin 2000). However, the relationship between level of light-caused disruption and survivorship has not yet been quantified. Relative degrees of sublethal and lethal effects have been reported, ranging from a mild misorientation of a few hatchlings to a strong disorientation of a whole clutch resulting in mortality for many (Salmon *et al*. 1995a, Witherington and Martin).

Both Mann (1977) and Ehrhart and Witherington (1987) found high mortality in the emergences

where the majority of the hatchlings were strongly disoriented. If the hatchlings are drawn landward from the beach, they may enter roadways where they may be run over or become irretrievably lost from finding their way to the surf. The protracted wanderings of disoriented hatchlings also lengthens the time they are susceptible to predation from raccoons, ghost crabs, seabirds, fish crows, and possibly dogs and cats. The prolonged exposure can exhaust and/or dehydrate the turtles to the point of death or limit their chance of survival once in the water. Weakened hatchlings that eventually reach the water may be more vulnerable to marine predators, which are abundant in nearshore waters (Wyneken *et al*. 1994).

Artificial lighting does not appear to be as problematic for nesting adult female sea turtles. They seem to use a "straight ahead" method to select a nest site. They do not appear to be affected as much by lights up and down the beach as they are by bright lights right in front of them upon emerging (Salmon *et al*. 1995b, Witherington 1992). Distant point sources and urban glow are more likely to affect hatchlings than adult females (Salmon *et al*. 1995b).

To reduce the harmful effects of artificial beachfront lighting, St. Johns County (Ordinance No. 99-33) and the City of St. Augustine Beach (Ordinance No. 95-17) have adopted lighting regulations that mimic those contained in the State of Florida's Model Lighting Ordinance for Sea Turtle Protection (Chapter 16B-55). The intent of these regulations is not to prohibit lighting of beachfront properties, but rather to manage light so it is confined to the property and does not shine out onto the beach. A variety of measures are available for effectively managing lights (Witherington and Martin 2000).

Hatchling disorientations have been documented within St. Johns County. A review of the Hatchling Disorientation Incident Reports submitted to FWC indicates were have been 12 documented disorientation incidents between 1996 and 2001 (FWC *unpublished data* 2001e). This number represents approximately 0.7 percent of all nests within the County during that time period. All but one of these incidents occurred within the vicinity of either St. Augustine Beach or Ponte Vedra Beach. The variety of problematic light sources identified at these events is indicative of the complexity of managing light on coastal beaches. Light sources implicated included roadway lighting (2 nests), condominium lights associated with dune crossovers (1) and tennis courts (2), commercial/parking lot lighting (2), and residential lighting (3). The effects of cumulative beach lighting from street, parking lot, and residential lights were implicated in the disorientation of two nest sites. Three of these incidents occurred subsequent to the establishment of the beach lighting ordinance (Ordinance No. 99-33). All of the reported disorientation events involved loggerhead hatchlings. It should be emphasized that the number of hatchling disorientation events recorded in St. Johns County is probably an underestimate as some disorientations are certain to have been overlooked or were not reported.

4.7.2. Effects of Artificial Lighting on AIBM in Plan Area

The AIBM and all *Peromyscus polionotus* are nocturnal rodents, and they seem to be more active on nights with half to new moons and cloudy skies than on nights with a full moon (Blair 1951). Peaks of activity occur shortly after dusk and again after midnight (Wooten 2001). Artificial lighting, particularly persistent nighttime lighting from skyglow, lights on buildings, and vehicle headlights, can have a negative impact on AIBM by suppressing or disrupting nocturnal

activities, thus decreasing time for finding food (Patrick *pers. comm.* 2002). Along the Gulf Coast of the Panhandle of Florida, it has been demonstrated that beach mice do not venture out of their burrows when their surroundings become well lit (Patrick *pers. comm.* 2002).

4.8. EMERGENCY RESPONSES TO STORMS

In response to severe storm erosion, the St. Johns County Board of County Commissioners has power to authorize the initiation of *temporary* emergency shoreline protection measures. In general, FDEP permits shoreline armoring, and the County defers to FWC and FDEP for guidance regarding the type and placement of structures and the timing of construction activities to avoid impacts to sea turtles and other protected species.

After receiving approval from FWC and FDEP, the Board of County Commissioners declared a state of emergency and authorized the temporary installation of shoreline protection at five private residential homes in Vilano Beach (St. Johns County Resolution No. 2000-161). Each of the five homeowners placed rocks on the beach as landward as practicable. In accordance with section 161.085(6), Florida Statutes, the five homeowners submitted permit applications to the FDEP for the permanent retention of the structures (Brewer *pers. comm*. 2002). Two of these property owners have been granted a permit to retain the rocks on the beach. Though awaiting official determination from FDEP, the remaining three property owners will likely be required to remove the rocks under FDEP direction (Brewer *pers. comm.* 2002).

4.8.1. Effects of Emergency Responses to Storms on Sea Turtles

If the initiation of emergency responses to storm events results in the installation of emergency shoreline protection measures, these responses have the potential to impact sea turtles in much the same way as shoreline armoring (section 4.6.1.). Additionally, when vehicles are used to access a site of an emergency on the beach, those vehicles have the potential to impact sea turtles as outlined in Table 4-5.

4.8.2. Effects of Emergency Responses to Storms on AIBM

If emergency shoreline protection measures are initiated along the foredune, these activities may impact AIBM similarly to shoreline armoring (section 4.6.2.). Shoreline armoring may reduce habitat available to beach mice for burrow construction and foraging. If the abundance of sea oats is reduced by this activity, further stress could be placed upon the AIBM by diminishing their available food supply.

4.9. COASTAL DEVELOPMENT & CONSTRUCTION

4.9.1. Effects of Coastal Development & Construction on Sea Turtles

In addition to shoreline protection activities, there are a variety of other types of coastal construction activities, each of which may affect sea turtles. These include, but are not limited to, the following:

- Construction of new and repair/maintenance of existing upland structures and dune crossovers;
- Construction of jetties and groins;
- Installation of utility cables;
- Installation and/or repair of public infrastructure; and
- Removal of wind-blown sand from upland properties.

Many of these activities may alter nesting habitat and impact sea turtle eggs, hatchlings, and/or nesting females. If vehicles are used on the beach in support of coastal construction, impacts to sea turtles may occur, as summarized in Table 4-5. Eggs may be crushed, unearthed, or otherwise destroyed during construction activities (e.g., heavy equipment, excavation, pile driving, water jetting, etc.). Eggs in undetected and unmarked nests may be buried beneath sand placed on the beach, resulting in mortality of developing embryos. If large quantities of sand are placed over incubating nests, hatchlings may not be able to escape from the nest. Hatchlings may be trapped beneath equipment, supplies, and/or construction debris on the beach.

The migration of hatchlings to the ocean may be impeded by equipment/supplies on the beach. Holes and ruts left on the beach by construction activities may also trap or misdirect hatchlings, increasing energy expenditures and susceptibility to predation. Construction lighting may disorient hatchlings. Holes, crevices, and deteriorating materials associated with structures composed of riprap, sand bags, and geotextile tubes may trap or entangle hatchlings.

Construction lighting and/or construction activities may deter nesting females from emerging onto the beach and reduce nesting success. Females may become entangled or trapped in building equipment and materials while searching for a nest site. Disturbed soil and holes left overnight in the construction areas may trap or topple nesting females.

4.9.2. Effects of Coastal Development & Construction on AIBM

Beach mice rely on periodic storms to overwash and/or erode the dune system, thereby pruning vegetation and maintaining their habitat in early succession. But, beach mice also rely on the availability of the backdune transitional zone, where they can temporarily retreat during storm events. These backdune areas are commonly altered or eliminated by beachfront development, thereby threatening the ability of beach mice populations to persist through sequences of intermittent storms.

Beachfront development is the most serious threat to beach mice persistence. All coastal construction seaward of the Coastal Construction Control Line is permitted by FDEP, not St. Johns County. Any construction along the dune system of Anastasia Island or GRSP, the prime area of beach mouse habitat, will likely result in direct habitat loss and/or habitat fragmentation. If vehicles are used on the beach in support of coastal construction, impacts to beach mice may occur, as summarized in Table 4-6.

4.10. STORMWATER OUTFALLS

4.10.1. Effects of Stormwater Outfalls on Sea Turtles

Rainfall incidents on the dunes and beaches percolate rapidly into the permeable sands and produce little, if any, runoff. Runoff from most developed areas on the barrier islands, typically collected by storm sewers, discharges into the estuarine lagoons landward of the islands. However, runoff from beachfront parking lots, roads, and swimming pool decks discharges directly onto the beaches and dunes either by sheet flow or through stormwater collection system outfalls. Collectively, these outfalls can sometimes create localized erosion channels, prevent natural dune establishment, and wash out sea turtle nests.

In St. Johns County, there are no records of a sea turtle nest having been relocated because of the threat of stormwater runoff (Table 4-4). Most of the beach-directed stormwater outfall occurs on beaches now displaying substantial escarpments or seawalls. These properties were primarily developed in the 1960s and 1970s, prior to current stormwater management regulations. The St. Johns River Water Management District typically requires all new developments to provide treatment of stormwater by onsite retention or detention before it is discharged off site.

In addition to the direct physical effects of upland runoff, contaminants contained in the discharges, such as oils, grease, metals, pesticides, and nutrients, may alter the incubation environment of nearby nests and have as yet undetermined consequences on embryonic development and reproductive success. The effect of chemicals contained in pool discharges is similarly unknown. There is no current means of comparing the quantity and effects of pollutants generated on upland property, roads, and parking lots that wash onto the beach via stormwater runoff.

4.10.2. Effects of Stormwater Outfalls on AIBM

The potential impacts of stormwater outfalls on AIBM are not known. It is reasonable to assume that beach mice will be harmed by the release of stormwater in direct proportion to any degradation or contamination that may result to the dune system.

4.11. FERAL & FREE-ROAMING CATS & DOGS

Numerous Federal, State, and local laws and regulations address the release or presence of feral and free-roaming cats and dogs in St. Johns County. Domesticated or feral cats and dogs are considered exotic species, and their release upon lands in the United States is prohibited under the National Invasive Species Act and Executive Order 13112. Florida Statutes also explicitly state that it is unlawful to release into the state any species that is not indigenous to Florida without having obtained a permit from FWC (F.S. 372.265; F.A.C. 68A-4.005). In some cases, the release of a domesticated animal into the wild can be interpreted as animal cruelty, which is prohibited under State law (F.S. 828.12). Additionally, the abandonment of a cat or dog is also prohibited under Florida Statutes, as described below:

> (3) Any person who is the owner or possessor, or has charge or custody, of any animal who abandons such animal to suffer injury or malnutrition or abandons any animal in a street, road, or public place without providing for the care, sustenance, protection, and shelter of such animal is guilty of a misdemeanor of

> the first degree, punishable as provided in s. 775.082 or by a fine of not more than $5,000, or by both imprisonment and a fine (F.S. 828.13).

Domestic dogs and cats within unincorporated portions of St. Johns County are not permitted to:

> "…enter upon any public or private road right-of-way, dedicated right-of-way, public property, the Beaches, or the private property of another…unless said Dog or Cat is wearing a Collar and is in actual physical control of such a person by a Retraint" (Ordinance 01-19).

The responsible party is described as, "any person or legal entity who shall own, be in custody of, be responsible for, or be in control of, any Dog or Cat". The first two non-contested violations of this Ordinance are punishable by a $50.00 fine. Contested violations may result in a maximum penalty of a $500.00 fine and/or 60 days imprisonment in the County Jail.

Section 3.02 of the St. Johns County's Beach Code (Ordinance 97-34) places restrictions regarding animals on the beaches: "(b) Any person who owns, is responsible for, or in control of any dog or cat on the beach of St. Johns County (1) shall then have in their possession and in the close proximity of such an animal an implement or material by which defecation of such animals may be removed from said beach; and (2) shall promptly remove any defecation of such animal from the beach using such implement or material (County Ordinance 99-21)."

4.11.1. Effects of Feral & Free-roaming Cats & Dogs on Sea Turtles

In addition to the foxes and raccoons that appear to concentrate their depredation activities on sea turtle nests within the undeveloped property of State parks, feral and/or free-roaming domestic dogs are becoming of increasing concern in developed regions. The tracks and signs of depredation by dogs may look very similar to that by foxes. However, the paw tracks leading to the depredated nests reportedly appear larger than those of a fox. Observers on the beach have actually watched domestic dogs digging into sea turtle nests (Stoll *pers. comm.* 2002). Between 1996 and 2001, the earliest records of depredation by dogs occurred in FMNM in 1997 (unknown number of nests depredated) and GRSP in 1998 (one nest was lost) (FWC *unpublished data* 2002). In 2001, six nests were disturbed by dogs in the monitoring zone of Beach Club Drive South, and 147 eggs were damaged (Stoll *pers. comm.* 2002). In the same year, one nest was lost to either a dog or raccoon in Old Ponte Vedra (with over 40 damaged eggs) (FWC *unpublished data* 2002).

4.11.2. Effects of Feral & Free-roaming Cats & Dogs on AIBM

Frank and Humphrey (1996) determined that cat predation was a significant factor affecting the long term persistence and population numbers of AIBM. In a single experiment, the population of AIBM increased approximately 20 percent after a sweeping cat control program was initiated at ASP (Frank 1996). Experts on beach mice agree that control of feral and free-roaming cats in AIBM habitat may be the single most important management strategy to reduce the subspecies' vulnerability to extinction (Miller, Frank, and Bard *pers. comm.* 2001).

4.12. VEHICLES ON THE BEACH

Direct and indirect impacts potentially resulting from vehicles on the beach are summarized in Table 4-5. The different types of vehicles and vehicular activities within the HCP Plan Area can be partitioned into the following categories:

- Public safety operations, such as those involving lifeguards, emergency vehicles, and law enforcement vehicles;
- Public vehicular access;
- Routine beach maintenance and sanitation;
- Access ramp grading and maintenance;
- Activities necessary to implement the terms and conditions of the ITP (e.g., sea turtle monitoring, Code Enforcement, GPS data collection, HCP management, etc.);
- Planned coastal construction projects properly permitted by local, State, and/or Federal regulatory agencies, such as seawall repairs, beach nourishment, dune restoration, and removal of wind-blown sand, where no reasonable upland alternative exists;
- Scientific monitoring and studies other than those related to sea turtles and AIBM;
- Emergency shoreline protection projects properly permitted by local, State, and/or Federal regulatory agencies; and
- Non-routine beach maintenance and sanitation, such as storm cleanup and removal of hazardous materials, debris and/or obstacles from the beach that pose a public health or safety risk following storms and other unforeseen circumstances (e.g., boat groundings, plane crashes, etc.).

The above types of vehicular activities on the beaches of St. Johns County have the potential to impact sea turtles and/or AIBM. A discussion of these impacts is provided in the following sections.

4.12.1. Effects of Vehicles on Sea Turtles

4.12.1.1. Direct Impacts of Vehicles on Sea Turtles

Direct impacts potentially resulting from vehicles on the beach are summarized in Table 4-5. Adult, hatchling, live stranded, and live washback post-hatchling sea turtles, as well as sea turtle nests may be run over by vehicles. Vehicles might run into or over nesting females, live stranded, live washback, and/or hatchlings; vehicles might run over nests and crush eggs. At night, vehicle lights might frighten nesting females from the beach or deter others from emerging from the ocean. Additionally, vehicle headlights can disorient emergent hatchlings during their crawl from the nest to the ocean.

4.12.1.2. Indirect Impacts of Vehicles on Sea Turtles

4.12.1.2.1. Sediment Compaction

A secondary effect of vehicular traffic on the beach is the potential for compacting sediments under the weight of cars, trucks, and heavy equipment. Compaction is an important

consideration for sea turtle conservation, because if sediments are too compact, a female turtle may have difficulty excavating an egg chamber of adequate depth or dimensions (Raymond 1984, Ryder 1990, Carthy 1994). She may also have to dig more often before finally constructing a suitable egg chamber, or she may abandon the nesting attempt altogether. Increased energy expenditures during the course of nesting may place a higher reproductive cost on that individual. Additionally, if the chamber is poorly constructed, the fate of the eggs may be affected. For example, if the chamber is too shallow, eggs are more susceptible to erosion, predation, and disturbance from activities on the beach.

In a cursory assessment of the impact of beach driving, Fletemeyer (1995) found that sediment compaction levels in Volusia County were higher in two areas routinely driven on than in nearby non-driving areas. However, it is unclear what steps were taken in that study to isolate driving effects from other physical beach variables that influence compaction (e.g., sediment type, tidal influence, etc.). In a related assessment, Fletemeyer (1995) repeatedly drove an SUV over a section of beach where public driving was prohibited. Although he found that compaction values were greater after the vehicle made its passes than before, the highest values obtained were well below those typically regarded as detrimental to sea turtle nesting by FWC (500 psi).

4.12.1.2.2. Vehicle Ruts

It is widely reported that vehicular ruts left in the sand create obstacles for hatchlings attempting to reach the ocean. Upon encountering a vehicle rut, hatchlings may be misoriented along the vehicle track, rather than cross over it to reach the water. Apparently hatchlings become diverted, not because they cannot physically climb out of the rut (Hughes and Caine 1994, Arianoutsou 1988), but because the sides of the track cast a shadow that disrupts their sea-finding ability (Mann 1977). At least two studies have confirmed hatchling disorientation by vehicular ruts (Cox *et al.* 1994, Hosier *et al.* 1981). In one study, tire ruts were found to cause nearly 21 percent of hatchling turtles to invert (flip over). If hatchlings are trapped or detoured by vehicle ruts, they are at greater risk to predators, fatigue, and desiccation. Live and desiccated turtles have been found trapped in deep vehicle ruts (LeBuff 1990, Rich *pers. comm.* 2001, Stam *pers. comm.* 2001).

4.12.1.2.3. Contaminants

Another potential indirect effect of vehicles is the emission of oil, antifreeze, grease, and other substances from automobiles parking and driving on the beach. However, there have been no studies to quantify the impacts of this source of pollution. Vehicle-related pollutants likely are quite mobile in beach sands, so they should be diluted and flushed from the beach area by rainfall, waves, and tides without reaching concentrations that could be harmful to incubating sea turtle nests.

4.12.2. Effects of Vehicles on AIBM

Little information is documented about the direct and indirect impacts that beach driving might have on AIBM or other subspecies of beach mice. Direct and indirect impacts potentially resulting from vehicles on the beach are summarized in Table 4-6. Most of the impacts to AIBM due to vehicular driving are probably indirect, not direct impacts. However, during nightly

surveys conducted along the Gulf Coast, beach mice do run out into the path of an oncoming vehicle, suggesting that it could be possible for a vehicle to run over a mouse (Patrick *pers. comm.* 2002). Another direct impact of public vehicles on the beach is that headlights may frighten or disrupt nocturnal activities of juvenile or adult AIBM.

Indirect impacts to AIBM include habitat degradation, deposition of contaminants, and other indirect effects associated with vehicular access to remote beach regions. The segment of beach in St. Johns County from St. Augustine Beach south to Matanzas Inlet is one of a few segments of beach in the U.S. where beach mouse habitat and public beach driving overlap. There has not been a published, rigorous scientific study conducted to quantify the impacts of beach driving on beach mice. The only comprehensive study on the AIBM throughout Anastasia Island was conducted in 1989-1990 by Frank and Humphrey (1996). The following excerpt from their study addresses beach driving in St. Johns County and potential impacts on AIBM:

> Driving automobiles on the beach is a long-standing tradition on Anastasia Island. An obvious effect of having automobile traffic on the beach is a neatly-trimmed dune line caused by traffic pruning back pioneering dune vegetation, prohibiting seaward dune growth on the upper beach. At ASRA [ASP], a policy prohibiting beach driving on the toe of the dunes was recently established, and the response was an immediate appearance of low, early successional dune formations just seaward of the established dune line. These low dunes provide habitat for beach mice and reduce dune erosion caused by strong winter storms out of the northeast. FMNM has an additional problem in that the beach remains open 24 hours, but staff patrol only during daylight hours [between October 16 and May 14]. This unsupervised driving results in damage to the dune system.

Additionally, researchers cite vehicular beach access as contributing to the problems of human trespassing and excrement in the dune system. The argument is that beach driving allows people to reach remote beaches that may be a considerable distance from a portable toilet or a public facility. Along these remote beaches, visitors might be disinclined to drive back to a restroom and choose to relieve themselves behind the primary dunes instead (Frank *pers. comm.* 2002). Such incident reports are anecdotal and not documented.

The months of the year when public vehicular access to the beach is permitted may be important for the conservation of AIBM. Peak population densities of AIBM tend to occur in the winter at both ASP and FMNM (Frank and Humphrey 1996). Additionally, both the ASP and the FMNM populations of the AIBM undergo a significant increase in reproductive activity between April and July (Frank and Humphrey 1996). During the winter months, public beach driving in St. Johns County is permitted during all hours of the day. Since populations may be more vulnerable to anthropogenic influences during periods of high reproductive activity, AIBM may be more susceptible to disturbance during the summer, when beach visitation by pedestrians and vehicles are highest.

4.13. FACTORS AFFECTING BIRDS IN PLAN AREA

Several State-listed and federally-listed bird species are known to occur, or may potentially occur, along the beaches of St. Johns County (see Appendix D). The beach environment provides nesting and foraging habitat for various species of shorebirds, as well as resting and stopover points for other migratory species. This section describes the current and potential impacts to protected birds within the Plan Area related to human use of the beach.

4.13.1. Nesting Birds

The beaches within the Plan Area are considered to be appropriate nesting habitat for several species of birds, including the State-listed least tern, black skimmer, and American oystercatcher. According to data obtained from the FNAI (March 2001, see Appendix D), least terns have been reported to nest in the vicinity of the St. Augustine and Matanzas Inlets, as well as within Guana River State Park (section 3.5.2.1.10.8.). In 1992, black skimmers were also observed to nest south of the St. Augustine Inlet on Conch's Island (FNAI 2002).

Colonial nesting shorebirds are particularly sensitive to human disturbance because of their high-density nesting habits. Although nesting shorebirds can habituate themselves to occasional human activities (Brubeck *et al*. 1981), persistent anthropogenic disturbances, such as pedestrian or vehicular traffic, free-roaming domestic cats and dogs, and habitat loss as a result of beachfront development and/or erosion can have more serious effects. Some evidence suggests that these types of disturbances can result in decreased reproductive success and even abandonment of a nesting colony (Fisk 1978, Gaddy 1982, Gochfeld 1983). Rodgers and Smith (1995) stated, "Identified detriments to reproductive success include egg and nestling mortality, nest evacuation, reduced nestling body mass and slower growth, premature fledging, and modified adult behaviors." Nesting terns, for example, will often mob perceived threats to their nest sites (such as pedestrians or vehicles), increasing energy expenditures and leaving their eggs vulnerable to overheating (Gaddy 1982) or predation. Intrusion into a nesting colony by pedestrian, vehicular, or horseback traffic could also cause eggs or young to be unintentionally crushed or otherwise disturbed. Another consequence of anthropogenic activities on the beach is improperly discarded refuse. Trash may increase the severity of predation on nesting birds by attracting predators such as raccoons, foxes, or crows to the beach. Lighting of the beach at night may negatively affect bird nesting habitat and/or make nesting birds more easily preyed upon by other species.

Due to the lack of a regular monitoring program that would document nesting attempts or nesting success, the present level of impact to nesting bird species within the Plan Area attributed to public vehicular traffic is unknown. However, Rodgers and Smith (1995) estimated the distance at which a human disturbance (a directly approaching pedestrian, canoe, or motorboat) prompted an initial mass upflight or an alert response (flush distance) by 14 species of colonial nesting waterbirds at 17 colonies in Florida (including 2 least tern nesting sites at Matanzas Point, St. Johns County). The researchers concluded, "In general, a recommended set-back distance of about 100 meters for wading bird colonies and 180 meters for mixed tern/skimmer colonies should be adequate to effectively buffer the sites we studied from human disturbance caused by the approach of pedestrians and motorboats." This study cited evidence suggesting that some

colonial nesting birds may be less disturbed by, perhaps even acclimated to, tangentially approaching disturbances (such as a vehicular traffic passing by the colony). Thus, insuring that vehicles, pedestrians, horseback riders, leashed dogs, etc. pass by nesting colonies and do not directly approach the birds may allow for shorter set-back distances, particularly if the disturbance exhibits low noise levels. A physical barricade that insures that the nesting birds cannot see the human disturbance may also allow for shorter set-back distances (again, provided the human disturbance is relatively quiet).

At some of the study sites in Florida, least terns nested beside roadways (Rodgers and Smith 1995). The authors observed much shorter flushing distances by the birds in these roadside colonies. Apparently, these birds became habituated to tangentially moving vehicles. However, studies have documented that roadside tern colonies exhibit increased alarm behaviors (longer flushing distances) when passed by large noisy vehicles, when vehicles stopped along the roadway, when vehicles honked their horns, or when vehicles directly approached the bird aggregations (Rodgers and Smith 1995).

4.13.2. Resting and Feeding Birds

Protected species of shorebirds, terns, and to a lesser extent, wading birds, utilize the County Beaches within the Plan Area for foraging and resting. Surveys conducted by local biologists have documented the federally threatened bald eagle and State-listed least terns, black skimmers, brown pelicans, and American oystercatchers either resting or foraging within ASP (Miller *unpublished data* 2001). A very small number of federally and State-threatened piping plovers have been recorded resting and feeding along FMNM (Meyer *pers. comm.* 2001, Van Ghent *pers. comm.* 2001). The presence of these species elsewhere within the Plan Area is likely.

Possible impacts to these birds may include disruption of foraging activities as a result of vehicular or pedestrian traffic. Some studies indicate that human disturbance reduces the amount of time that piping plovers, a federally threatened winter resident along Florida's beaches, spend feeding (Johnson and Baldassare 1988, Haig 1992), which could limit the individual's ability to survive its lengthy migration. Upon approach, piping plovers and other shorebirds will evade perceived threats by taking to the air in search of areas that appear free from disturbance. Certain species are more prone to the negative impacts of being frightened into the air, and these species may tend to move or otherwise change their behavior as a result of such impacts.

Improperly discarded refuse might increase the severity of predation on shorebirds by attracting predators such as raccoons, foxes, or crows to the beach. Birds can also become entangled in improperly discarded fishing line and other trash on County Beaches. Timely and appropriate trash pick-up on all beaches of St. Johns County helps to alleviate negative impacts for both wildlife and people.

4.14. ACTIVITIES OVER WHICH ST. JOHNS COUNTY HAS AUTHORITY

The above sections have outlined various activities along the coastline of St. Johns County that have potential to result in harassment, injury, and/or death to adult, hatchling, stranded, or post-hatchling washback sea turtles, AIBM, and birds within the Plan Area. However, St. Johns

County does not have regulatory authority over all of these activities. For example, the County does not have the power to authorize coastal development, construction, beach renourishment, or shoreline armoring within the HCP Plan Area. All construction occurring within the HCP Plan Area would necessarily be seaward of the Coastal Construction Control Line, dictating that the activity be permitted by FDEP (F.S. Chapter 161 and Chapter 62B-33).

St. Johns County has limited power to authorize emergency responses to storms and other unusual occurrences, though FWC and FDEP actually regulate this activity. In accordance with applicable local regulations and ordinances, stormwater outfalls are generally regulated by the State. Also, many human beach activities, such as high-impact special events, activities impacting dune vegetation, placement of recreational beach equipment, and fishing activities are generally either permitted or prohibited by the State.

St. Johns County does have regulatory authority over artificial lighting as outlined in the Beach Lighting Ordinance (Ordinance 99-33) and over public vehicular access to the beach in accordance with Florida Statute Chapter 161.85. The County also authorizes public horseback riding on the beach (Ordinances 97-34, 99-21, and 2001-5). Additionally, a number of beach management activities including trash removal, ramp grading, and low-impact special events are permitted and regulated by St. Johns County. Finally, St. Johns County does exercise some regulatory authority over feral and free-roaming cats and dogs (Ordinances 98-70, 97-34, 99-21).

4.15. ACTIVITIES COVERED BY THE INCIDENTAL TAKE PERMIT

If issued, the ITP will authorize the incidental take of federally listed sea turtles and AIBM on the Atlantic coast beaches of St. Johns County within the HCP Plan Area causally related to vehicular driving and associated activities, as described in section 1.10. of this HCP.

Chapter 5. TAKE ASSESSMENT

Due to a lack of consistent monitoring and reporting of historical take of sea turtles and AIBM in St. Johns County, it is difficult to quantify future incidental take levels potentially resulting from vehicular activity on the beach. However, the level of future incidental take due to vehicular access to the beach is expected to be considerably lower than the level of previous incidental take due to the implementation of minimization and mitigation measures contained in this HCP (Chapter 7). In general terms, anticipated incidental take of sea turtles and AIBM is described below.

5.1. INCIDENTAL TAKE ASSESSMENT: SEA TURTLES

Incidental take of sea turtles can occur as a result of vehicular access to the beach. Impacts can be direct or indirect and affect sea turtle nests, eggs, adults, and/or hatchlings, as described in section 4.12.1. and Table 4-5. Table 5-1 presents all records of historical incidental take of sea turtles due to vehicles or vehicular activities on the beaches of St. Johns County, as documented by USFWS Jacksonville, FWC Bureau of Protected Species, St. Johns County Planning Division, St. Johns County Legal Services Division, St. Johns County Sheriff's Department, and the Marine Turtle PPHs in St. Johns County.

Table 5-1 demonstrates that incidental take of sea turtles has not been systematically or uniformly documented in St. Johns County. However, the information compiled since 1991 suggests that both lethal and sublethal incidental take of sea turtles due to vehicles or vehicular activities has occurred along the beaches of the County. It is logical to assume that incidental take occurred prior to 1991, but no records or anecdotal evidence are available for that period. Since 1991, approximately 43 post-emergent hatchlings have been run over and killed by vehicles on the beaches of St. Johns County. Additionally, 15 eggs/embryos from one nest were crushed and killed, 3 nests were run over (with no or unknown damage to eggs/embryos/hatchlings), and an unspecified number of hatchlings have been trapped in tire ruts. Additional harm or mortality has been reported, but the number of individuals involved was not documented.

Most of the incidental take of sea turtles attributable to beach driving occurred during a single year. During 1994, there were 52 reported lethal incidental takes of hatchlings and eggs directly attributable to beach driving, including 29 hatchlings that were run over near the Vilano Ramp on one night (Table 5-1). However, there were extenuating circumstances in the 1994 Vilano Ramp incident. Hatchlings were first disoriented by artificial beachfront lights (FWC unpublished data 2001e), and a large proportion were run over on the Vilano Ramp and in the parking lot at Vilano Ramp (just west of Fiddler's Green Restaurant) (Stauber, Williams, Brewer, and Holmberg *pers. comm.* 2002). Nevertheless, an unknown number of hatchlings were also run over that night by beach drivers on the beach proper (Stauber *pers. comm.* 2002; in 1994 beach driving was permitted in St. Johns County until 11:00 PM).

The 1994 Vilano Ramp incident was extreme and appeared to have resulted from a combination of a disorientation event coupled with illegal nighttime driving (Stauber *pers. comm.* 2002). Thus, it is not representative of the level of incidental take that has occurred historically.

Additionally, anticipated future incidental take is expected to decrease in response to HCP conservation strategies (Chapter 7). The level of future incidental take is expected to display a correlation with the level of beach driving visits (i.e., if beach driving visits decrease/increase, then incidental take of sea turtles can be expected to decrease/increase on a similar trajectory).

5.2. INCIDENTAL TAKE ASSESSMENT: ANASTASIA ISLAND BEACH MICE

Incidental take of AIBM can occur as a result of vehicular access to the beach. Impacts can be direct or indirect and affect all life history stages of beach mice, as described in section 4.12.2. and Table 4-6. There were no available documents recording historical cases of direct impacts to AIBM due to beach driving in St. Johns County. However, the impacts on AIBM from public vehicular access to the beaches are most likely indirect impacts. Potential indirect impacts include degradation of habitat by vehicles trimming dune vegetation, and the use of vehicles to gain access to remote beaches where human trespassing, garbage, and excrement in the dunes might not otherwise be a problem. There is not enough data to confidently quantify either historical or anticipated levels of incidental take of AIBM due to beach driving.

5.3. CUMULATIVE IMPACTS

There are few areas in the U.S. that authorize public vehicular access to sea turtle nesting beaches. Beach driving presently occurs in parts of Duval, St. Johns, Volusia, and Gulf Counties in Florida, and along segments of the Outer Banks in North Carolina. With the exception of Duval County, all these Florida counties where driving is permitted are also home to several subspecies of protected beach mice. Likewise, the cumulative impacts of public vehicular beach access on beach mouse populations can be considered low relative to the negative impacts related to coastal development and cat predation.

5.4. SECONDARY IMPACTS

The most notable secondary impacts of public vehicular access to the beaches of St. Johns County arise from increased human visitation and presence on remote beaches. As a result of beach driving, remote beaches may be frequented by beachgoers that might otherwise find the beach less attractive if they had to bike or walk to the beach. This increased access to remote beaches can have secondary impacts on sea turtles or AIBM, if the increased access results in amplified negative effects from humans, such as increased dune trampling, violations of the Conservation Zone, litter on the beach, and deposition of human excrement in the dunes.

Since FDEP instituted a ban on public beach driving in ASP in August 2000, the park has experienced several changes (Miller *pers. comm.* 2002). Overall, there has been decreased daily visitation to the park, which has constituted a proportional loss in revenue for the park. Although, daily visitation has gone down, camping has risen. Following the beach driving prohibition, park staff have observed a pronounced demographic shift of beach users from mostly fishermen to mostly families. Additionally, park staff spend less time picking up litter on the beach since the beach driving ban went into effect, particularly along the remote north end of the park at Conch's Island, which is prime AIBM habitat.

Chapter 6. ALTERNATIVES

St. Johns County is seeking Federal authorization for the incidental take of sea turtles and AIBM causally related to vehicular driving and associated activities, as afforded under section 10(a)(1)(B) of the ESA. The County exercises authority to allow public beach driving and wishes to continue to exercise that authority in order to continue to provide its citizens with adequate beach access (section 1.6.1.2.) and the socio-economic benefits they derive from beach driving (section 1.11.2.).

In the absence of Federal authorization for such incidental take, the County could pursue a spectrum of management alternatives. There are a number of possible alternatives, and this HCP will consider a reasonable number to cover the range of possibilities. This analysis of alternatives is presented to satisfy requirements of the National Environmental Policy Act (NEPA). Alternatives are not critiqued in detail in HCPs. Complete detailed analysis of the environmental and social impacts of each alternative is presented in the Environmental Assessment (EA) or Environmental Impact Statement (EIS) prepared by the USFWS. The EA is prepared during USFWS review of the ITP application. Both the HCP and EA will be posted in the Federal Register and will be subject to a 60-day Public Comment Period. USFWS must respond to all Public Comments.

Alternatives range from eliminating all public vehicular access to the beach to continuing current beach driving practices without Federal coverage for incidental take. The following alternatives have been briefly evaluated relative to their impacts on sea turtles and beach mice and are based on best available data. Since reliable and consistent historical baseline data regarding incidental take of sea turtles and AIBM under the County's past and current beach driving management practices are not existing, any prediction of future incidental take through the life of the ITP will necessarily be imprecise. Therefore, conceptual models were used to compare the various environmental costs and benefits of the management alternatives described below.

In order to compare alternatives, attempts were made to establish general trends for the following datasets:

- Number of sea turtle nests deposited on the beaches of St. Johns County (1988-2001; FWC *unpublished data* 2002);
- Total annual beach driving visits to St. Johns County (1990-2001; Williams *unpublished data* 2002);
- Documented incidental take of sea turtles due to beach driving (1991-2001; Table 5-1); and
- Total revenue generated from beach tolls (Williams *unpublished data* 2002).

Based on best-fit regression analyses for each dataset, none of the trends were statistically significant. Nevertheless, the trends did allow for the general characterization of the effects of the various alternatives. The conceptual models simulate how the trend lines would be impacted at ITP issuance for each of the selected alternatives (Figures 6-1, 6-3, 6-4, and 6-5).

The recognized assumptions necessary to force this kind of conceptual comparison of alternatives include the following:

- The apparent increase in sea turtle nesting will continue at the same rate for each alternative;
- Each of the variables does not reach a maximum or biological threshold during the timeframe of the ITP;
- St. Johns County will continue to incrementally increase the prices of daily and season beach passes in conformance with the projected trajectory;
- The level of effort used to document sea turtle nests, beach driving visits, incidental take, and generated revenue has not and will not change over time;
- There is a baseline level of incidental take of sea turtles due to impacts from official vehicles that occurs with or without public vehicular access to the beach; and
- North Beach Vehicular Access Permit Holders constitute a very small percentage of the total beach driving visits in St. Johns County.

6.1. ALTERNATIVE #1 (NO ACTION)

Alternative #1 describes the scenario in which no action is taken by St. Johns County. The County does not seek an ITP, the HCP is not implemented, and current beach driving areas (Table 1-2), and access regulations remain the same. Figure 6-1 displays a conceptual representation of the potential results of this alternative. Sea turtle nesting, beach toll revenue, beach driving visits, and incidental take of sea turtles follow historical trends. Beach driving visits eventually plateaus as on-beach parking capacity is maximized. Take of sea turtles is directly proportionate to beach driving visits.

Alternative #1 is not preferred by St. Johns County, because the County, private citizens, the municipalities and parks, and the protected species would not derive the benefits that they would be afforded under the minimization and mitigation programs contained in this HCP (section 1.1).

6.2. ALTERNATIVE #2 (PREFERRED ALTERNATIVE)

The Preferred Alternative includes a restriction in the number of hours that beach driving is permitted from 17 hours per day to 12 per day (30 percent reduction). Additionally, this alternative includes minimization strategies as summarized below (Chapter 7).

1. Authorizing public vehicular beach access between 8:00 AM and 8:00 PM from May 1 through October 31 of each year (gates will remain open on a 24-hour basis from November 1 through April 30 on all public driving beaches and from 8:00 AM on July 4 through 1:00 AM on July 5 at Porpoise Point);
2. Installing and maintaining traffic barricades at beach ramps and other points to regulate vehicular access;
3. Monitoring and conspicuous marking of all sea turtle nests in the Plan Area;
4. Developing a standard protocol to remove vehicle ruts seaward of sea turtle nests during periods when hatchlings are expected to emerge;
5. Increased and dedicated enforcement of beach driving policies and procedures;

6. Developing and implementing a public awareness program that includes, but not limited to, the following features:
   - Developing and distributing public awareness materials containing information regarding driving regulations and protected species' issues to beach drivers as they access beaches within the Plan Area;
   - Developing Public Service Announcements, including "special reports," to be aired on the St. Johns County government television station discussing HCP regulations and protected species;
   - Designing and conducting periodic public workshops that include the general public but will also focus on the beach community and hotels/motels to discuss HCP issues; and
   - Posting phone numbers to report HCP violations and sea turtle emergencies.
7. Elevating trash receptacles on posts along public driving areas within AIBM habitat (i.e., Anastasia Island, excluding FMNM);
8. Increased enforcement of existing Conservation Zone (CZ) regulations (defined in Ordinance No. 97-34) and an expansion in the width of the CZ in one region to protect and enhance AIBM and nesting bird habitats;
9. Developing and instituting a training program that must be attended by drivers wishing to obtain a four-wheel drive permit for driving north of Vilano Ramp; and
10. Reducing public beach driving along Summer Haven.

In addition to the minimization measures described above, the County will mitigate unavoidable incidental take that might occur as the result of County-authorized vehicular driving through a number of programs that will provide benefits to sea turtles and AIBM. These mitigation programs include the measures listed below.

1. Developing a proactive Beach Lighting Management Program and align the City of St. Augustine Beach's lighting regulations and the County's lighting regulations;
2. Developing and instituting a beach horseback riding registration and education program;
3. Redirecting Porpoise Point vehicular driving to allow re-establishment of natural dune features; and
4. Restoring the primary dune along Summer Haven.

The programs and policies listed above and described elsewhere in this HCP (Chapter 7) consist of measures that will be implemented to minimize the potential for impacts to sea turtles and the AIBM and mitigate unavoidable incidental take, causally related to vehicular access to the beach allowed under the County's authorization. Under the implementation of Alternative #2, the Plan will substantially improve protected species management on the County's beaches relative to practices currently in place.

6.3. ALTERNATIVE #3

Under this Alternative (Figure 6-3), the length of beach available for public driving is reduced by eliminating public vehicular access to the beaches north of Vilano Ramp (i.e., the elimination of the North Beaches Vehicular Access Permit system). In this scenario, a very small percent of the

total number of beach drivers would be negatively impacted in exchange for a disproportionate decline in incidental take. This represents a 27.9 percent reduction in the length of beaches upon which the public can drive (Table 1-2). A large percentage of incidental take has historically occurred at or north of Vilano Ramp (Figure 6-2, Table 5-1). Under this alternative, the County would suffer a relatively small loss of beach toll revenue (Figure 6-2). North Beach vehicular access permit holders are season beach pass holders, but, due to their small numbers, they do not contribute significantly to the total annual beach toll revenue generated each year.

Alternative #3 is not presented as the County's preferred alternative, because citizens of St. Johns County have a particular interest in maintaining vehicular access north of the Vilano Ramp for fishing and other recreational purposes.

6.4. ALTERNATIVE #4

Alternative #4 eliminates all public vehicular access to the beaches of St. Johns County. Figure 6-5 displays a conceptual representation of potential results of this alternative, including a complete reduction in beach driving visits and beach toll revenues. Incidental take of sea turtles due to vehicles and related activities would drop down to a very low level of baseline incidental take attributable to the presence of official vehicles on the beaches (e.g. public safety, law enforcement, and other emergency response vehicles).

Alternative #4 is not preferred by St. Johns County, because citizens of St. Johns County enjoy beach driving and derive numerous socio-economic benefits from doing so (section 1.11.2.). Additionally, the elimination of all public driving would constitute a 100 percent loss in beach toll revenues to St. Johns County Division of Beach Management, which equaled $935,968 in 2001 (Williams *unpublished data* 2002). Most beach services, such as trash pick-up, maintenance of restroom facilities, ramp grading, and employment of lifeguards, all services which would still be required to various degrees, are currently paid for by the revenue generated from sale of daily and season beach passes.

This alternative includes the elimination of public beach driving south of Fort Matanzas Ramp -- a management decision that must be made by, or in cooperation with, the National Park Service. St. Johns County regulates, but does not explicitly authorize, beach driving along FMNM (Ordinance 97-34); the National Park Service exercises regulatory authority in this region. The Federal government owns the Fort Matanzas Ramp and the beaches in FMNM seaward to the Mean High Water line. Thus, the implementation of this alternative would require a regulatory action by the U.S. Department of the Interior National Park Service. Public beach driving along FMNM is being evaluated as the General Management Plan for FMNM is being developed. When the management plan is completed (potentially 2005), the County, National Park Service, and USFWS may wish to re-evaluate this alternative.

6.5. OTHER ALTERNATIVES

As indicated above, there are an infinite number of alternatives that could be postulated based on specific locations and times when driving could be allowed, each having varying levels of benefits/impacts on the coastal ecology and the social, cultural, and economic fabric of the

community. However, it is believed that the alternatives presented above provide a reasonable range of options, including the extremes. At one end of this spectrum the County could do nothing and continue with its current beach driving practices. At the other end, the County could immediately eliminate all public vehicular access to the beaches.

During stakeholder meetings in St. Johns County, the environmental community recommended one additional option. This involved a gradual (e.g., 5-year) phasing out of beach driving in conjunction with a program to acquire additional off-beach parking. This option was not evaluated as part of this HCP, because it is considered an incremental approach to Alternative #4. Most of the socio-economic costs and cultural impacts associated with elimination of public vehicular beach access would be incurred, but the impacts would not be immediate.