
Tampa Bay Refuges

*Egmont Key, Pinellas, and Passage Key
National Wildlife Refuges*

Comprehensive Conservation Plan



U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region

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COMPREHENSIVE CONSERVATION PLAN

TAMPA BAY REFUGES

EGMONT KEY NATIONAL WILDLIFE REFUGE

PINELLAS NATIONAL WILDLIFE REFUGE

PASSAGE KEY NATIONAL WILDLIFE REFUGE

Hillsborough, Pinellas, and Manatee Counties, Florida

**U.S. Department of the Interior
Fish and Wildlife Service**

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Executive Summary

The U.S. Fish and Wildlife Service (Service) has prepared this Comprehensive Conservation Plan (CCP) to guide the management of the Tampa Bay National Wildlife Refuges, consisting of Egmont Key, Pinellas, and Passage Key in Hillsborough, Pinellas, and Manatee Counties, Florida. The CCP outlines programs and corresponding resource needs for the next 15 years, as mandated by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act).

Before the Service began planning, it conducted a biological review of the refuges' wildlife and habitat management programs and conducted public scoping meetings to solicit public opinion of the issues the CCP should address. The biological review team was composed of biologists from federal and state agencies and non-governmental organizations that have an interest in the refuges. The staff held three public scoping meetings and two public meetings to solicit public reaction to the proposed alternatives. Also, a 30-day public review and comment period of the Draft Comprehensive Conservation Plan and Environmental Assessment for the Tampa Bay National Wildlife Refuges was provided.

The Service developed and analyzed three alternatives. Alternative A proposed to maintain the status quo, that is, would represent no change from current management of the refuges. The refuges would continue with the primary mission of providing habitat for wildlife. Wildlife and habitat would be protected through a variety of management tools, such as area closures, predator control, law enforcement, exotic plant control, erosion control, and cleanup of trash. These activities (except for the closures) would be conducted on an opportunistic basis or under the direction and guidance of others.

The refuges would continue to be managed by one full-time assistant refuge manager, with the support of nine staff members, stationed at the Chassahowitzka National Wildlife Refuge. The refuges would continue to be assisted by numerous partners in opportunistically conducting bird and other wildlife surveys, educating visitors, and encouraging wildlife photography and observation. The Service would continue its cooperative management agreement with the Florida Park Service to manage Egmont Key National Wildlife Refuge (Egmont Key NWR), with the state being responsible for most public recreation and interpretation of natural and cultural resources, and the Service being primarily responsible for the management of all wildlife and habitat. Meetings between the two agencies would continue to be held approximately twice a year.

Under this alternative, the existing level of funding and staffing would be maintained. Accordingly, some positions would not be filled when vacated if funds needed to be reallocated to meet rising costs or new priorities.

Alternative B, the preferred alternative, is considered to be the most effective management action for meeting the purposes of the refuges. Under Alternative B, the Service would take more of a leadership role by coordinating and/or directing activities and decisions made by partners that have an impact on the refuges, including: coordinating, directing, and conducting bird surveys and Atlantic loggerhead sea turtle surveys; coordinating additional bird surveys and monitoring and conducting research on the gopher tortoises of Egmont Key; and, with partners, identifying, mapping, and protecting state-listed plant species on the refuges. The Service would promote and support increasing the Friends group to more than 150 members.

Under this alternative, Service staff dedicated to the Tampa Bay Refuges would be increased to four full-time permanent employees and one part-time permanent employee, which would include the addition of a law enforcement officer to increase protection of wildlife, habitat, and visitor safety; a biological technician

to conduct bird surveys, predator and exotic species control, and beach management activities; a public use specialist to facilitate and create opportunities for environmental education, interpretation, and wildlife photography and observation; and a part-time administrative office assistant. Larger office space to accommodate the increased staff along with the Friends group would be acquired, as well as facilities for boat storage and use; also, a visitor center would be established.

The cooperative agreement with the Florida Park Service to manage Egmont Key would be enhanced under this alternative by establishing monthly communications and quarterly meetings. Further, the Service would facilitate the transfer of the U.S. Coast Guard (USCG) property on Egmont Key to the Service, and would establish the Service's interest in the Pilots Compound property in the event that occupancy of that property changes. Acquisition of these lands would enable the Service to better conserve, protect, and manage the habitat on Egmont Key.

Alternative C proposed that the Service would take on an even greater leadership role at the refuges, enhancing and expanding the activities proposed under Alternative B. The Service staff dedicated to the Tampa Bay Refuges would be increased to seven full-time permanent employees, including two law enforcement officers, one biological technician, one public use specialist, one maintenance person/equipment operator, and an administrative office assistant. The Service would promote and support increasing the Friends group to 200-300 members. Additional equipment and facilities would be acquired to support the staff and increased activities on the refuges.

The additional staff members would allow the refuges to increase the frequency of some monitoring (e.g., piping plover); initiate bird research; routinely monitor and research gopher tortoises; enhance protection of wildlife, habitats, and visitor safety; control exotic and invasive vegetation on a routine basis; and provide educational events on a routine basis, including weekly interpretive tours using concessionaire(s) selected and operating under Service contract.

Under this alternative, the Service would own and manage all of Egmont Key without sharing that responsibility with the Florida Park Service—dissolving the cooperative agreement to manage Egmont Key State Park and allowing the Service to manage the island in a comprehensive manner.

The Service selected Alternative B as its preferred alternative and is reflected in this CCP. Alternative B is selected for implementation because it directs the development of programs to best achieve the purpose and goals of the refuges; emphasizes enhanced leadership roles on the refuges, collection of habitat and wildlife data, and protection of wildlife; and ensures long-term achievement of refuge and Service objectives. At the same time, the management actions provide increased and balanced levels of compatible public use opportunities consistent with existing laws, Service policies, and sound biological principles. It provides the best mix of program elements to achieve desired long-term conditions.

Under this alternative, all lands under the management and direction of the refuges will be protected, maintained, and enhanced to best achieve national, ecosystem, and refuge-specific goals and objectives within anticipated funding and staffing levels. In addition, the action positively addresses priority resource issues and concerns expressed by the public.

I. Background

INTRODUCTION

This CCP for Tampa Bay Refuges was prepared to guide management actions and direction for the refuges. Fish and wildlife conservation will receive first priority in refuge management; wildlife-dependent recreation will be allowed and encouraged as long as it is compatible with, and does not detract from, the mission of the refuges or the purposes for which they were established.

A planning team developed a range of alternatives that best met the goals and objectives of the refuges and that could be implemented within the 15-year planning period. The draft of this CCP was made available to state and federal government agencies, conservation partners, and the general public for review and comment. The comments from each entity were considered in the development of this CCP.

PURPOSE AND NEED FOR THE PLAN

The purpose of the CCP is to develop a management action that best achieves the refuges' purposes; attains the vision and goals developed for the refuges; contributes to National Wildlife Refuge System (Refuge System) mission; addresses key problems, issues, and relevant mandates; and is consistent with sound principles of fish and wildlife management.

Specifically, the CCP is needed to:

- Provide a clear statement of management direction;
- Provide neighbors, visitors, and government officials with an understanding of Service management actions on and around each refuge;
- Ensure that Service management actions, including land protection and recreation/education programs, are consistent with the mandates of the Refuge System; and
- Provide a basis for the development of budget requests for operations, maintenance, and capital improvement needs.

FISH AND WILDLIFE SERVICE

The Service traces its roots to 1871 and the establishment of the Commission of Fisheries involved with research and fish culture. The once-independent commission was renamed the Bureau of Fisheries and placed under the Department of Commerce and Labor in 1903.

The Service also traces its roots to 1886 and the establishment of a Division of Economic Ornithology and Mammalogy in the Department of Agriculture. Research on the relationship of birds and animals to agriculture shifted to delineation of the range of plants and animals so the name was changed to the Division of the Biological Survey in 1896.

The Department of Commerce, Bureau of Fisheries, was combined with the Department of Agriculture, Bureau of Biological Survey, on June 30, 1940, and transferred to the Department of the Interior as the Fish and Wildlife Service. The name was changed to the Bureau of Sport Fisheries and Wildlife in 1956 and finally to the Fish and Wildlife Service in 1974.

The Service, working with others, is responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people through federal programs relating to migratory birds, endangered species, interjurisdictional fish and marine mammals, and inland sport fisheries (142 DM 1.1).

As part of its mission, the Service manages more than 540 national wildlife refuges covering over 95 million acres. These areas comprise the Refuge System, the world's largest collection of lands set aside specifically for fish and wildlife. The majority of these lands, 77 million acres, is in Alaska. The remaining acres are spread across the other 49 states and several United States territories. In addition to refuges, the Service manages thousands of small wetlands, national fish hatcheries, 64 fishery resource offices, and 78 ecological services field stations. The Service enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat, and helps foreign governments with their conservation efforts. It also oversees the Federal Aid program that distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state fish and wildlife agencies.

NATIONAL WILDLIFE REFUGE SYSTEM

The mission of the Refuge System, as defined by the Improvement Act is:

“...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

The Improvement Act established, for the first time, a clear legislative mission of wildlife conservation for the Refuge System. Actions were initiated in 1997 to comply with the direction of this new legislation, including an effort to complete comprehensive conservation plans for all refuges. These plans, which are completed with full public involvement, help guide the future management of refuges by establishing natural resources and recreation/education programs. Consistent with the Improvement Act, approved plans will serve as the guidelines for refuge management for the next 15 years. The Improvement Act states that each refuge shall be managed to:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of comprehensive conservation plans that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System; and
- Recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation, are legitimate and priority public uses; and allow refuge managers authority to determine compatible public uses.

The following are just a few examples of your national network of conservation lands. Pelican Island National Wildlife Refuge (NWR), the first refuge, was established in 1903 for the protection of colonial nesting birds in Florida, such as the snowy egret and the brown pelican. Western refuges were established for American bison (1906), elk (1912), prong-horned antelope (1931), and desert bighorn sheep (1936) after over-hunting, competition with cattle, and natural disasters decimated once-

abundant herds. The drought conditions of the 1930s Dust Bowl severely depleted breeding populations of ducks and geese. Refuges established during the Great Depression focused on waterfowl production areas (i.e., protection of prairie wetlands in America's heartland). The emphasis on waterfowl continues today but also includes protection of wintering habitat in response to a dramatic loss of bottomland hardwoods. By 1973, the Service had begun to focus on establishing refuges for endangered species.

Approximately 38 million people visited national wildlife refuges in 2002, most to observe wildlife in their natural habitats. As the number of visitors grows, there are significant economic benefits to local communities. In 2001, 82 million people, 16 years and older, fished, hunted, or observed wildlife, generating \$108 billion. In a study completed in 2002 on 15 refuges, visitation had grown 36 percent in 7 years. At the same time, the number of jobs generated in surrounding communities grew to 120 per refuge, up from 87 jobs in 1995, pouring more than \$2.2 million into local economies. The 15 refuges in the study were Chincoteague (Virginia); National Elk (Wyoming); Crab Orchard (Illinois); Eufaula (Alabama); Charles M. Russell (Montana); Umatilla (Oregon); Quivira (Kansas); Mattamuskeet (North Carolina); Upper Souris (North Dakota); San Francisco Bay (California); Laguna Atacosa (Texas); Horicon (Wisconsin); Las Vegas (Nevada); Tule Lake (California); and Tensas River (Louisiana) the same refuges identified for the 1995 study. Other findings also validate the belief that communities near refuges benefit economically. Expenditures on food, lodging, and transportation grew to \$6.8 million per refuge, up 31 percent from \$5.2 million in 1995. For each dollar spent on the Refuge System, surrounding communities benefited with \$4.43 in recreation expenditures and \$1.42 in job-related income (Caudill and Laughland, unpubl. data).

Volunteers continue to be a major contributor to the success of the Refuge System. In 2002, volunteers contributed more than 1.5 million hours on refuges nationwide, a service valued at more than \$22 million.

The wildlife and habitat vision for national wildlife refuges stresses the following: that wildlife comes first; that ecosystems, biodiversity, and wilderness are vital concepts in refuge management; that refuges must be healthy and growth must be strategic; and that the Refuge System should serve as a model for habitat management with broad participation from others.

The Improvement Act stipulates that comprehensive conservation plans be prepared in consultation with adjoining federal, state, and private landowners and that the Service should develop and implement a process to ensure an opportunity for active public involvement in the preparation and revision (every 15 years) of the plans.

All lands of the Refuge System will be managed in accordance with an approved comprehensive conservation plan that will guide management decisions and set forth strategies for achieving refuge unit purposes. The plan will be consistent with sound resource management principles, practices, and legal mandates, including Service compatibility standards and other Service policies, guidelines, and planning documents (602 FW 1.1).

LEGAL AND POLICY CONTEXT

Legal Mandates, Administrative and Policy Guidelines, and Other Special Considerations

Administration of national wildlife refuges is guided by the mission and goals of the Refuge System, congressional legislation, presidential executive orders, and international treaties. Policies for management options of refuges are further refined by administrative guidelines established by the Secretary of the Interior and by policy guidelines established by the Director of the Service. Select

legal summaries of treaties and laws relevant to administration of the Refuge System and management of the Tampa Bay Refuges are provided in Appendix C.

Treaties, laws, administrative guidelines, and policy guidelines assist the refuge manager in making decisions pertaining to soil, water, air, flora, fauna, and other natural resources; historical and cultural resources; research and recreation on refuge lands; and provide a framework for cooperation between Tampa Bay Refuges and other partners, such as the Florida Department of Environmental Protection, and private landowners, etc.

Lands within the Refuge System are closed to public use unless specifically and legally opened. No refuge use may be allowed unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuge. All programs and uses must be evaluated based on mandates set forth in the Improvement Act. Those mandates are to:

- Contribute to ecosystem goals, as well as refuge purposes and goals;
- Conserve, manage, and restore fish, wildlife, and plant resources and their habitats;
- Monitor the trends of fish, wildlife, and plants;
- Manage and ensure appropriate visitor uses as those uses benefit the conservation of fish and wildlife resources and contribute to the enjoyment of the public; and
- Ensure that visitor activities are compatible with refuge purposes.

The Improvement Act further identifies six priority wildlife-dependent recreational uses. These uses are: hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. As priority public uses of the Refuge System, they receive priority consideration over other public uses in planning and management.

Biological Integrity, Diversity, and Environmental Health Policy

The Improvement Act directs the Service to ensure that the biological integrity, diversity, and environmental health of the Refuge System are maintained for the benefit of present and future generations of Americans. The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and the Refuge System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. When evaluating the appropriate management direction for refuges, refuge managers will use sound professional judgment to determine their refuges' contribution to biological integrity, diversity, and environmental health at multiple landscape scales. Sound professional judgment incorporates field experience, knowledge of refuge resources, refuge role within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service.

NATIONAL AND INTERNATIONAL CONSERVATION PLANS AND INITIATIVES

Multiple partnerships have been developed among government and private entities to address the environmental problems affecting regions. There is a large amount of conservation and protection information that defines the role of the refuge at the local, national, international, and ecosystem levels. Conservation initiatives include broad-scale planning and cooperation between affected parties to address declining trends of natural, physical, social, and economic environments. The

conservation guidance described below, along with issues, problems, and trends, was reviewed and integrated where appropriate into this CCP.

This CCP supports, among others, the Partners-in-Flight Plan, the North American Waterfowl Management Plan, the Western Hemisphere Shorebird Reserve Network, and the National Wetlands Priority Conservation Plan.

North American Bird Conservation Initiative. Started in 1999, the North American Bird Conservation Initiative is a coalition of government agencies, private organizations, academic institutions, and private industry leaders in the United States, Canada, and Mexico working to ensure the long-term health of North America's native bird populations by fostering an integrated approach to bird conservation to benefit all birds in all habitats. The four international and national bird initiatives include the North American Waterfowl Management Plan, Partners-in-Flight, Waterbird Conservation for the Americas, and the U.S. Shorebird Conservation Plan.

North American Waterfowl Management Plan. The North American Waterfowl Management Plan is an international action plan to conserve migratory birds throughout the continent. The plan's goal is to return waterfowl populations to their 1970s' levels by conserving wetland and upland habitat. Canada and the United States signed the plan in 1986 in reaction to critically low numbers of waterfowl. Mexico joined in 1994, making it a truly continental effort. The plan is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, private companies, and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species and people. Plan projects are international in scope, but implemented at regional levels. These projects contribute to the protection of habitat and wildlife species across the North American landscape.

Partners-in-Flight Bird Conservation Plan. Managed as part of the Partners-in-Flight Plan, the peninsular Florida physiographic area represents a scientifically based land bird conservation planning effort that ensures long-term maintenance of healthy populations of native land birds, primarily non-game land birds. Non-game land birds have been vastly under-represented in conservation efforts, and many are exhibiting significant declines. This plan is voluntary and non-regulatory, and focuses on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

U.S. Shorebird Conservation Plan. The U.S. Shorebird Conservation Plan is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected. The plan was developed by a wide range of agencies, organizations, and shorebird experts for separate regions of the country, and identifies conservation goals, critical habitat conservation needs, key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face.

North American Waterbird Conservation Plan. This plan provides a framework for the conservation and management of 210 species of waterbirds in 29 nations. Threats to waterbird populations include destruction of inland and coastal wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and industries, disturbance, and conflicts arising from abundant species. Particularly important habitats of the southeast region include pelagic areas, marshes, forested wetlands, and barrier and sea island complexes. Fifteen species of waterbirds are federally listed, including breeding populations of wood storks, Mississippi sandhill cranes, whooping cranes, interior least terns, and Gulf Coast populations of brown pelicans. A key objective of this plan is the standardization of data collection efforts to better recommend effective conservation measures.

RELATIONSHIP TO STATE WILDLIFE AGENCY

A provision of the Improvement Act, and subsequent agency policy, is that the Service shall ensure timely and effective cooperation and collaboration with other state fish and game agencies and tribal governments during the course of acquiring and managing refuges. State wildlife management areas and national wildlife refuges provide the foundation for the protection of species, and contribute to the overall health and sustainment of fish and wildlife species in the State of Florida.

The Florida Fish and Wildlife Conservation Commission's (FWC) mission is "managing fish and wildlife resources for their long-term well-being and the benefit of people." The FWC manages the state's fish and wildlife resources to conserve some of the most complex and delicate ecosystems in the world as well as a wide diversity of species. The FWC scientists work to provide the latest scientific information used to make good management decisions involving fish and wildlife populations, habitat issues, and the human dimension aspects of conservation. FWC law enforcement officers enforce rules to protect fish and wildlife, keep waterways safe for millions of boaters, and cooperate with other law enforcement agencies providing homeland security. In addition, the FWC staff communicates with a variety of audiences to encourage participation, responsible citizenship and stewardship of the state's natural resources, including hunter safety training, boating safety classes, and birding and outdoor recreation classes. The FWC territory includes 53,927 square miles of land and 5,983 square miles of water. The territory includes 5.6 million acres of wildlife management areas, 2,276 miles of tidal shoreline, about 10,550 miles of rivers, streams and creeks, and about 7,700 lakes greater than 10 acres. In the state, there are over 200,000 hunters, more than 3 million freshwater and saltwater anglers (residents and nonresidents), and more than 3 million wildlife watchers.

The state's participation and contribution throughout this planning process will provide for ongoing opportunities and open dialogue to improve the ecological sustainment of fish and wildlife in the State of Florida. An essential part of comprehensive conservation planning is integrating common mission objectives where appropriate.

II. Refuge Overview

INTRODUCTION

There are 28 national wildlife refuges in the State of Florida (Figure 1). The Tampa Bay Refuges are managed as part of the Chassahowitzka National Wildlife Refuge Complex (Figure 2). The Tampa Bay Refuges currently have one dedicated full-time assistant refuge manager, and are otherwise supported by nine staff members located 100 miles away at Crystal River NWR in Crystal River, Florida. The Tampa Bay Refuges include Egmont Key, Pinellas, and Passage Key Refuges (Figure 3).

Egmont Key NWR (Figure 4) is located at the mouth of Tampa Bay, along the Gulf Coast of Florida in Hillsborough County. In 1974, the 392-acre refuge was established to protect the Key's significant natural, historical, and cultural resources from the impending threats of development. Egmont Key is the only refuge island open to the public in Tampa Bay and has been traditionally visited for many years as a primary recreation destination. The refuge is open only during daylight hours. The island receives about 130,000-170,000 visitors annually that access the island by private or tour boat (USFWS Tampa Bay Refuges Visitor Services Review Report, March 2004; and Kleen and Hunter, USFWS, Tampa Bay Refuges Biological Review Report, June 2006).

Specifically, Egmont Key NWR seeks to provide nesting habitat for brown pelicans and other waterbirds, as well as to conserve and protect barrier island habitat and preserve historical structures of national significance. Presently, the island's approximately 244 acres of beach and coastal berm supports more than 110 species of nesting, migrating, and wintering birds. Thousands of laughing gulls and royal terns, hundreds of brown pelicans and sandwich terns, dozens of black skimmers and least terns, and a handful of American oystercatchers, nest annually. Egmont Key provides valuable wildlife habitat in the very populated Tampa Bay area. The island is listed as critical habitat for endangered piping plovers and provides habitat and protection for endangered manatees and sea turtles. Approximately 20-70 endangered Atlantic loggerhead turtles nest annually. Egmont has an unusually high population of gopher tortoises and box turtles. Two wildlife sanctuaries, one on the east side of the island and one at the south end of the island, comprise about 97 acres and are closed to all public use, year-round (Kleen and Hunter, June 2006).

Cooperative management agreements between the Service, the U.S. Coast Guard (USCG), and the Florida Department of Environmental Protection (FDEP) entrust daily management activities of Egmont Key Refuge to the Florida Park Service (FPS). The FPS plays a critical role in managing recreation on the island. Egmont Key State Park is managed to protect, and restore the historic structures (i.e., historic lighthouse, guard house, gun batteries, and brick roads) and for swimming, sunbathing, shelling, and picnicking. Park staff also assist the refuge in habitat and wildlife management on a regular basis. Park staff monitor sea turtle nesting, control exotic species, and care for injured birds. The USCG owns 55 acres, including the lighthouse, at the north end of the island. This property is the focus of the Florida State Parks operation due to the concentration of historic sites (e.g., Fort Dade) on this property. In addition, the Tampa Bay Pilots Association (TBPA) leases 5 acres of land from Hillsborough County and two tracts totaling 5 acres from the Service along the east side of the island to conduct their business of piloting large ships into and out of Tampa Bay (Figure 5).

Figure 1. National Wildlife Refuges of Florida



Figure 2. Chassahowitzka National Wildlife Refuge Complex



Figure 3. Tampa Bay Refuges

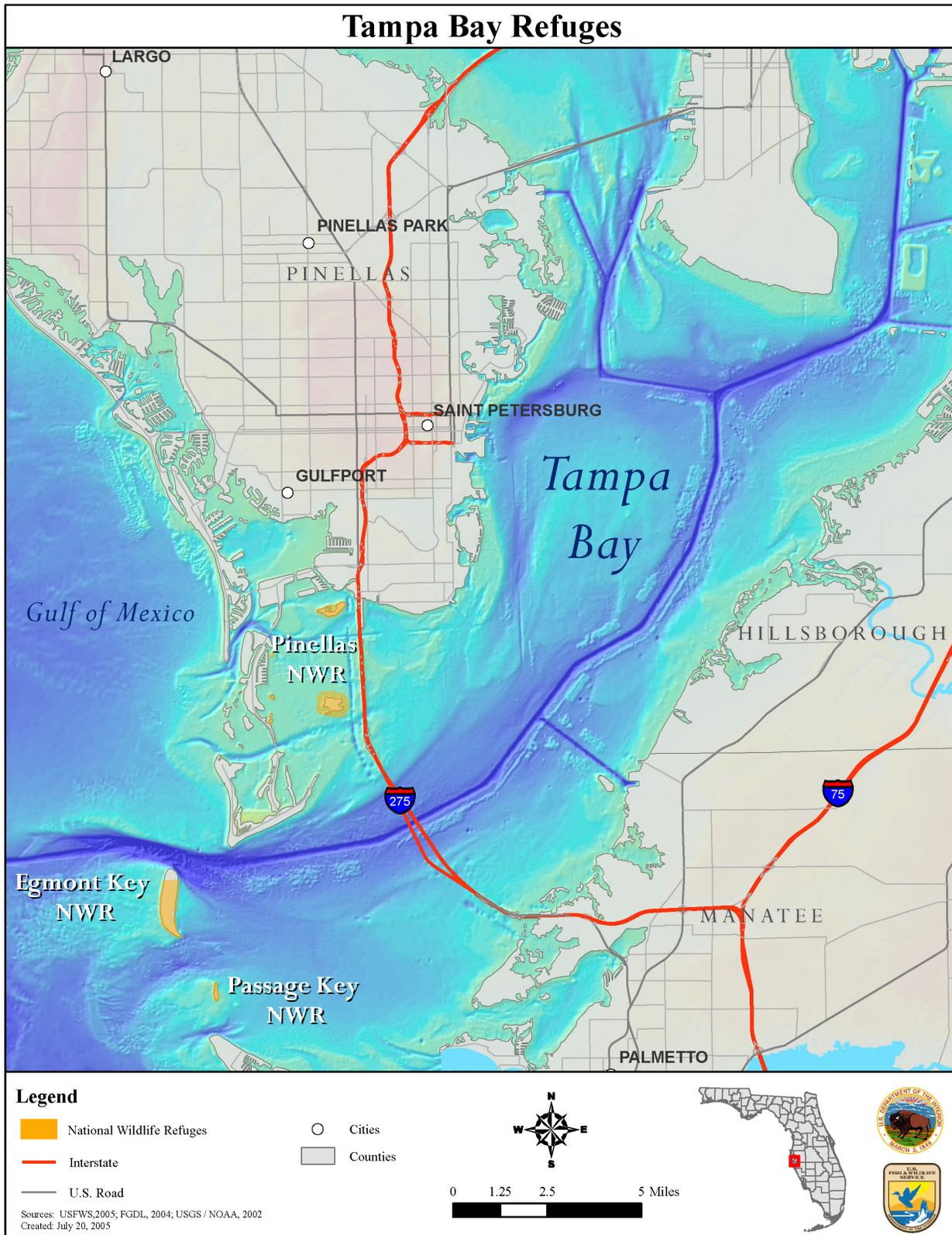


Figure 4. Egmont Key National Wildlife Refuge



Figure 5. Land Ownership of Egmont Key National Wildlife Refuge



Pinellas NWR (Figure 6) is located at the mouth of Tampa Bay, along the Gulf Coast of Florida, in Pinellas County. The refuge was established in 1951 as a breeding ground for colonial bird species. It contains seven mangrove islands encompassing about 394 acres, with only Indian Key within the city limits of St. Petersburg. The refuge is comprised of Little Bird, Mule, Jackass, Listen, and Whale Island Keys and leases Tarpon and Indian Keys from Pinellas County. A Pinellas County seagrass sanctuary is located around Tarpon and Indian Keys and the use of internal combustion engines within this zone is prohibited to protect seagrass beds. Hundreds of brown pelicans and double-crested cormorants and dozens of herons, egrets, and roseate spoonbills nest within Tarpon and Little Bird Keys. Pinellas Key provides important mangrove habitat for most long-legged wading species, especially for reddish egrets. All of the mangrove islands of Pinellas NWR are closed to public use year-round to protect migratory birds (Kleen and Hunter, USFWS, June 2006).

Passage Key NWR (Figure 7) is located at the entrance to Tampa Bay in Manatee County, along the Gulf Coast of Florida, just north of Bradenton, Florida. When Passage Key was originally designated as a federal bird reservation by President Roosevelt in 1905, it was a 60-acre island with a freshwater lake and lush vegetation. Unfortunately, erosion and hurricanes have virtually destroyed the key. It is now a meandering sand bar, varying in size from 0.5 to 10 acres, depending on weather (USFWS, Visitor Services Review Report, March 2004). In 1970, Passage Key NWR was designated a Wilderness Area, and because of its fragility and small size it is now closed to all public use (Figure 8). The refuges' objectives are to provide habitat for colonial waterbirds. Hundreds of brown pelicans, laughing gulls, black skimmers, and royal terns nested annually until the island washed away in 2007. Small numbers of herons and egrets also nested on the island. The key once hosted the largest royal tern and sandwich tern nesting colonies in the state of Florida. Passage Key NWR is closed to public use year-round to protect the migratory birds that use the island.

REFUGE HISTORY AND PURPOSE

The Tampa Bay Refuges are crucial to the survival of many threatened and endangered species. For the most part, none of the priority public uses are actively promoted by the Service on the Tampa Bay Refuges. However, there are excellent opportunities for wildlife observation, wildlife photography, outreach, and environmental education and interpretation. Fishing is a primary public use off-shore, with the state and local governments providing primary enforcement oversight over the waterways (USFWS Visitor Services Review Report, March 2004).

During the Pleistocene era, the Tampa Bay Refuges were part of the mainland of Florida. At the end of the last glacial period, ~20,000 years ago, ice began to melt rapidly and the sea level rose swiftly, separating them from Florida.

Egmont Key NWR is the only refuge in this group open for public visitation and is the refuge for which the most historical and cultural information exists. Little historical information exists for Pinellas or Passage Key NWRs.

Figure 6. Pinellas National Wildlife Refuge

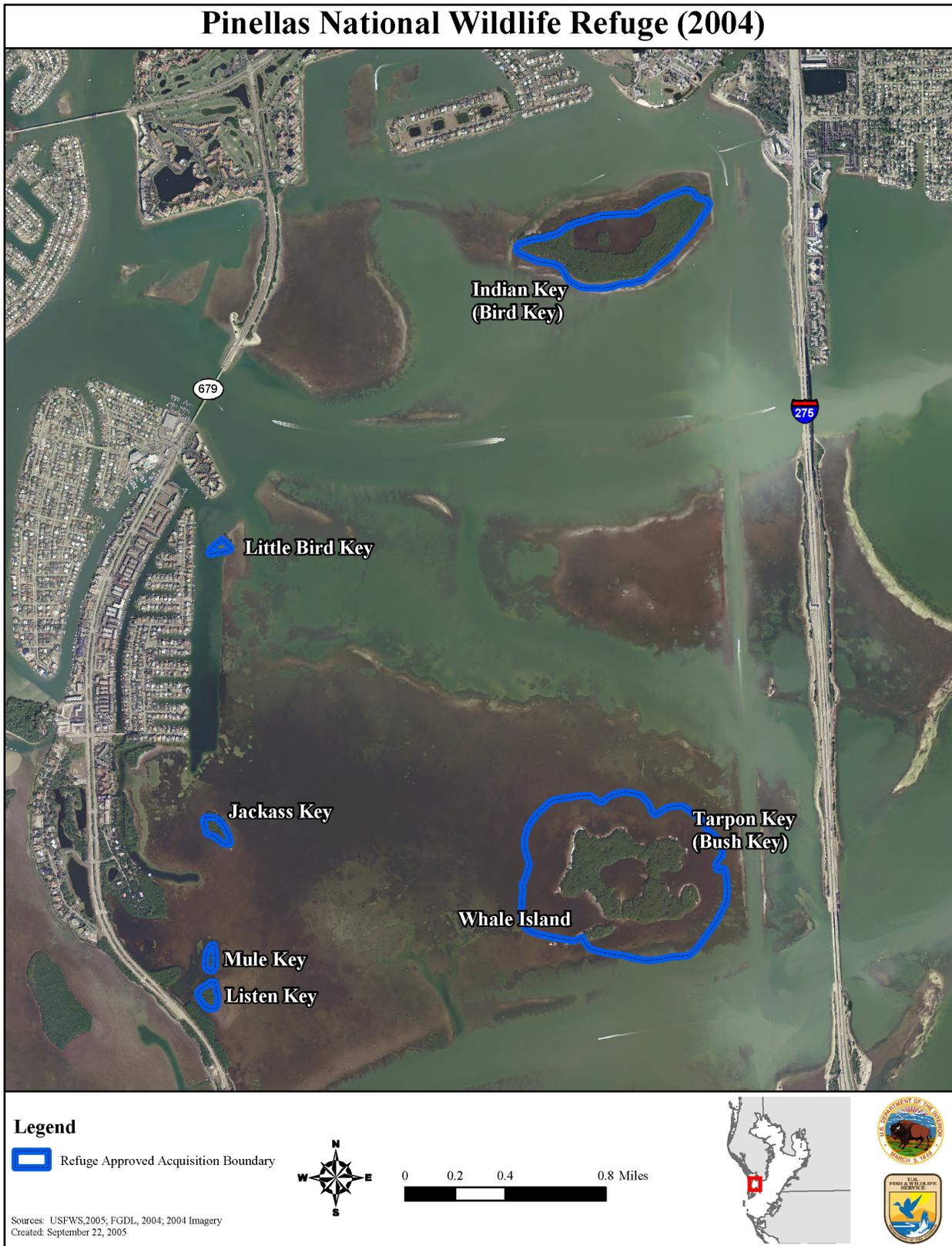
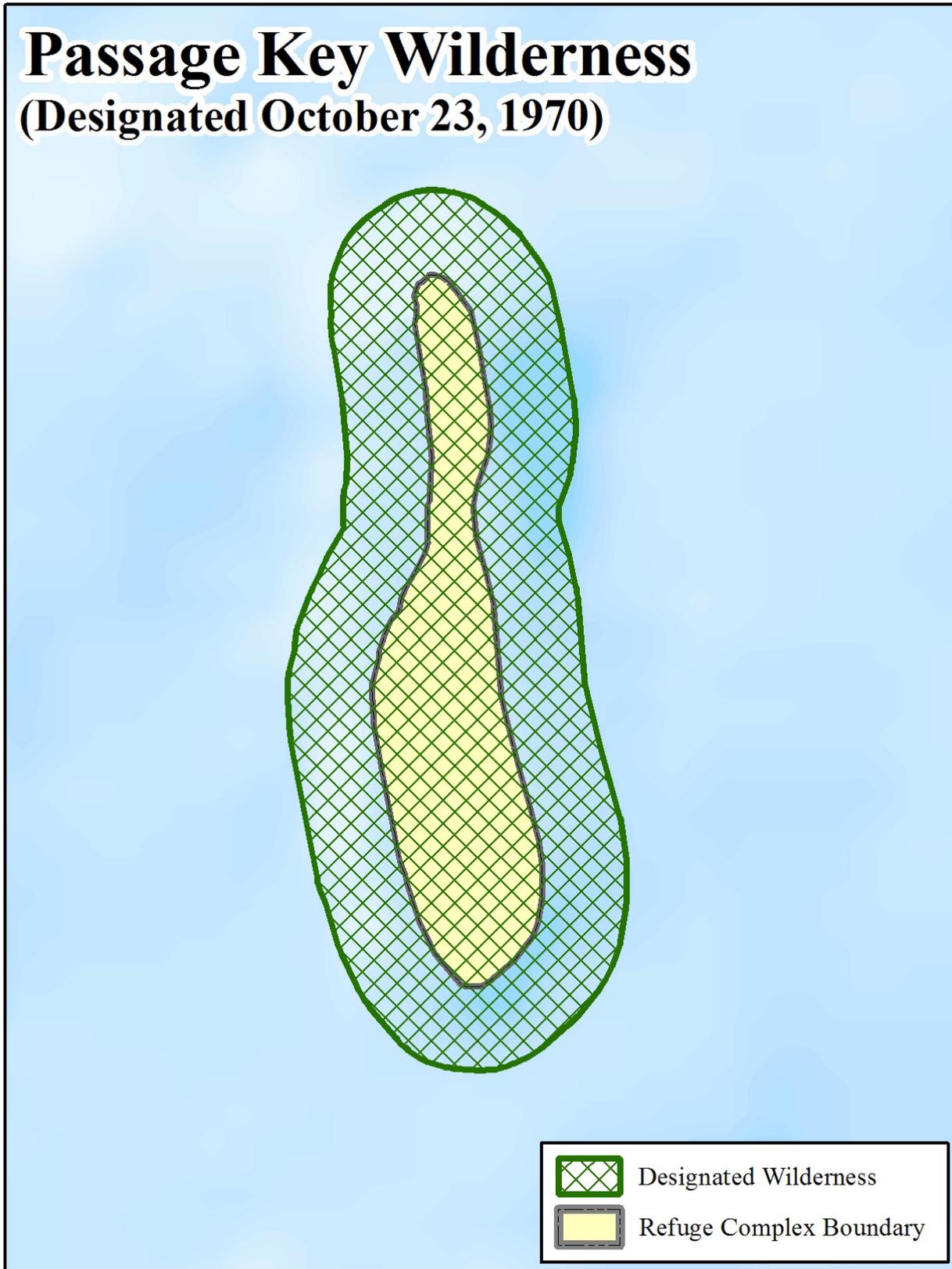


Figure 7. Passage Key National Wildlife Refuge



Figure 8. Passage Key NWR Wilderness



Egmont Key has a rich history. The entire key is listed on the National Register of Historic Places. Artifacts of aboriginal/Indian pottery dating back 2,000 years have been found on the island. Since there is no freshwater source and because travel to the key entails crossing open water, it is likely that the key was used only periodically by Native Americans for hunting, crabbing, and shell fishing. Spanish expeditions first sighted the key in the early 1500s. The first recorded contact with the key was in 1757 by Don Francisco Maria Celi, a Spanish explorer. Egmont Key was named in 1763, after the second Earl of Egmont, John Perceval, the first Lord of the British Admiralty, and a member of the Irish House of Commons.

When mapped by the Geodetic Survey in 1875, Egmont Key was approximately 50 percent larger than it is today. The first lighthouse was built in 1848 and was the only lighthouse on the western Gulf Coast of Florida. After hurricanes damaged the lighthouse in 1848 and 1852, the lighthouse was moved inland and rebuilt in 1857-58, and remains in service today. In the 1850s, Egmont Key was used as a holding area for Seminole Indians as they were being transported to Arkansas and Oklahoma.

Early in the Civil War, the key saw occupation by Confederate blockade-runners; while later in the 1860s, Union forces used Egmont Key to operate their Gulf Coast blockade of the Confederacy. The key was also used as a refuge for Union sympathizers and a military prison during the war.

Construction of Fort Dade began in 1898, with temporary gun batteries to protect Tampa at the outbreak of the Spanish/American War. The Spanish fleet never came, but by 1910 a small town of about 300 residents, brick streets, a narrow gauge railroad, an electric generating plant, and 70 buildings existed. At this time, during World War I, Fort Dade was used as a training center for National Guard Coast Artillery Units. The fort was deactivated in the early 1920s, but later reactivated and used during World War II, as a harbor patrol station and an ammunition storage facility.

Egmont Key became a national wildlife refuge in 1974 and was named to the National Register of Historic Places. In 1989, the State of Florida established Egmont Key State Park through cooperative agreement with the Service. At the present time, the USCG maintains the lighthouse and owns 55 acres at the north end of the island. The lighthouse is believed to be the oldest structure still used for its original purpose in the Tampa Bay area. The historic ruins of Fort Dade and Egmont Key State Park are managed by the FPS in cooperation with the Service. Also, the Tampa Bay Pilots Association leases a 10-acre tract of land, 5 acres from Hillsborough County and 5 acres in two additional tracts from the Service along the east side of the island to conduct its business of piloting large ships into and out of Tampa Bay (Figure 9).

Egmont Key NWR, established in 1974, is administered in accordance with the National Wildlife Refuge System Administration Act of 1966. The refuge has four basic purposes:

1. provide nesting, feeding, and resting habitat for brown pelicans, terns, and other colonial nesting waterbirds;
2. conserve and protect barrier island habitat and preserve historical structures of national significance;
3. provide habitat and protection for endangered species such as manatees and sea turtles; and
4. provide wildlife-dependent recreation and environmental education for the public (USFWS Visitor Services Review Report, March 2004).

Figure 9. Existing facilities of Egmont Key National Wildlife Refuge



Pinellas NWR was established in 1951 for use as an inviolate sanctuary and for migratory birds. It is closed to the public. Pinellas NWR includes Tarpon, Whale, Indian, Little Bird, Mule, Jackass, and Listen Keys. The larger islands in this group are surrounded by extensive seagrass flats, and as a result no internal combustion engines are allowed within a signed boundary to protect these areas.

The refuge has two basic purposes:

1. provide nesting, feeding, and resting habitat for brown pelicans and other waterbirds; and
2. preserve and protect barrier island habitat (Kleen and Hunter, USFWS, June 2006).

Passage Key NWR was established under executive order (Theodore Roosevelt) in 1905 as a preserve and breeding ground for native birds. Congress designated Passage Key NWR as a Wilderness Area in 1970 (36 acres). Passage Key is closed to the public. A hurricane swept through this area in 1921, transforming this mangrove island containing a freshwater lake into a meandering sandbar. Passage Key NWR stands at the mouth of Tampa Bay, where it faces the full force of storms off the Gulf of Mexico, and now ranges in size from 0.5-10 acres. The refuge is an intermittent island that is very important to birds. When the land is exposed, birds populate the area. The refuge has two basic purposes:

1. provide nesting, feeding, and resting habitat for colonial waterbirds including laughing gulls, royal terns, black skimmers, sandwich terns, brown pelicans and oystercatchers; and
2. provide critical habitat and protection for thousands of shorebirds and waterbirds (Kleen and Hunter, USFWS, June 2006).

SPECIAL DESIGNATIONS

Special designations in the Tampa Bay region are depicted in Figure 10.

Egmont Key NWR – Egmont Key has two principal features. The first is an extensive series of military structures and ruins, and a still-operating lighthouse. The second is the island itself, relatively remote, yet accessible, with its beaches and island vegetation. Because of its colorful military past, Egmont Key NWR was listed on the National Register of Historic Places in 1979. The Egmont Key lighthouse has also been designated a Hillsborough County Landmark. Egmont Key NWR and State Park is cooperatively managed with FPS. The bird sanctuary area at the southern end of Egmont Key is closed to all public use, year-round, and a vessel exclusion zone has been established around the seagrass beds on the east side of the island to protect them from propeller damage. Egmont Key is an Index Nesting Beach Site for the Atlantic loggerhead sea turtle in the State of Florida. The refuge is also designated as critical habitat for piping plovers.

Pinellas NWR – All of the islands of Pinellas NWR are closed to the public to protect the habitat and wildlife. Pinellas County has established seagrass sanctuaries around Tarpon and Indian Keys. These areas are posted to prevent boats with internal combustion engines from entering the seagrass beds. Because of Tarpon Key's unique shape, topography, and vegetative status as a mangrove island, it is a significant nesting, resting, and feeding area for a variety of marsh and waterbirds. Boca Ciega Bay Aquatic Preserve, in which Pinellas NWR is located, is designated as an Outstanding Florida Water (OFW).

The OFW designation is given to waters that are "worthy of special protection due to their natural attributes" (Section 403.061, Florida Statutes); these waters are listed in Section 62-302.700, Florida Administrative Code. All permanent water bodies within state parks have been designated as OFW. The OFW designation affords the highest protection possible under state

Figure 10. Special designations



water quality rules by prohibiting degradation of water quality from the conditions existing at the time of designation. OFWs in the Tampa Bay area are:

- Hillsborough River State Park, Hillsborough Bay segment;
- Cockroach Bay Aquatic Preserve, Coastal Middle Tampa Bay Basins segment;
- Little Manatee River, Middle Tampa Bay segment;
- Terra Ceia State Aquatic Preserve, Coastal Lower Tampa Bay Basins segment;
- Boca Ciega State Aquatic Preserve, Lower Tampa Bay segment;
- Pinellas County Aquatic Preserve, Lower Tampa Bay segment; and,
- Lake Manatee State Recreation Area, Manatee River segment (Florida Department of Environmental Protection, "Basin Status Report," November 2001).

Other significant land and water resources in the vicinity of the Tampa Bay Refuge's include:

- DeSoto National Memorial and Mullet Key (named the number one beach in the continental U.S.) (The Tampa Bay Estuary Program, "Charting the Course for Tampa Bay," May 2006);
- Little Manatee River State Recreation Area;
- National Society's Washburn Sanctuary (Bird Key) in Terra Ciega Bay;
- Ybor City State Memorial; and
- Weedon Island County Preserve.

With the exception of Passage Key NWR Wilderness area, other lands within the Tampa Bay Refuges were reviewed for their suitability in meeting the criteria for wilderness areas, as defined by the Wilderness Act of 1964. No other areas in the refuges were found to meet these criteria. Therefore, the suitability of other lands within the Tampa Bay Refuges for wilderness designation is not further analyzed in this CCP.

Passage Key NWR – Congress designated Passage Key NWR a Wilderness Area in 1970 (36 acres). The refuge is closed to visitation to protect wildlife and other natural, cultural, and/or other resources consistent with the conservation purpose(s) of the refuge. In 1992, a year-round, 100-yard buffer zone was established around the perimeter of Passage Key NWR to protect nesting terns and gulls. Wilderness designation provides an additional level of protection for this refuge, but does not open the area to public access or use.

ECOSYSTEM CONTEXT

An ecosystem is a geographical area that includes and interconnects all the living (biotic) organisms, their physical (abiotic) surroundings, and the natural cycles that sustain them. The Outer Coastal Plain Ecological Province (Bailey 1978) encompasses a large portion of the southeastern, coastal United States. The Outer Coastal Plain Ecological Province is an area of gentle slopes with abundant water resources. Estuaries, swamps, marshes, rivers, and lakes are abundant and provide habitat for a wide variety of plant and animal life. The Tampa Bay Refuges are located in the southern part of the Outer Coastal Plain Ecological Province, in an area designated as the North Florida-Peninsular Florida ecosystem unit (Figure 11). The North Florida Ecosystem includes several important areas with protective designations, including Ocala National Forest and Okefenokee and Merritt Island NWRs. In total, 13 national wildlife refuges and 1 national fish hatchery exist in the North Florida Ecosystem. Various other local, state, and federal conservation areas are also located within the North Florida Ecosystem. Conservation areas in the Tampa Bay region are identified in Figure 12. The North Florida Ecosystem spans temperate and subtropical climates, numerous physiographic districts, and a wide variety of habitats. Barrier islands, xeric scrub, pine flatwoods, freshwater marshes, lakes, streams, springs, mixed hardwood/pine forests, cypress swamps and domes, dry

prairies, maritime forests, hardwood hammocks, estuarine marshes, pine rocklands, sandhill woodlands, coastal strands, sawgrass prairies, sloughs, and tree islands of the North Florida Ecosystem serve a variety of native wildlife, including over 100 federally listed species, as well as interjurisdictional fishes, neotropical migratory birds, non-game waterbirds, and waterfowl.

Specifically, the Tampa Bay Refuges are located along the Gulf Coast in the Southwestern Florida Flatwoods Sub-ecoregion of the Southern Coastal Plain Ecoregion. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources (U.S. Environmental Protection Agency, http://www.epa.gov/wed/pages/ecoregions/level_iii.htm). The Southern Coastal Plain consists of mostly flat plains, but it is a heterogeneous region containing barrier islands, coastal lagoons, marshes, and swampy lowlands along the Gulf and Atlantic Coasts. Tampa Bay is the most prominent geographic feature in the region. In central Florida, an area of discontinuous highlands contains numerous lakes. The ecoregion is low in elevation (less than 100' MSL) with little relief. Its textured soils are wet, coarse, and sandy. The climate is subtropical with a long growing season. Average annual temperatures are about 74° F and average annual rainfall is about 50 inches; supporting a diverse range of flora and fauna. The ecoregion was once covered by a variety of forest communities that included trees of longleaf pine, slash pine, pond pine, beech, sweetgum, southern magnolia, white oak, and laurel oak. Population growth has been rapid in the last 35 years, and much of the region has been urbanized. Land cover is now mostly slash and loblolly pine with oak-gum-cypress forest in some low-lying areas, citrus groves, pasture for beef cattle, and urban areas (U.S. Environmental Protection Agency, "Level III Ecoregions of Florida—revised April 2000;" Native Seed Network, <http://www.nativeseednetwork.org/ecodetail?region=75>). Present land use in the Tampa Bay basin is characterized as: 28 percent agricultural and rangelands; 19 percent developed and urban; 18 percent upland forests; 10 percent wetlands; 8 percent shrub and brush; and 17 percent open water. Table 1 lists types of natural communities in the Tampa Bay Basin, and Table 2 lists unique or rare natural communities in the Tampa Bay Basin (Florida Department of Environmental Protection, "Basin Status Report," November 2001).

Tampa Bay's wetlands, mangroves, and shoreline areas are important ecological resources and support the state's largest and most diverse colonies of wading and shorebirds and one of the most productive bird nesting habitats in the United States. Three classes of emergent tidal wetlands are generally recognized in the Tampa Bay area: mangrove forests; salt marshes; and salt barrens. The emergent tidal wetlands collectively provide critical habitat for much of the bay's wildlife. Marsh grasses and mangrove trees provide critical feeding, nesting, and sheltering habitat for a variety of birds such as pelicans, cormorants, herons, ibises, spoonbills, and egrets. The areas provide important attachment sites for algae and invertebrate communities and provide submerged habitat for hundreds of recreationally and commercially important species of fish, crabs, shrimp, and other shellfish such as the pink shrimp, tarpon, snook, menhaden, mullet, blue crabs, and red drum. Sizable populations of bottle-nosed dolphins also inhabit the bay, while the shallow seagrass flats provide an important fish nursery and feeding ground for the endangered Florida manatee (Imperial, August 2000).

Interior parts of Egmont Key are undeveloped and covered with palmetto, shrubs and natural vegetation. The interior ecological system of Egmont Key is described as a Palustrine system with forest and scrub/shrub consisting of broad-leaved evergreens. The shoreline is an intertidal estuarine system with scrub/shrub consisting of needle-leaved evergreens near a sandy shore.

Figure 11. U.S. Fish and Wildlife Service Ecoregions – Southeast Region

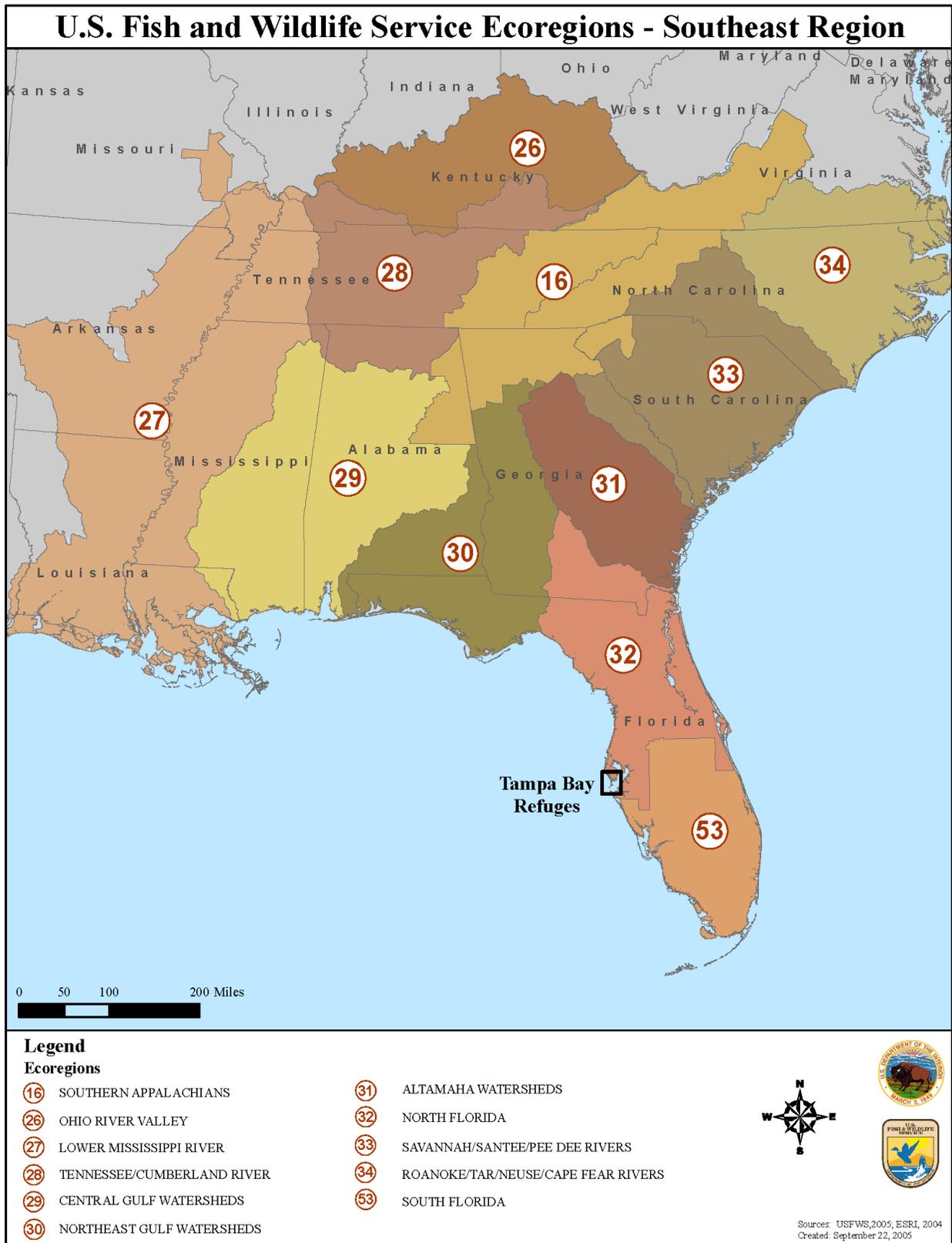


Figure 12. Conservation Areas in the Tampa Bay Region



Table 1. Types of natural communities in the Tampa Bay Basin

| Land-Cover Category | Community Type | Area in Acres | Percentage of Total Area | Characteristics |
|---------------------|---------------------|---------------|--------------------------|--|
| Uplands | | | | |
| 1 | Coastal strand | 12 | 0.001 | Occurs on well drained sandy coastlines and includes typically zoned vegetation of upper beach, nearby dunes, or coastal rock formations. |
| 2 | Dry prairie | 74,353 | 4.55 | Large treeless grasslands and shrublands on very flat terrain, interspersed with scattered cypress domes, cypress strands, isolated freshwater marshes, and hammocks. |
| 3 | Pinelands | 67,393 | 4.12 | Includes north and south Florida pine flatwoods, south Florida pine rocklands, scrubby flatwoods, and commercial pine plantations. Cypress domes, bayheads, titi swamps, and freshwater marshes are commonly interspersed in isolated depressions. |
| 4 | Sand pine scrub | 4,735 | 0.29 | Xeric plant community dominated by overstory of sand pine. Occurs in well drained sands deposited along former shorelines and islands of ancient seas. |
| 5 | Sandhill | 2,949 | 0.18 | Xeric plant community dominated by overstory of scattered longleaf pine, along with understory of turkey oak and bluejack oak. Occurs in areas of rolling terrain on deep, well-drained sands. |
| 6 | Xeric oak scrub | 9,165 | 0.56 | Hardwood community consisting of clumps of low-growing oaks interspersed with white sand. Occurs in areas of deep, well-washed sterile sand. |
| 7 | Mixed hardwood pine | 42,152 | 2.58 | Southern extension of the Piedmont southern mixed hardwoods, occurring mainly on clay soils of the northern Panhandle. Also includes upland forests in which a mixture of conifers and hardwoods dominate overstory. |
| 8 | Hardwood hammock | 101,179 | 6.19 | Includes major upland hardwood associations that occur statewide on fairly rich sandy soils. |
| 9 | Tropical hammock | N/A | N/A | Cold-intolerant hardwood community with very high plant diversity that occurs on coastal uplands in extreme south Florida. It is characterized by tropical trees and shrubs at the northern edge of their range, which extends into the Caribbean. |

| Land-Cover Category | Community Type | Area in Acres | Percentage of Total Area | Characteristics |
|---------------------|---------------------|---------------|--------------------------|--|
| Wetlands | | | | |
| 10 | Coastal salt marsh | 7,028 | 0.43 | Herbaceous and shrubby wetland communities that include cordgrass, needlerush, and transitional or high salt marshes, occurring statewide in brackish waters along protected low energy estuarine shorelines. |
| 11 | Freshwater marsh | 46,123 | 2.82 | Wetland communities dominated by wide assortment of herbaceous plant species growing on sand, clay, marl, and organic soils in areas where water depths and inundation regimes vary. |
| 12 | Cypress swamp | 37,466 | 2.29 | Regularly inundated communities that form forested buffer along large rivers, creeks, and lakes, or occur in depressions as circular domes or linear strands. Strongly dominated by bald cypress or pond cypress. |
| 13 | Hardwood swamp | 59,510 | 3.64 | Association of wetland-adapted trees, composed either of pure stands of hardwoods or a hardwood-cypress mixture that occurs on organic soils and forms the forested floodplain of nonalluvial rivers, creeks, and broad lake basins. |
| 14 | Bay swamp | N/A | N/A | Type of hardwood swamp often found in shallow depressions in pinelands or at base of sandy ridges where seepage maintains constantly wet soils. Broadleaf evergreen trees such as sweetbay, swamp bay, and loblolly bay dominate overstory. |
| 15 | Shrub swamp | 3,677 | 0.23 | Dominated by low-growing, woody shrubs or small trees, usually found in wetlands changed by natural or human processes, such as altered hydroperiod, fire, clear-cutting or land clearing, and siltation. |
| 16 | Mangrove swamp | 9,142 | 0.56 | Dense, brackish water swamps, usually dominated by red, black, and white mangroves that occur along low-energy shorelines and in protected, tidally influenced bays of southern Florida. Comprises freeze-intolerant tree species that are distributed south of a line from Cedar Key on the Gulf Coast to St. Augustine on the Atlantic Coast. |
| 17 | Bottomland hardwood | N/A | N/A | Wetland-adapted forests composed of pure stands of hardwoods or a mixture of hardwoods and cypress. They occur throughout the state on organic soils and form the forested floodplains of nonalluvial rivers, creeks, and broad lake basins. Tree species include a mixed overstory containing black gum, water tupelo, bald cypress, blue beech, and swamp ash. |

| Land-Cover Category | Community Type | Area in Acres | Percentage of Total Area | Characteristics |
|---------------------|----------------------------------|---------------|--------------------------|--|
| Open Water | | | | |
| 18 | Water | 273,380 | 16.73 | Open water areas of inland lakes, ponds, rivers, and streams and brackish and saline waters of estuaries and bays. |
| Disturbed | | | | |
| 19 | Grassland and agricultural lands | 447,511 | 27.38 | Upland communities with very low-growing grasses and forbs. Intensively managed sites such as improved pastures, lawns, golf courses, road shoulders, cemeteries, or weedy fallow agricultural fields. |
| 20 | Shrub and brush | 133,213 | 8.15 | Includes different situations where natural upland communities have recently been disturbed and are recovering through natural succession. |
| 21 | Exotic plant communities | N/A | N/A | Upland and wetland areas dominated by invasive non-native species that outgrow and outcompete native plant communities. |
| 22 | Barren land | 315,381 | 19.30 | Developed areas such as roads, parking lots, and buildings. |

N/A—This community type is not present in the basin.

Source: Natural community definitions are adapted from Kautz, Randy, D. T. Gilbert, and G. M. Mauldin. 1993. "Vegetative Cover in Florida Based on 1985-1989 Landsat Thematic Mapper Imagery." *Florida Scientist* 56(3):135-154.

Table 2. Unique or rare natural communities in the Tampa Bay Basin

| Natural Community Type | FNAI Global Rank | FNAI State Rank |
|------------------------------------|------------------|-----------------|
| Beach dune | G4 | S2 |
| Bird rookery | N/A | N/A |
| Coastal dune lake | G2 | S1 |
| Estuarine composite substrate | G3 | S3 |
| Estuarine consolidated substrate | G3 | S3 |
| Estuarine grass bed | G2 | S2 |
| Estuarine tidal marsh | G4 | S4 |
| Estuarine tidal swamp | G3 | S3 |
| Estuarine unconsolidated substrate | G5 | S5 |
| Geological feature | N/A | N/A |
| Manatee aggregation site | N/A | N/A |
| Marine grass bed | G2 | S2 |
| Marine mollusk reef | G3 | S3 |
| Marine tidal swamp | G3 | S3 |
| Maritime hammock | G4 | S2 |
| Scrub | G2 | S2 |
| Xeric hammock | G3 | S3 |

N/A = Not available.

Note: The Florida Natural Areas Inventory Global Rank characterizes an element's relative rarity or endangerment worldwide, with G1 being critically imperiled globally because of extreme rarity or because of extreme vulnerability to extinction, and G5 being demonstrably secure globally. Likewise, the State Rank of S1 through S5 characterizes an element's relative rarity or endangerment in Florida. The rankings are based on many factors, the most important being the estimated number of element occurrences, estimated abundance (or area for natural communities), range, estimated adequately protected occurrences, relative threat of destruction, and ecological fragility.

Source: Marois, Katherine C. June 1999. *Tracking List of Rare, Threatened, and Endangered Plants and Animals and Natural Communities of Florida*. Tallahassee, Florida: Florida Natural Areas Inventory.

REGIONAL CONSERVATION PLANS AND INITIATIVES

Comprehensive conservation plans and environmental documents are being prepared for the 28 national wildlife refuges in the State of Florida. The plans will provide refuge managers with a 15-year strategy and broad direction to: conserve wildlife and their habitats; achieve refuge purposes; and contribute toward the mission of the Refuge System. In addition, the plans identify wildlife-dependent opportunities available to the public, including opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation.

The National Estuary Program, established as part of the 1987 amendments to the Clean Water Act (CWA), seeks to protect and restore 28 designated estuaries of national significance, that are deemed to be threatened by pollution, development, or overuse. The Tampa Bay Estuary Program is one of the seven estuary programs in the Gulf of Mexico. Several federal agencies participate in the planning and assessment efforts: EPA, NOAA, USGS, DOI, and USDA (U.S. EPA, <http://www.epa.gov/owow/oceans/nepccr/>, June 2007; U.S. EPA, <http://www.epa.gov/owow/oceans/nccr/2005/>, December 2004).

The Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA), provides national leadership, strategic direction, and guidance to state and territory coastal programs and estuarine research reserves. It oversees six major programs. Each program has a national reach, but is designed to account for local resources and needs. The Office works with state and territory coastal resource managers to develop a scientifically based, comprehensive national system of marine protected areas (MPAs) and supports effective management and sound science to protect, sustain, and restore coral reef ecosystems. These activities are mandated by the Coastal Zone Management Act, the MPA Executive Order, and the Coral Reef Conservation Act (National Oceanic and Atmospheric Administration, <http://coastalmanagement.noaa.gov/>).

USGS National Coastal Program Plan -- "*A Plan for a Comprehensive National Coastal Program*" describes a comprehensive national coastal program that responds to critical regional needs while addressing national issues associated with coastal change, including nutrient enrichment, oxygen depletion, harmful algal blooms, chemical contamination, diseases in marine organisms, and fish kills; shoreline erosion, the increasing susceptibility of coastal communities to natural hazards and sea level rise, increasing demands on non-living resources (including groundwater, sand and gravel, and energy resources); and declines in living marine resources, habitat loss, loss of biodiversity, and invasions of non-indigenous species (U.S. Geological Survey, <http://marine.usgs.gov/coastal-plan/index.html>).

The Tampa Bay National Estuary Program (TBNEP), now simply called the Tampa Bay Estuary Program (TBEP), was established in 1991 as a partnership of Hillsborough, Manatee, and Pinellas Counties; the cities of Tampa, St. Petersburg, and Clearwater; the Southwest Florida Water Management District; the FDEP; the U.S. Environmental Protection Agency and the USGS. *Charting the Course*, A Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay, seeks to restore and protect water quality and bay habitats as the foundation for healthy and diverse populations of fish and wildlife. The CCMP details progress made in restoring and protecting Tampa Bay and advances strategies for continuing improvements in the future. *Charting the Course* was first released in 1996, and updated in 2006 (Tampa Bay Estuary Program, May 2006). This management plan defined a new direction for Tampa Bay resource management recognizing that environmental management must be an evolving/adaptive process that shifts away from emphasis on piecemeal oversight and toward a holistic view that assesses cumulative impacts of human action on entire natural systems (ecosystem management). Many collaborative activities (Table 3) have been

initiated as a result of this multi-agency task force. Many research and study reports for the TBEP are available at: <http://gulfsce.usgs.gov/tampabay/reports/index.html> .

One important component and outgrowth of the TBEP is the USGS's *Gulf of Mexico Integrated Science - Tampa Bay Study*. This study responds to the need to use an integrated science approach for studying the interrelations between geological, biological, chemical, and hydrological components of estuarine systems, and the impact of natural and anthropogenic change to all components of estuarine systems. The USGS Geological, Biological Resources, Water Resources, and National Mapping Disciplines are working together with other federal, state, and local partners to develop and implement an integrated, multidisciplinary science strategy for estuarine research. Results from this research will enable scientists and resource managers to better assess the fate of our estuaries in the future. The integrated science strategy developed through this project will be used as a model for USGS integrated science in other Gulf of Mexico estuaries.

The Southwest Florida Water Management District has developed the Comprehensive Watershed Management (CWM) program to conduct water resource assessment and planning on a watershed basis. The CWM was designed to allow for careful evaluation of the regional status of water resources, with emphasis on the District's Areas of Responsibility: Water Supply; Flood Protection; Water Quality; and Natural Systems. Multi-disciplinary and multi-agency teams were convened to develop and implement watershed management activities within each of the District's watersheds. Of particular import is the Tampa Bay/Anclote River Comprehensive Watershed Management Plan.

The "*American Oystercatcher Conservation Plan for the Atlantic and Gulf Coasts of the United States*" (Shulte and Brown, April 2006) focuses on *H. p. palliatus* in the United States, referred to as "American Oystercatcher" or simply as "oystercatchers." The present plan addresses only the populations on the East and Gulf Coasts and summarizes current knowledge of their life history, distribution, and population trends, describes current threats, lists research and management needs, and outlines recommended conservation actions. Conservation activities recommended to address these threats include: identification and protection of existing habitat; creation of new habitat through carefully designed use of dredge-spoil materials; management of existing protected areas to reduce predation and disturbance; and control of predator populations, especially in the nesting season.

"*Florida's Endangered and Threatened Species Management and Conservation Plan*" (Florida Fish and Wildlife Conservation Commission, 2004), as required under Section 5 of the Florida Endangered and Threatened Species Act of 1977 [s.372.072, Florida Statutes] is a plan for management and conservation of endangered and threatened species.

Future of the Region: A Strategic Regional Policy Plan for the Tampa Bay Region (FRSRPP) (Tampa Bay Regional Planning Council, September 2005) was prepared pursuant to Chapter 186, Florida Statutes, and Chapter 27E-5, Florida Administrative Code. The FRSRPP is a long range guide for physical, economic, and social development of the region which identifies regional goals and policies. The purpose of the plan is the identification of objectives and/or issues of most importance to the Tampa Bay Region and which have the greatest impact on the formulation of a regional vision. The following goals serve as the foundation for the SRPP: Affordable Housing; Economic Development; Emergency Preparedness; Natural Resources; Regional Transportation.

Atlantic loggerhead sea turtle recovery plan – Egmont Key serves as a loggerhead sea turtle nesting index beach necessary to determine population status and trends along the Atlantic and Gulf Coasts of the United States to determine progress towards the recovery (Kleen and Hunter, USFWS, June 2006).

North American Waterbird Conservation Plan (NAWCP) – The draft Southeastern U.S. Waterbird Conservation Plan stresses protection of nesting and foraging habitats for both colonial and non-colonial waterbird. Egmont Key and Passage Key are important for supporting large colonies of beach-nesting species (brown pelicans; sandwich, royal, and least terns; black skimmers; and laughing gulls). Pinellas Key provides important mangrove habitat for most long-legged wading species, especially for reddish egrets. Tampa Bay represents the northern most “large” nesting population of reddish egrets on the Gulf Coast of Florida (Kleen and Hunter, USFWS, June 2006).

Contributions to Partner in Flight (PIF) – PIF formed Bird Conservation Plans by Bird Conservation Regions that set conservation priorities and habitat and population objectives. Habitats found on primarily Egmont Key and Pinellas include: Upland forest and scrub, primarily important for transient Nearctic-Neotropical migratory landbirds crossing the Gulf of Mexico, and mangrove woodlands, primarily Pinellas Refuge: northernmost stable populations for Mangrove Cuckoo, Black-whiskered Vireo, and Florida Prairie Warbler along Gulf Coast of Florida (Kleen and Hunter, USFWS, June 2006).

Contributions to the U.S. Shorebird Conservation Plan (USSCP) – The USSCP is a partnership effort being undertaken throughout the country to ensure that shorebird populations are restored and protected. Primary objectives of this plan are: Development of scientifically-sound monitoring system to provide practical information to researchers and land managers; Identify principles upon which management plans can integrate shorebird habitat conservation with multiple species strategies; and Design a strategy for increasing public awareness and information concerning wetlands and shorebirds.

Tampa Bay Refuge’s are included in the Southeastern Coastal Plain-Caribbean Regional Shorebird Conservation Plan. Priorities in this regional plan focus on providing adequate nesting, foraging, and roosting habitat for especially beach nesting and inlet foraging species. Beach and sandflat habitats on Egmont Key and Passage Key provide important nesting habitat for American oystercatcher and foraging and roosting habitat for many species of shorebirds (including occasional non-breeding snowy plover and Wilson’s plover, also winter habitat for occasional piping plover) (Kleen and Hunter, USFWS, June 2006).

Contributions to the North American Bird Conservation Initiative (NABCI) - A broad coalition of governmental, non-governmental, and academic organizations interested in coordinating efforts to conserve bird populations and the landscapes upon which they depend. NABCI evolved in 1998 from conservationists recognizing the value of coordinating and integrating planning, implementation, and evaluation efforts of NAWCP, PIF, and USSCP (Kleen and Hunter, USFWS, June 2006).

The Tampa Bay Estuary Atlas, maintained by the University of South Florida, is designed to provide citizens, scientists, professionals, and planners with comprehensive and current water quality, hydrologic, and ecological data, as well as information about recreational opportunities and a library of scientific and educational materials on water resource issues. The Atlas is a "one stop information shop" for concerned citizens and scientists alike. The Atlas functions as a warehouse for a variety of water resources information, including documents and educational links. The Atlas is a tool to help in maintaining and improving Tampa Bay’s vital water resources. There exists enormous interest and wide-public support for conservation and protection of Tampa Bay’s natural resources as evidenced by the many local initiatives and programs. Just a few of the many projects and restoration efforts in the Tampa Bay region are:

- [Agency on Bay Management](#), Tampa Bay Regional Planning Council
- [Florida Forever Program](#), Florida Department of Environmental Protection
- [Florida Natural Areas Inventory](#), Florida State University conducts a variety of conservation planning and analysis projects.

- [Florida's Springs: Strategies for Protection and Restoration](#), An educational document provided by the Florida Springs Task Force
- [Gulf of Mexico Integrated Science -Tampa Bay Study Overview](#), and [Five Year Science Plan for the Tampa Bay Study](#), USGS
- [Inshore Marine Monitoring and Assessment Program](#), An EPA-funded initiative to assess the coastal marine water of Florida.
- [Ocean & Coastal Resource Management](#), NOAA
- [Restore America's Estuaries](#), A national non-profit organization dedicated to preserving the nation's network of estuaries.
- [Southwest Florida Conservation Corridor: Tampa Bay Watershed Section](#), The Agency on Bay Management, the Natural Resources Committee of the Tampa Bay Regional Planning Council.
- [Tampa Bay Oil Spill Restoration Plan and Environmental Assessment](#), Florida Department of Environmental Protection.
- [Tampa Bay Surface Water Improvement and Management \(SWIM\) Plan](#), Southwest Florida Water Management District

Table 3. Monitoring, restoration, and research programs in Tampa Bay

Water and Air Quality

| <u>Program</u> | <u>Agency</u> | <u>Budget</u> |
|--|--|---------------|
| Surface Water Monitoring | EPCHC | \$150,000.00 |
| Surface Water Monitoring | Pinellas County | \$695,000.00 |
| Beach Water Quality | Pinellas County | \$10,000.00 |
| Bioassay Studies | Pinellas County | \$18,000.00 |
| Surface Water, Benthic, and Air Quality Monitoring | Manatee County | \$289,500.00 |
| Surface Water Monitoring | City of Tampa | \$400,000.00 |
| Water Quality Monitoring | City of Clearwater | \$208,800.00 |
| Surface Water Monitoring | Tampa Bay Water | unavailable |
| Water Quality, Benthic Studies, Air Quality Monitoring | EPCHC | \$979,000.00 |
| Atmospheric Deposition | University of South Florida/EPA funded | unavailable |
| Benthic Nutrient Flux | FMRI | unavailable |
| Microbial Monitoring – Health Beaches | USF | unavailable |
| Non-point pollution control | USCG | \$264,000.00 |

Habitats

| <u>Program</u> | <u>Agency</u> | <u>Budget</u> |
|--|---|---------------|
| Satellite monitoring shoreline vegetative habitat | FMRI, NOAA | unavailable |
| Watershed Characterization Studies | EPCHC, Pinellas County | unavailable |
| Sediment chemistry, grain size, benthos | Manatee and Pinellas Counties | unavailable |
| Seagrass aerial photography mapping | SWFWMD, TBRPC | \$150,000.00 |
| Seagrass transect monitoring | City of Tampa Bay Study Group, SWFWMD-SWIM Program | \$350,000.00 |
| Seagrass Restoration Techniques | FMRI | \$500,000.00 |
| Seagrass Restoration Techniques | USF | \$40,000.00+ |
| Labyrinthula Monitoring | FMRI | unavailable |
| Artificial Reef Program | EPCHC | \$90,000.00+ |
| Benthic Quality (depth, temperature, salinity, dissolved oxygen, %silt/clay, contaminants) | HCEPC, SWFWMD | see above |
| Dredged Material Management – Habitat Restoration | USACE | unavailable |

Living Resources

| <u>Program</u> | <u>Agency</u> | <u>Budget</u> |
|--|--|---------------|
| Marine mammals, fisheries, sea turtle nesting | FMRI | unavailable |
| Mussel Watch and Oyster projects | NOAA | unavailable |
| Bird populations coastal colonies census | National Audubon Society | unavailable |
| Bird Sanctuary Program | National Audubon Society | unavailable |
| Oyster reef creation and monitoring | Tampa Bay Watch | unavailable |
| Scallop abundance | FMRI, Mote Marine, UNC Wilmington | unavailable |
| Reef fish, sessile invertebrates (Artificial Reef Program) | EPCHC | see above |
| Benthic taxa (abundance, diversity, evenness, dominant taxa) | EPCHC, SWFWMD | see above |
| Florida Marine Fisheries Monitoring (fisheries Dependent and independent) | FMRI | \$600,000.00+ |
| Manatee carcass recovery, necroscopy 1974-1985 | USGS/USFWS Sirenia Project | unavailable |
| Manatee monitoring | FMRI | |
| Marine Mammal Pathology Laboratory | Eckerd College/USFWS | unavailable |
| Dolphin Biology Research Institute (photo i.d., community structure) 1988-1993 | Chicago Zoological Society/NMFS | unavailable |
| Dolphin research and monitoring | Mote Marine Laboratory | unavailable |
| Biology and habitat use of bottlenose dolphins | Eckerd College Dolphin Project | unavailable |
| Dolphin rescue, rehabilitation, mortality studies | Clearwater Marine Aquarium, Marine Mammal Pathology Lab, Mote Marine Lab, Tampa Bay Marine Animal Stranding Team | unavailable |
| Hydrobiological Monitoring (hydrology, water quality, benthic invertebrates, zooplankton/ fish larvae, adult and juvenile fish, water dependent birds, habitat/vegetation indices) | Tampa Bay Water, EPCHC, SWFWMD, FMRI | \$950,000.00 |

Habitat Restoration Projects Since 1995 – Non-inclusive

| <u>Program</u> | <u>Agency</u> | <u>Budget</u> |
|--|--|-----------------|
| Lake Maggiore Restoration | SWFWMD | \$5,000,000.00* |
| Cockroach Bay Aquatic Preserve Restoration | FDEP, EPCHC, HCC | \$90,000.00+ |
| Cypress Point Restoration | FDEP, ELAPP, SWFWMD-SWIM, City of Tampa et al. | \$45,000.00 |
| South Parcel Restoration | SWIM, FDEP, EPCHC, Cargill | \$800,000.00* |
| General Habitat Restoration (numerous locations) | SWFWMD-SWIM | \$1,473,600.00* |
| Wetland Preservation and Restoration | EPCHC | \$840,000.00 |
| Terra Ceia Aquatic Preserve and Buffer | FDEP, SWFWMD | \$5,000,000.00* |

*denotes total budget rather than annual budget.

Sources:

Pribble et al. 1999, Hazen and Sawyer 1996, H. Greening pers. comm. Appendix 1 -- Non-inclusive list of monitoring, restoration, and research programs in Tampa Bay and estimated budgets.
http://gulfsci.er.usgs.gov/tampabay/reports/5yr_plan/index.html

Pribble R.J., Janicki A.J., Greening H. (eds.). 1999. Baywide Environmental Monitoring Report 1993-1998. Tampa Bay Estuary Program Technical Publication #07-99

Hazen and Sawyer (eds.). 1996. Funding Source Inventory for Comprehensive Conservation and Management Action Plans, Tampa Bay Estuary Program Technical Publication #14-95

ECOLOGICAL THREATS AND PROBLEMS

The following are considered to be critical needs and priority action recommendations for the three Tampa Bay Refuges (Kleen and Hunter, USFWS, June 2006):

- (1) Control of predators, including raccoons, rats, and fish crows, is necessary to protect nesting birds. Colonies have been devastated by raccoon predation and predation by fish crows has increased in the recent past. Nesting colonies of birds on Pinellas NWR, particularly Tarpon, Indian, and Little Bird Keys, have been devastated by raccoons. More recently, depredation from fish crows is considered an increasingly serious problem. Rats have become a significant issue on Egmont Key NWR. Predator control on these islands is imperative.
- (2) Beach (Egmont Key NWR) and mangrove (Pinellas NWR) habitat must be protected and restored, where appropriate, to provide habitat for threatened loggerhead turtles, beach-nesting birds, and mangrove-nesting birds. Loss of habitat caused by severe erosion along the west beach of Egmont Key NWR is affecting the loggerhead sea turtle populations. An assessment and decision regarding beach renourishment for Egmont Key NWR (and possibly Passage Key NWR) are needed. An assessment and decision regarding a buffer establishment around all three refuges are needed.
- (3) Habitat restoration, including controlling exotic plants and planting native plants, is needed to maintain wildlife diversity. Control of exotics, including Brazilian pepper and Australian pine, needs to be continued.

Egmont Key NWR – Erosion is the foremost problem for Egmont Key and Passage Key NWRs. Alterations of the smooth, natural bottom topography near the mouth of Tampa Bay in the last century, including enlargement of natural channels and creation of new channels, spoil areas, turning basins, and causeways, have resulted in much scouring of Egmont Channel and Key (USFWS, “An Ecological Characterization of the Tampa Bay Watershed,” 1990).

There is an immediate need to manage the dynamics of offshore sand transport to achieve sand accretion results and to begin to expand the key back to its original size. Egmont Key NWR has lost nearly half its acreage since 1877, and has lost nearly a third since 1969. In 1877, Egmont Key was 539 acres. In 1974, when the island was designated a national wildlife refuge, it was 392 acres. Presently the island is approximately 275 acres. Several historic structures are now covered by the encroaching sea, with others soon to follow (Florida Department of Environmental Protection, November 1996). The periodic dredging of nearby Egmont Channel is thought to have changed the transport of sand from the north thereby depriving the island of sediments that once maintained its larger size. Restoring Egmont Key NWR may require that the dredging practices in Egmont Channel be modified.

Two beach renourishment projects were operated by the USACE on the island. Presently, most of the southwest beach is gone and some upland area and historic structures are beginning to erode. Tampa Bay harbor navigation and maintenance includes removal of 250,000 cubic yards of material every 5 years just north of Egmont Key NWR in the Egmont Channel. The USACE has the option of using this dredged material either to renourish the west beach or dispose of it out at sea. The dredging of the channel may be accelerating erosion problems on the west shore more rapidly than anticipated, and as a result the upland areas of the island are eroding as well. This will likely have a major impact to visitation of Egmont Key NWR if beach goes no longer have a beach at which to recreate (USFWS, “Visitor Services Report,” March 2004).

If it is decided to regularly renourish beaches on Egmont Key and Passage Key NWRs, the refuge staff would need to pay particular attention to type and quality of beach sand being used. Guidelines have been established with respect to sea turtle nesting beaches. In addition, very frequent renourishment may lead to depletion of invertebrates in the substrate that may not be able to recover from the last event and therefore impacting foraging shorebirds.

Eradication measures for two exotic plants (e.g., Brazilian pepper and Australian pine) are now successfully in progress on Egmont Key NWR. Both plants have become pervasive and have altered and replaced the natural hammock community habitats. The coastal berm supports the island's native box turtle populations. Eradication of predators, namely rats, should be addressed in a more comprehensive manner.

The bird sanctuary area at the southern end of Egmont Key NWR is closed to all public use, year-round, and a vessel exclusion zone has been established around the seagrass beds on the east side of the island to protect them from propeller damage. Egmont Key NWR is designated as a critical habitat for piping plovers; however, public beach use may be interfering with foraging and roosting of these birds.

Egmont Key NWR is located within the undisputed lightning capital of the North America. The coastal scrub that was the original habitat land cover on the island is very pyrogenic and undoubtedly burned frequently. Fires, both natural and human caused, were rampant on the island during settlement years. A large fire was recorded in September 1891, when a coal shed spontaneously combusted near the lighthouse. The Keeper and his family had to flee to the mainland until fire suppression support arrived 3 days later.

Since the abandonment of Fort Dade in 1923, wildfires from arson and lightning have swept the island on a few occasions. A large fire occurred on April 25, 1925, when federal agents started grass fires to smoke out smugglers and illegal immigrants. This fire destroyed eight homes, a coal storage facility, and the large ice house/ power plant. In 1975, a lightning-caused fire swept across most of the island and consumed the remaining combustible materials left from Fort Dade. The fire destroyed much of the lower shrub understory and killed several palm trees. In recent years, there have been several small wildfires. Three of them were on southern end of the refuge in the vicinity of the pilot compound and may have posed a serious threat to the facilities there. An arson fire in 1995 destroyed the tile roof and consumed all flammable materials from the Egmont Key Guard House, which was the last intact structure from that period.

Fire has played a key role in the island's history, and controlled fire can be used to manage the island's habitats to benefit wildlife and to protect island facilities. A system of regularly scheduled prescribed burns every 5 to 10 years will control natural succession to maintain sea oats. Also, upland habitats infested with exotic plant species will be prescribed burned as needed to control plant regeneration and remove dead biomass.

Pinellas NWR – The seven mangrove islands comprising the Pinellas NWR total about 394 acres. The Pinellas NWR islands are closed to the public due to their small size and critical importance to coastal bird species; however, illegal access by the public still occurs and causes birds to abandon their nests or flush from their nests allowing predators (raccoons, fish crows, etc.) to move in. Also, offshore fishing is allowed and as such, birds nesting near shore may be disturbed by boaters.

Raccoons may be the sole factor for breeding bird failures on Tarpon Key and other keys, although fish crows and rats have contributed by depreddating tree-nesting birds on Tarpon and Indian Keys. Some mangrove habitat has been lost due to erosion from boat wakes, storm tides, tropical storms, and hurricanes. Renourishment with oyster shells and planting of *Spartina* are recommended on Tarpon and Little Bird Keys to prevent further erosion and allow mangrove seedlings to take hold. Fishing line and other trash entangle birds, manatees, fish, turtles, and other wildlife and is a serious problem at Pinellas NWR – killing hundreds of animals each year.

The two main short-term management issues identified effecting mangrove-nesting species are (1) depreddation which within recent years (when predator control has slacked off) has led to near complete abandonment of Tarpon and Whale Keys (among other islands on the refuge) and (2) through law enforcement presence the need to ensure that human disturbance is not a factor where and when waterbirds are nesting on the refuge.

In addition to the above two major issues, three other long-term issues need to be considered: (1) island stabilization through renourishment, (2) removal of exotic vegetation, and (3) reduction of monofilament lines causing mortality (Kleen and Hunter, USFWS, June 2006).

Passage Key NWR – Passage Key NWR is closed to the public and represents one of the last remaining nesting site for laughing gulls, black skimmers, and royal terns in Tampa Bay. Easily accessible by boat from the Tampa/St. Petersburg Metropolitan area, Passage Key NWR has been inundated with humans to the point where the island had to be closed to all visitors. Currently, you must observe the key from a distance of at least 300 feet.

Restoring Passage Key NWR would require analysis under the Wilderness Act to determine the “minimum tool necessary” to accomplish the task. Renourishment at Passage Key NWR should be considered. A decision needs to be made whether to take an active role in curbing erosion on Passage Key NWR or allow erosion to continue (not likely a natural process given potential connection to Tampa Bay dredging). If Passage Key NWR remains submerged for extended periods of time, it may no longer serve the purpose of a nesting island for migratory birds.

Common Concerns

Each year, an average 4 billion gallons of oil and other hazardous substances pass through Tampa Bay and Egmont Channel. These vessels, bound predominantly for one of the bay’s three deepwater ports or its many industrial facilities, are joined by a variety of other cargo carriers as well as a rapidly expanding cruise ship fleet. The potential for a catastrophic spill of petroleum or other toxic substances necessitates improving the region’s overall emergency response readiness to avoid another a major spill similar in nature to the 300,000 gallons of oil that were released following a dramatic three-way ship collision at the mouth of the bay in August 1993. The heavy recreational and commercial traffic in Tampa Bay and Egmont Channel has the potential to adversely impact the natural resources of Egmont Key, Passage Key, and Pinellas NWRs if a spill occurs. Emergency response and agency coordination plans are needed (Tampa Bay Estuary Program, <http://www.tbep.org/baystate/spillprevention.html>). Presently, the Service has coordinated with Hillsborough County and is a part of its oil spill response plan.

Illegal public access to all three refuges causes birds to abandon their nests or flush from their nests, allowing predators to move in. A law enforcement presence is needed to discourage unauthorized human disturbances to nesting areas.

Small numbers of West Indian manatees are observed in the seagrass beds along the east side of Egmont Key NWR and occasionally around Passage Key and Pinellas NWRs during the spring and summer. All habitats are outside refuge jurisdiction, but some foraging habitats (seagrass beds) are directly adjacent to the refuges. These foraging areas need to be protected from recreational/boating disturbances. A 30- to 300-foot submerged land buffer zone to protect bird nesting and seagrass foraging areas is needed, particularly around Egmont and Whale Keys.

Physical Resources

CLIMATE

(Source: Natural Resources Conservation Service, National Weather and Climate Center, Climate Reports, <ftp://ftp.wcc.nrcs.usda.gov/support/climate/soil-nar/fl/pinellas.doc>)

The Tampa Bay Refuges experience a subtropical climate, characterized by generally mild winters and hot, humid summers.

The average relative humidity in mid-afternoon is about 50 percent in April and May, and about 60-65 percent from July to September. Humidity is higher at night, and the average at dawn is about 90 percent in all months. The sun shines 60 percent of the time in summer and 63 percent in winter. The sunniest months are April and May, with 75 percent of possible sunshine. The prevailing wind is from the east in most months. Average wind speed is highest, between 9 and 10 miles per hour, from February to April.

Table 4 gives data on temperature and precipitation and degree data for growing days for the survey area as recorded at St. Petersburg in the period 1971 to 2000.

In winter, the average temperature is 63.4 degrees and the average daily minimum temperature is 55.6 degrees. The lowest temperature on record, which occurred at St. Petersburg on December 13, 1962, was 22 degrees. In summer, the average temperature is 83.1 degrees and the average daily maximum temperature is 90.1 degrees. The highest temperature, which occurred at St. Petersburg on July 5, 1995, was 100 degrees. Actual temperatures on the refuges are moderated due to the coastal influence, which results in lower daytime highs and higher nighttime lows.

The average annual total precipitation is about 49.58 inches. The heaviest 1-day rainfall during the period of record was 12.20 inches at St. Petersburg on October 27, 1986. Thunderstorms occur on about 86 days each year, and most occur from June through September. Florida can receive a major portion of its yearly rainfall from hurricanes and tropical storms, usually in the summer and early fall. Florida had its worst drought in history between 1998 and 2000.

Measurable snowfall has never been recorded since records have been kept at St. Petersburg, beginning in 1948.

CLIMATE CHANGE AND GLOBAL WARMING

According to NOAA and NASA data, the Earth's average surface temperature has increased by about 1.2°F to 1.4°F since 1900. The ten warmest years in the 20th century have all occurred within the past 15 years, with the warmest two years being 1998 and 2005. Some climate models, based on emissions of greenhouse gases, primarily carbon dioxide, methane, and nitrous oxide, predict that average surface temperatures could increase from 2.5 °F to 10.4°F by the end of this century (US Environmental Protection Agency, "Climate Change," <http://www.epa.gov/climatechange/>).

Effects of climate change and global warming will be changes in weather/rainfall patterns, decreases in snow and ice cover, rising sea levels, and stressed ecosystems. For the southeastern U.S. and Gulf Coast this can mean increased loss of barrier islands and wetlands; increased risk of shoreline flooding due to sea level rise, storm surge, and extreme precipitation events; greater likelihood of warmer/dryer summers and wetter/reduced winter cold; and, alterations of ecosystems and habitats due to these changes in weather patterns – to name but a few possibilities.

Global warming, resulting in melting of glaciers and ice sheets, will cause sea levels to rise. NASA estimates that yearly, 50 billion tons of ice is melting from the Greenland ice sheet. NASA aerial surveys show that more than 11 cubic miles of ice is disappearing from the ice sheet annually (Krabill, July 2000). Considering that land less than 10 meters above sea level contains 2 percent of the world's land surface but 10 percent of its population, in the U.S. major impacts will be felt by large numbers of people living on the low-lying coastlands, particularly the Gulf and East Coast states.

Globally, sea level has risen 4–10 inches during the past century. The effects of rising sea levels are even more dramatic in Florida. Because of Florida's natural subsidence, south Florida's sea level has risen about 12 inches since 1846. It is still rising today, at a rate that is equivalent to 8-16 inches per century. That rate is 6-10 times faster than the average rate of sea level rise along the south Florida coast during the past 3,000 years. If the current trend continues without any additional global warming, the sea along the south Florida coast would climb another 3 inches by 2025 and 10 inches by 2100. Global warming is expected to accelerate this sea level rise. During the next 25 years, the sea is likely to rise 5 inches rather than 3. By 2100, the best available science indicates that south Florida seas will be approximately 20 inches higher than they were in 1990 (U.S. Environmental Protection Agency, "Climate Change," <http://www.epa.gov/climatechange/>).

In addition to the rising seas, changes in temperature and precipitation will affect plants and wildlife. A warmer climate could allow heat-loving pest species, such as the invasive Australian pine tree, to expand their range. However, warmer winters lead to fewer frosts, consequently, tropical plants and trees that are vulnerable to cold temperatures may benefit. Rapid sea level rise could harm low-lying mangrove communities. Florida's mangrove forests also provide food, nesting, and nursery areas for many animals—including more than 220 fish species, 24 reptile and amphibian species, 18 mammal species, and 181 bird species. In general, the response of mangroves to sea level rise depends on the type of mangroves, their environmental setting, the amount of freshwater available to maintain root growth, and the sediment supply. Mangrove communities in south Florida already are affected by a number of stresses, including invasive Brazilian pepper plants, hurricanes, agricultural runoff, and human development. Climate change and a rise in sea level pose new stresses to an ecosystem already in danger (U.S. Environmental Protection Agency, "Climate Change," <http://www.epa.gov/climatechange/>).

A recent study of the effects of climate change on eastern U.S. bird species concluded that as many as 78 bird species could decrease by at least 25 percent; while as many as 33 species could increase in abundance by at least 25 percent due to climate and habitat changes (Mathews et al. 2004).

Table 4. Temperature and Precipitation

(Recorded in the period 1971-2000 at ST PETERSBURG, FL7886)

| Month | Temperature | | | | Precipitation | | |
|--------------|-----------------------|-----------------------|----------------|--|---------------|---|------------------|
| | Average daily maximum | Average daily minimum | Average | Average number of growing degree days* | Average | Average number of days with 0.10 inch or more | Average snowfall |
| | ⁰ F | ⁰ F | ⁰ F | Units | In | | In |
| January----- | 70.1 | 54.5 | 62.3 | 389 | 2.76 | 4 | 0.0 |
| February---- | 71.6 | 55.8 | 63.7 | 390 | 2.87 | 4 | 0.0 |
| March----- | 76.1 | 60.5 | 68.3 | 568 | 3.29 | 4 | 0.0 |
| April----- | 80.7 | 65.1 | 72.9 | 686 | 1.92 | 2 | 0.0 |
| May----- | 86.2 | 71.1 | 78.6 | 888 | 2.80 | 3 | 0.0 |
| June----- | 89.5 | 75.3 | 82.4 | 972 | 6.09 | 7 | 0.0 |
| July----- | 90.6 | 76.6 | 83.6 | 1040 | 6.72 | 10 | 0.0 |
| August----- | 90.2 | 76.6 | 83.4 | 1035 | 8.26 | 11 | 0.0 |
| September--- | 88.6 | 75.5 | 82.1 | 962 | 7.59 | 9 | 0.0 |
| October----- | 83.5 | 69.9 | 76.7 | 828 | 2.64 | 3 | 0.0 |
| November---- | 77.2 | 63.0 | 70.1 | 604 | 2.04 | 3 | 0.0 |
| December---- | 71.8 | 56.6 | 64.2 | 447 | 2.60 | 3 | 0.0 |
| Yearly: | | | | | | | |
| Average--- | 81.3 | 66.7 | 74.0 | --- | --- | --- | --- |
| Extreme--- | 100 | 24 | --- | --- | --- | --- | --- |
| Total----- | --- | --- | --- | 8810 | 49.58 | 63 | 0.0 |

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees. F)

GEOLOGY AND TOPOGRAPHY

The Tampa Bay area is a product of the fluctuations in sea level caused by Pleistocene and earlier glaciation. During times of lowered sea level, the river valley of Tampa Bay was cut into underlying limestones by the paleo-Hillsborough, Manatee, and Alafia Rivers. As sea level rose during glacial retreat (beginning 6,000 to 8,000 years ago and ending between 3,000 and 5,000 years ago), the area was flooded and became Tampa Bay (Doyle 1985). Prior to this flooding, the sea level was 100 meters lower than present and land extended 160 kilometers farther west.

Rock formations in the region are Tertiary marine carbonates that are thousands of feet thick deposited over millions of years of geologic time. Geologic formations comprising the upper 1,000-1,500 feet of this carbonate platform are most important in terms of groundwater development and ecological watershed management. Underlying Tampa Bay are limestones and dolomites of Oligocene age and older. The Miocene St. Marks/Tampa formation, which consists of dolomitic limestones interbedded with terrigenous clastics, directly underlies the unconsolidated surface sediments in the northern portion of the Bay. The Hawthorn Formation is absent in the northern portions of Tampa Bay but is present at the surface throughout the lower two-thirds of the bay. The Hawthorn Formation also outcrops along portions of eastern Tampa Bay (Doyle 1985; Southwest Florida Water Management District 2002). In the vicinity of Egmont Key NWR, the Hawthorne Group sediments are approximately 325-feet thick and are found about 50-60 feet below MSL. St. Mark's/Tampa Formation (a remnant layer of the Hawthorn Formation contiguous throughout central Florida), is composed of sandy, chalky limestone. In some locations, the upper portion of the deposit is composed of calcareous sands and clays graduating downward into unconsolidated or loosely cemented lime mud. The base of this formation is typically marked by beds of clayey sand (Tampa City Council – Hillsborough County City-County Planning Commission, January 1998).

The stratigraphy of this section, in descending order, includes: the Miocene age Arcadia Formation (Tampa Member) of the Hawthorn Group; the Oligocene Suwannee Limestone; the upper Eocene Ocala Limestone; and, limestones and dolostones of the middle Eocene Avon Park Formation. Composition of these formations range from a sandy, phosphatic, dolomitic limestone of the Tampa Member, to relatively pure calcium carbonates limestones of the Suwannee and Ocala Limestones. The Avon Park Formation is composed of both limestone and thick units of recrystallized dolomite, forming highly permeable beds of dolostone (Southwest Florida Water Management District 2002).

In the deeper water portions of Tampa Bay, the Pleistocene river valley has down cut as much as 90 feet (30 meters) into the underlying limestones. This archaic bed has filled in with unconsolidated estuarine and fluvial sediments. Recently deposited sediments are quartzitic with carbonate mixtures. Bay sediments are derived from reworked terrace deposits, transport of suspended loads from rivers, in situ production and weathering of shell, and inshore movement and deposition of sediment from the Gulf of Mexico. Immense deposits of marine mollusk shells are found in many areas of Tampa Bay and are mined for use as fill. Very recent fine-grained silts and mud deposits may also be present in part of the bay, especially near river mouths and tidal creeks. There are up to 20 meters of unconsolidated sediments in parts of Tampa Bay (Southwest Florida Water Management District 2002).

The alternating high and low sea levels during the Pleistocene and Holocene shaped the land surface of the Tampa Bay region. The region is low in elevation, with elevations ranging from a depth of 94 feet below sea level at the mouth of the Bay up to a height of 105 feet above sea level in Clearwater. The Tampa Bay watershed area consists of mostly flat plains with little relief. It is a heterogeneous region containing barrier islands, coastal lagoons, marshes, and swampy lowlands along the Gulf and Atlantic Coasts. Tampa Bay is the most prominent geographic feature in the region. The dominant landforms are

marine terrace deposits, representing former sea level positions over recent geologic time. These marine terraces have been modified over time by wind, erosion, and sinkholes resulting in the present day topography and land cover.

The Gulf Coastal Lowlands, the dominant landform in the western area of the basin, adjoin Tampa Bay. These relict marine terraces (ancient shorelines) have low relief over broad plains bordered by slopes. Major municipalities such as the cities of Tampa and St. Petersburg are located in the Lowlands.

To the east, Florida's Central Highlands is an area of discontinuous highlands, containing numerous lakes, characterized by many ridges and depressions without any well-defined system of surface streams or outlets, and with elevations up to 300' MSL (Florida Department of Environmental Protection, "Basin Status Report," November 2001).

Karst features exist throughout the Tampa Bay area, the sinkholes that develop in this porous limestone terrain typically result in shallow, bowl-shaped depressions and a generally rolling topography (Florida Department of Environmental Protection, "Basin Status Report," November 2001).

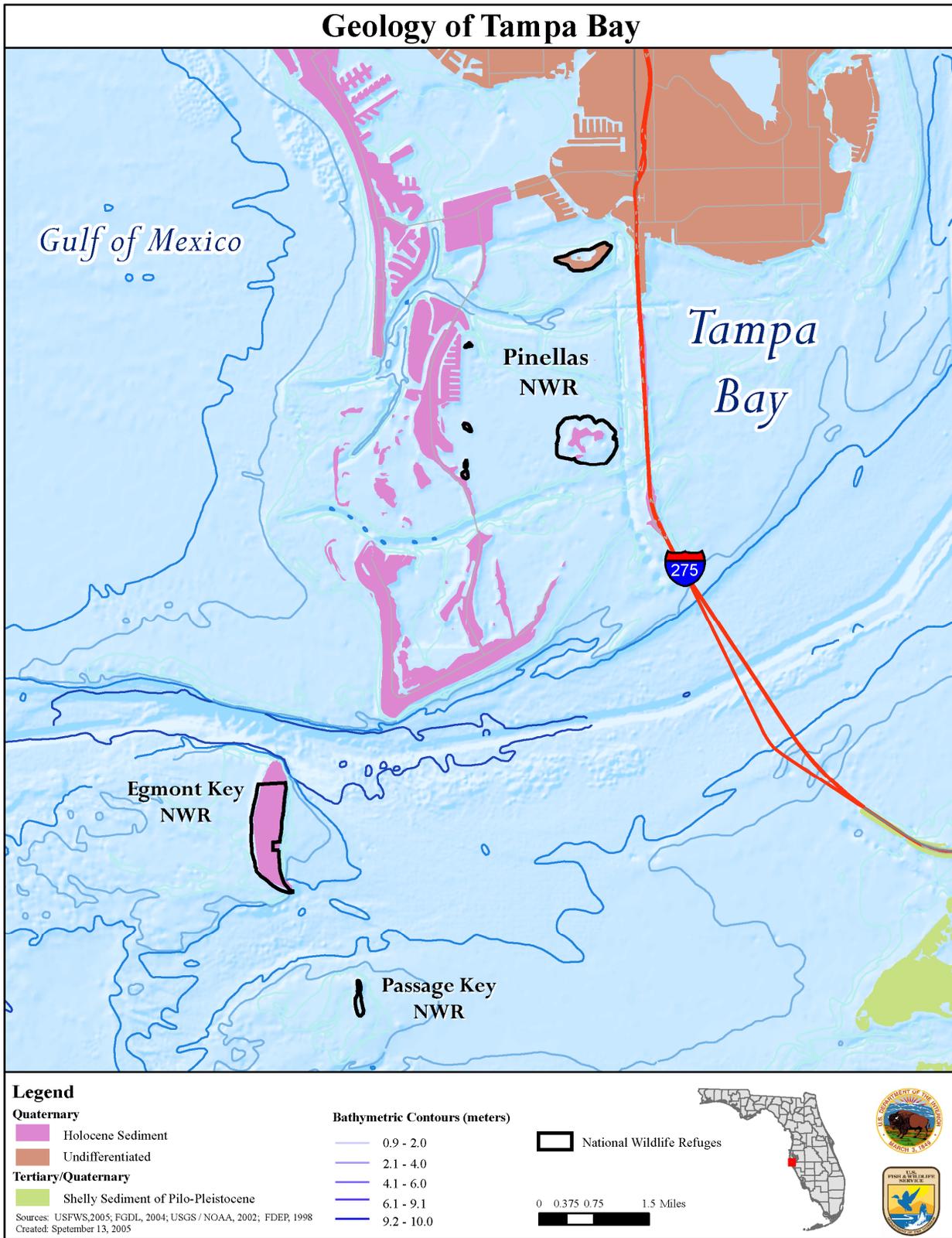
Egmont Key NWR is nearly 2 miles long of relatively uniform width, and is approximately 2,250 feet across at its widest point. It is not considered a barrier island. The key has little topographic relief, and its average elevation is about 5 feet above MSL. Complete inundation of the island has occurred in the past during hurricanes and tropical storms. Topographic features are continuously changing, influenced by wind, surf, tides, coastal currents, and storms. These forces constantly alter the distribution and elevation of marine-derived sediments which comprise the island. In 1875, Egmont Key was approximately 50 percent larger than it is today (Florida Division of Recreation and Parks, February 1998).

A general depiction of the geology in the Tampa Bay area is presented in Figure 13.

SOILS

In central and south Florida, the soils or uppermost sediments are geologically young and are surficial; that is, the soil profiles reflect changes in sediment types rather than development of chemically or mechanically produced horizons. For example, one is likely to observe sands layered over marsh-produced calcareous marl, particularly in coastal areas. Each soil is an indicator of preexisting conditions (i.e., parent materials). Soils are organized into a taxonomic classification system by the U.S. Department of Agriculture, Natural Resources Conservation Service, in which each soil is categorized by order, suborder, great group, subgroup, family, and soil series. Nationwide, there are 10 orders of soil, four of which (*Entisols*, *Spodosols*, *Ultisols*, and *Histosols*) dominate Florida's landscape. *Spodosols* are the dominant soil order in the Tampa Bay area; of which of Aquods (a suborder of *Spodosols*) has the largest total acreage. Aquods are acidic, wet, poorly drained, sandy soils overlying an organic stained subsoil layer, of which the Myakka series is the most common and well known. Myakka fine sand is the official state soil of Florida, is the most extensive soil in the state, and does not occur in any other state. Pine flatwoods are well suited for this type of soil, and it is also found in flats, depressional, tidal, and floodplain landforms ((USFWS, "An Ecological Characterization of the Tampa Bay Watershed," 1990; USDA Natural Resources Conservation Service, http://soils.usda.gov/survey/online_surveys/florida/; http://www.mo15.nrcs.usda.gov/news/state_soils/fl_ss.html).

Figure 13. Geology of Tampa Bay



Soils of the Tampa Bay area are derived from marine deposits known as the Suwannee, Tampa, Hawthorn and Bone Valley formation, laid down during the late Oligocene and lower and middle Miocene periods. These geologic formations were further modified by the marine environment and fluctuating sea levels during Pleistocene and recent times (Southwest Florida Water Management District SWIM Section, February 1999).

Soils associated with the barrier islands of the Tampa Bay watershed are dominated by the sandy *Entisols* soil order, of which Quartzpsamments (a great group of *Entisols*) is the most abundant. Quartzpsamments are extremely sandy soils with little or no soil profile, of which the Canaveral Fine series is the most common. Canaveral Fine is characterized as a moist mineral soil, with sand and shell fragments and a thin accumulation of organic material at or near the surface. These tan-colored, well-oxidized soils are composed of mixed carbonate shell material and fine to medium-grained quartz sand (USFWS, "An Ecological Characterization of the Tampa Bay Watershed," 1990).

Surficial sediments of Egmont Key (and presumably Passage Key) are comprised of post-Pleistocene undifferentiated sand and shells. The entire Egmont Key (and presumably Passage Key) is classified under a single soil type, St. Augustine Fine Sand. St. Augustine fine sand is nearly level and somewhat poorly drained and is found on flats and ridges bordering Tampa Bay (USDA Soil Conservation Service et.al. 1989, "Soil Survey of Hillborough County, Florida). Typically, this soil has a surface of dark gray sand, underlain to a depth of about 12 inches with light brownish gray fine sand. The middle part, to a depth of about 30 inches, is light gray, mottled fine sand containing ball of sandy clay. The lower part, to a depth of about 80 inches, is gray fine sand. Beach and dune sand and shell normally prevail on the western side of the keys, where greater tidal, wind, and current forces are exerted.

HYDROLOGY

Groundwater – Groundwater is the largest and most readily available source of potable water in Florida. Three different aquifer systems can be found in the parts of Florida where springs are common. They are the shallow Surficial Aquifer, the Intermediate Aquifer, and the limestone Floridan Aquifer. In some areas, all three aquifers may exist in sequence, separated by impermeable layers. In other areas, only the Floridan Aquifer may be present, and it may be exposed to the surface waters by sinkholes and other karst features. Karst topography in the Tampa Bay region interconnects groundwater and surface water. Spring flow and seepage constitute the base flow of many streams; freshwater wetlands retard and store floodwaters and enhance infiltration to groundwater; and stream discharges to estuaries are critical for maintenance of salinity regimes. These interrelationships are the basis of the state's and this region's ecological systems (Southwest Florida Water Management District, July 2005). This characteristic also leaves the underlying Floridan aquifer vulnerable to pollution infiltration.

In general, the Floridan aquifer acts as a single, interconnected hydrologic unit, with large quantities of water found within openings along faults, joints, bedding planes, and other fractures. The Floridan aquifer system is the principal source of groundwater production in the Tampa Bay region, and is capable of yielding greater than 5,000 gallons per minute (GPM) from fully penetrating wells. Water produced from the Floridan is primarily used for industrial and domestic purposes (Tampa City Council – Hillsborough County City-County Planning Commission, January 1998).

Egmont Key is underlain by the Floridan Aquifer. There are no public wells on Egmont Key and available water capacity is low. The key may lie in a zone where no potable water is available from the Floridan Aquifer. U.S. Geological Survey potentiometric surface data suggests Egmont Key is in an area of zero recharge to the Floridan aquifer system. In the transition zone which separates fresh and saltwater, south and southwest of Tampa Bay, relatively high concentrations of sulfate and chloride make the groundwater non-potable. On Egmont Key, a reverse osmosis treatment system is located and operated by the Tampa Bay Pilots. This system converts readily available saltwater into non-potable water used primarily for cleaning and bathing. All drinking water must be brought in from the mainland. Treated water from the pilot's water system must be trailered up to the park manager's residence on a weekly basis. In most years, the water table at Egmont Key ranges from 3 to 4 feet below land surface (Fernandez, 1996). Seasonally, the high water table is at a depth of 20-30 inches for 2 to 6 months and recedes to a depth of about 50 inches during prolonged dry periods. Prior to the Colonial era, freshwater on Egmont Key probably consisted only of rainwater pools and puddles. The presence of at least two species of frogs suggests temporary pond formation occurred often enough for reproductive success. There are now several cisterns and old foundations which also trap and hold rain water (Florida Division of Recreation and Parks, February 1998).

Surface Water -- The west-central coast of Florida bordering the Gulf of Mexico is a low-energy, microtidal (less than 0.5 m tidal amplitude) region that is constantly changing as a result of active coastal processes that are directly linked to meteorological events. Wind-driven waves and tidal currents are the most important geological agents controlling sediment transport and evolution of the Gulf and bay shores. Astronomical tides in the Gulf of Mexico are mixed and typically have a range of less than 1 m. Water levels vary only about 0.5 m between high and low tides during a normal tidal cycle. Non-storm waves in the eastern Gulf of Mexico are normally less than 0.3 m high, and wave energy decreases to the north where the Gulf shore consists of marsh (USGS Coastal and Marine Geology Program, "Coastal Classification Atlas, West-Central Florida Coastal Classification Maps – Anclote Key to Venice Inlet," <http://pubs.usgs.gov/of/2003/of03-227/process.html>).

More specifically, tides in Tampa Bay are a mixture of lunar (semidiurnal) and solar (diurnal) gravitational effects. Two unequal high and low tides occur daily, with an average range of about 2.3 feet. Tides produce currents of about 6 feet per second during ebb tide and about 4 feet per second during flood tide in Egmont Channel at the mouth of the bay. During hurricanes and tropical storms, the associated storm surge from high winds and low barometric pressure also affects water movement in the bay. The highest recorded storm tide was 15 feet in 1848 (Tampa Bay Estuary Program, "Baywide Environmental Monitoring Report, 2002-2005," December 2006).

Groundwater discharges to the bay are seasonal and greatest during and after the wet season. The roles of groundwater discharge in bay ecology are poorly understood, but can be postulated as: (a) reducing peak runoff rates and constituent loads; (b) prolonging estuarine conditions along shorelines and in marshes or mangrove forests; and (c) creating favorable refugia and nursery areas for marine life in tidal creeks. Drainage of uplands around the bay has concentrated the different flows of surficial groundwater discharge, routed it to major stormwater outlets, and altered the hydrology and constituent loads of manmade tributaries so that many of the benefits of diffuse flows have probably been lost (Southwest Florida Water Management District, February 1999).

Surface water flows are not only a product of runoff, but also include a groundwater baseflow component. In fact, many surface water systems in west-central Florida are closely interconnected with the underlying ground-water system through springs and sinkholes. In accordance with hydrologic conditions, these natural interconnections may augment flow, reduce flow, or perform both functions intermittently. Because this region manifests annual wet and dry seasons with significant variations in precipitation frequency and intensity, the contribution of surface runoff and groundwater

baseflow to streams varies. This cyclic pattern of changing baseflow conditions results in variable surface water quantity and quality. Rain and thus stream flows are generally lowest during April and May. Unfortunately, high municipal water demands historically occur during this same seasonal time period, primarily due to corresponding increased outdoor irrigation. The low monthly minimum flows during peak consumptive periods have required the development of a large storage reservoir on the Hillsborough River in order to ensure an adequate supply (Tampa City Council – Hillsborough County City-County Planning Commission, January 1998).

Tampa's surface water system includes three major drainage basins, all of which ultimately discharge into either Old Tampa Bay or Hillsborough Bay, sub-sections of Tampa Bay. These basins are the Hillsborough River basin, the Palm River/Tampa Bypass Canal basin, and the upper Tampa Bay/Northwest Hillsborough basin. These drainage systems transport an average of more than 400 million gallons per day of freshwater from uplands in Hillsborough County and adjacent areas to the Tampa Bay estuary (Tampa City Council – Hillsborough County City-County Planning Commission, January 1998).

AIR QUALITY

The Clean Air Act (CAA) of 1970 (as amended in 1990 and 1997), required the U.S. Environmental Protection Agency (EPA) to implement air quality standards to protect public health and welfare. National Ambient Air Quality Standards (NAAQS) were set for six pollutants commonly found throughout the United States: lead, ozone, nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), and particulate matter less than 10 and 2.5 microns in diameter (PM₁₀ and PM_{2.5}).

The Florida Division of Air Resource Management operates National Ambient Monitoring Stations (NAMS) and State and Local Ambient Monitoring Stations (SLAMS) to measure ambient concentrations of these pollutants. Ambient air data are collected by over 200 monitors in 34 counties throughout the state (Florida Department of Environmental Protection, Division of Air Resource Management, "Florida Air Monitoring Report, 2004," <http://www.dep.state.fl.us/Air/publications/techrpt/amr.htm>). Areas that meet the NAAQS standards are designated "attainment areas", while areas not meeting the standards are termed "non-attainment" areas. While no pollutant monitoring data are available for the three Tampa Bay Refuges, per se, air quality is monitored on a regular basis by over 60 monitors in the 4-county region (Hillsborough, Manatee, Pasco, and Pinellas). The 2005 monitoring results indicate that all of the Tampa Bay area qualifies as an attainment area for all monitored pollutants, and that improvement is being noted, see Tables 5 and 6. "Maintenance areas" are areas previously classified as non-attainment areas, which have successfully reduced air pollutant concentrations to below NAAQS standards. As a result of improved air quality, in 1996, Hillsborough and Pinellas Counties were designated as maintenance areas for ozone; and, Hillsborough County a maintenance area for lead (Florida Department of Environmental Protection, Division of Air Resource Management, "Florida Air Monitoring Report, 2004," <http://www.dep.state.fl.us/Air/publications/techrpt/amr.htm>).

The Air Quality Index (AQI) is a summary index for reporting daily air quality. It tells how clean or polluted the air is, and what associated health effects might be concerns. The AQI focuses on health effects that may be experienced within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. (Note: Lead is also considered a major air pollutant under the Clean Air Act. However, because all areas of the United States are currently attaining the NAAQS for lead, the AQI does not specifically address lead). For each of these pollutants, EPA has established national air quality standards to protect public health (U.S. Environmental Protection Agency,

“AirNow,” <http://www.airnow.gov/>). Compared to other metropolitan areas in Florida, the Tampa Bay region has had the least number of good days for air quality. But overall, the average air quality has been improving (Tampa Bay Regional Planning Council, September 2005).

WATER QUALITY

Salinity in lower Tampa Bay, in Egmont Channel, generally ranges over 25-38 ppt. Surface salinities are normally 1-2 ppt (parts per thousand) less than those near the bottom. Minimum salinities occur in September of each year, with maximum salinities in June. Like salinity patterns, temperature patterns in Tampa Bay show little variation with water depth. The annual average water temperature differs by less than 1° C (1.8° F) from the surface to the bottom. Between June and August, maximum water temperatures are 28° to 30° C (82° to 86° F), with minimum temperatures of 15° to 18° C (59° to 64° F) from December through February. Seasonal temperature patterns are similar throughout the bay (Tampa Bay Estuary Program, December 2006).

Based on information collected in 2000, EPA's National Estuary Program Coastal Condition Report rated the overall water quality of Tampa Bay as fair. Using information collected by the Tampa Bay's Estuary Program, the rating used five component indicators: nitrogen, phosphorous, chlorophyll-a, water clarity, and dissolved oxygen conditions in Tampa Bay. All indicators rated good or fair, with the exception of water clarity, which rated poor. Expectations for water clarity were higher because of efforts to re-establish seagrasses in Tampa Bay (Tampa Bay Estuary Program, June 2007).

Although nitrogen is an essential plant nutrient, excess amounts of nitrogen can cause algae blooms and reduced oxygen levels in the bay, resulting in turbid water, fish kills and loss of seagrass when the water becomes so cloudy that sunlight cannot reach grass blades. Stormwater accounts for about 63 percent of total nitrogen loadings to Tampa Bay and about 21 percent comes from atmospheric deposition (air pollution) directly to the bay's surface, either with rainfall or dry deposition. Nitrogen load reductions to Tampa Bay since the late 1970s have resulted in improvements in both water clarity and quality. These improvements are believed to have led to an increase of seagrass acreage that began in the early 1980s, averaging about 250 acres per year, over the past two decades (Tampa Bay Estuary Program, “Baywide Environmental Monitoring Report, 2002-2005,” December 2006; Tampa Bay Estuary Program, <http://www.tbep.org/baystate/waterquality.html>).

Table 5. Air Quality Statistics City and County

Air Quality Statistics by City, 2005^{a,b}

| Metropolitan Statistical Area | 2000 Population | CO 8-hr (ppm) | Pb Qmax (µg/m ³) | NO ₂ AM (ppm) | O ₃ 1-hr (ppm) | O ₃ 8-hr (ppm) | PM ₁₀ Wtd AM (µg/m ³) | PM ₁₀ 24-hr (µg/m ³) | PM _{2.5} Wtd AM (µg/m ³) | PM _{2.5} 24-hr (µg/m ³) | SO ₂ AM (ppm) | SO ₂ 24-hr (ppm) |
|--|-----------------|---------------|------------------------------|--------------------------|---------------------------|---------------------------|--|---|---|--|--------------------------|-----------------------------|
| Tampa--St. Petersburg--Clearwater, FL MSA ^c | 2395997 | 3 | 1.12 ^d | 0.008 | 0.110 | 0.083 | 29 | 78 | 11.1 | 26 | 0.004 | 0.033 |
| National Ambient Air Quality Standards -- | | 9 | 1.50 | 0.053 | 0.125 | 0.085 | 50 | 150 | 15 | 65 | 0.030 | 0.140 |

Air Quality Statistics by County, 2005^{a,b}

| Parish/ County | 2000 Population | CO 8-hr (ppm) | Pb Qmax (µg/m ³) | NO ₂ AM (ppm) | O ₃ 1-hr (ppm) | O ₃ 8-hr (ppm) | PM ₁₀ Wtd AM (µg/m ³) | PM ₁₀ 24-hr (µg/m ³) | PM _{2.5} Wtd AM (µg/m ³) | PM _{2.5} 24-hr (µg/m ³) | SO ₂ AM (ppm) | SO ₂ 24-hr (ppm) |
|--|-----------------|---------------|------------------------------|--------------------------|---------------------------|---------------------------|--|---|---|--|--------------------------|-----------------------------|
| Hillsborough County | 998948 | 3 | 1.12 ^d | 0.008 | 0.110 | 0.083 | 29 | 78 | 11.1 | 26 | 0.004 | 0.033 |
| Manatee County | 264002 | ND | ND | 0.005 | 0.102 | 0.077 | 27 | 99 | 8.9 | 21 | 0.002 | 0.007 |
| Pasco County | 344765 | ND | ND | ND | 0.093 | 0.077 | ND | ND | ND | ND | ND | ND |
| Pinellas County | 921482 | 2 | 0.01 | 0.008 | 0.090 | 0.074 | 23 | 54 | 10.4 | 25 | 0.003 | 0.024 |
| National Ambient Air Quality Standards -- | | 9 | 1.50 | 0.053 | 0.125 | 0.085 | 50 | 150 | 15 | 65 | 0.030 | 0.140 |

CO - Highest second maximum non-overlapping 8-hour concentration (applicable NAAQS is 9 ppm)

Pb - Highest quarterly maximum concentration (applicable NAAQS is 1.5 µg/m³)

NO₂ - Highest arithmetic mean concentration (applicable NAAQS is 0.053 ppm)

O₃ (1-hour) - Highest second daily maximum 1-hour concentration (applicable NAAQS is 0.125 ppm)

O₃ (8-hour) - Highest fourth daily maximum 8-hour concentration (applicable NAAQS is 0.085 ppm)

PM₁₀ - Highest weighted annual mean concentration (applicable NAAQS is 50 µg/m³)

- Highest second maximum 24-hour concentration (applicable NAAQS is 150 µg/m³)

PM_{2.5} - Highest weighted annual mean concentration (applicable NAAQS is 15 µg/m³)

- Highest 98th percentile 24-hour concentration (applicable NAAQS is 65 µg/m³)

SO₂ - Highest annual mean concentration (applicable NAAQS is 0.03 ppm)

- Highest second maximum 24-hour concentration (applicable NAAQS is 0.14 ppm)

ND - Indicates data not available

AM - Annual mean

Qmax - Quarterly maximum

IN - Indicates insufficient data to calculate summary statistic

µg/m³ - Units are micrograms per cubic meter

ppm - Units are parts per million

Notes: Data from exceptional events are not included. The monitoring data represent the quality of air in the vicinity of the monitoring site and, for some pollutants, may not necessarily represent urban-wide or parish/ county-wide air quality.

^a U.S. Environmental Protection Agency, <http://www.epa.gov/airtrends/factbook.html>

^b "Florida Air Monitoring Report, 2004", State of Florida, Department of Environmental Protection, Division of Air Resource Management, Tallahassee, FL, <http://www.dep.state.fl.us/Air/publications/techrpt/amr.htm>

^c The Tampa-St.Petersburg-Clearwater Metropolitan Statistical Area (MSA) is comprised of four counties: Pinellas, Hillsborough, Pasco, and Hernando

^d Localized impact from an industrial source in Tampa, FL. Concentration from highest nonpoint source site is 0.01 µg/m³ in Pinellas County, FL.

Table 6. Air Quality Trends

Air Quality Trends - Tampa - St. Petersburg - Clearwater MSA, 1990-2005^a

| Pollutant | Trend Statistic | Number of Trend sites | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------------------|----------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| CO | 2nd Max | 2 | 4.5 | 3.2 | 3.3 | 2.4 | 2.4 | 3.1 | 2.5 | 2.7 | 3.0 | 2.3 | 2.1 | 2.3 | 2.2 | 1.8 | 1.5 | 1.5 |
| NO ₂ | Annual Mean | 2 | 0.013 | 0.012 | 0.011 | 0.011 | 0.010 | 0.011 | 0.011 | 0.011 | 0.011 | 0.013 | 0.012 | 0.011 | 0.011 | 0.010 | 0.009 | 0.008 |
| O ₃ | 4th Max | 7 | 0.080 | 0.070 | 0.074 | 0.071 | 0.075 | 0.075 | 0.074 | 0.080 | 0.089 | 0.084 | 0.081 | 0.081 | 0.069 | 0.077 | 0.074 | 0.075 |
| O ₃ | 2nd Max | 7 | 0.106 | 0.097 | 0.094 | 0.093 | 0.093 | 0.096 | 0.098 | 0.099 | 0.111 | 0.108 | 0.100 | 0.104 | 0.086 | 0.101 | 0.090 | 0.093 |
| PM _{2.5} | Weighted Annual Mean | 5 | 27.2 | 27.4 | 25.9 | 27.0 | 25.6 | 24.8 | 26.4 | 26.9 | 26.8 | 26.0 | 26.6 | 25.6 | 22.2 | 23.0 | 22.4 | 22.9 |
| SO ₂ | Weighted Annual Mean | 2 | | | | | | | | | | 12.3 | 12.9 | 11.5 | 10.5 | 9.9 | 10.5 | 10.7 |
| SO ₂ | Annual Mean | 7 | 0.0066 | 0.0058 | 0.0052 | 0.0059 | 0.0055 | 0.0046 | 0.0046 | 0.0048 | 0.0048 | 0.0051 | 0.0041 | 0.0041 | 0.0042 | 0.0036 | 0.0028 | 0.0025 |

Note: Data from exceptional events are not included. These trends are based on sites having an adequate record of monitoring data during the trend period.

The values shown are the composite averages among these trend sites.

Units for CO, NO₂, O₃, and SO₂ are ppm. Units for PM_{2.5} are ug/m³.

The 4th max for ozone is based on 8-hour data. The 2nd max for ozone is based on 1-hour data.

^a U.S. Environmental Protection Agency, <http://www.epa.gov/airtrends/factbook.html>

Despite improvements in water quality in Tampa Bay, most of the bay is closed to shellfish harvesting because of the risk of bacterial contamination from pollutants carried in runoff from the land. Consuming shellfish from such waters could result in a variety of illnesses, ranging from diarrhea to infectious hepatitis. To protect public health, it is actually against the law to possess shellfish such as oysters or clams taken from waters that are closed to shellfish harvesting. Two areas of Tampa Bay, near Fort DeSoto in Pinellas County and in portions of Tampa Bay in Manatee County, are conditionally approved for shellfish harvesting; however, these areas are typically closed to harvesting following heavy rains, which wash bacteria-laden pollutants into the water. Information about the status of these two conditionally approved harvesting areas is available by calling the state's regional aquaculture, <http://www.floridaaquaculture.com> (Tampa Bay Estuary Program, <http://www.tbep.org/eyesonthebay/greenmussels.html>).

Red tides occur in the Gulf of Mexico almost every year, generally in the late summer or early fall. They are most common off the central and southwestern coasts of Florida. The Florida red tide organism, *Karenia brevis*, produces a toxin that can kill marine animals and affect humans. Scientists have studied this organism for more than 50 years. The Florida red tide organism was identified in 1947, but anecdotal reports of the effects of red tide in the Gulf of Mexico date back to the 1530s. Most blooms last 3 to 5 months and may affect hundreds of square miles. Occasionally, however, blooms continue sporadically for as long as 18 months and may affect thousands of square miles. Red tides can kill fish, birds, and marine mammals; cause health problems for humans; and adversely affect local economies. When *Karenia brevis* reaches cell counts of 5,000 cells per liter of seawater, shellfish beds in the area are closed, sometimes for months at a time, until it was safe to harvest again. A protracted and intense red tide (*Karenia brevis*) bloom affected Tampa Bay and surrounding waters during 2005. Originating south of Tampa Bay, the bloom was first detected at medium to high levels at the mouth of the bay on June 10, 2005, moving into the lower bay by July 6. The medium to high levels as indicated by pink and red dots correspond to cell counts greater than 100,000 cells per liter, levels consistently associated with fish mortalities. These elevated cell counts persisted within Tampa Bay through the beginning of October 2005 (Florida Fish and Wildlife Conservation Commission, "2005 Red Tide Impacts on Fish Spawning in Tampa Bay," http://research.myfwc.com/features/view_article.asp?id=27503 and "Red Tides in Florida," http://research.myfwc.com/features/view_article.asp?id=24936).

Excessive concentrations of mercury have been found in Tampa Bay (and in fact all of Florida's coastal waters), affecting commercial and sport-fishing interests. A much better understanding of local, regional, and global sources, amounts, and effects of mercury on Florida waters and fisheries is needed. Most Florida seafood contains low to medium levels of mercury. As a result, the State of Florida has issued human health advisories regarding consumption of fish for several species. "Do not eat" advisories have been issued for all of Florida coastal and marine waters for king mackerel, shark, blackfin tuna, cobia, and little tunny. Moderate risk and low risk fish consumption advisories have also been issued for a number of other marine and estuarine fish species (Florida Department of Health, Division of Environmental Health, "Your Guide to Eating Fish Caught in Florida," <http://doh.state.fl.us/floridafishadvice/>; and National Science and Technology Council, June 2004).

A potential groundwater contaminants site at the base of the lighthouse on Egmont Key was investigated and was determined not to be significant. The USCG supposedly had dumped the old batteries from the lighthouse at its base. Additional surveys were conducted within Fort Dade at some potential sites for oil contamination (oil house for the train), and no oil was found (Kleen and Hunter, USFWS, June 2006).

BIOLOGICAL RESOURCES

HABITAT

Egmont Key NWR is an offshore island, not a true barrier island. It provides nesting, feeding, and resting habitat for brown pelicans, terns, and other colonial nesting waterbirds. It also provides habitat and protection for endangered species such as manatees, sea turtles and others. Egmont Key has a long history of human habitation (Section A, Chapter II), and its habitats are highly modified by both exotic plants and past human habitation. The primary vegetation types include sea oat (*Uniola paniculata*) meadows, Australian pine (*Casuarina equisetifolia*) groves, and extensive forests with a mixed cabbage palm (*Sabal palmetto*) – Australian pine-Brazilian pepper (*Schinus terebinthifolius*) overstory (Dodd, March 1998). Brazilian pepper and Australian pine occur throughout the interior of the key, interspersed with cabbage palms, sea grapes, red cedar, wax myrtle, and strangler fig.

Egmont Key contains five distinct natural communities (plus ruderal and developed areas) (Florida Division of Recreation and Parks, February 1998):

- Coastal berm – storm-deposited sand and shell berms which develop ridges paralleling the shoreline. Dominant plant species on Egmont are cabbage palm, strangler fig, poison, ivy, Spanish stopper, saw palmetto, sea grape and Florida privet. A small number of southern red cedars also occur. Gopher tortoise burrows are frequent in the coastal berm community. This community is extensively and heavily infested with the exotic Brazilian pepper.
- Beach dune – dunes are formed by wind and wave action and are characterized by low-growing pioneer plants. Sea oats, sand spur, railroad vine and hairy beach sunflower are found here.
- Marine unconsolidated substrate – sandy beaches are best developed on the western shore of the Egmont Key, where Gulf waves strike the shoreline. This natural community supports marine invertebrates, amphipods, shrimp, and crabs, which in turn, support vertebrates such as redfish and flounder. This sandy beach community provides essential habitat for shorebirds such as terns, skimmers, oyster catchers, plovers and sandpipers.
- Coastal grassland – the coastal grassland community is found on the west-central part of the island. It is transitional between coastal berm and dune, lacking the woody species of the coastal berm – trees and shrubs are few. Common plants include sea oats, tall threeawn grass, muhly grass, beach panicum, sand spurs, and seaside gentian.
- Marine grass beds – Seagrass beds are just beyond the sheltered, eastern shore. Three species of seagrass (shoal grass, turtle grass, and manatee grass) are found.

A summary depiction of the habitats found on Egmont Key is presented in Figure 14.

Seagrass beds are important habitat in Tampa Bay and are identified in Figure 15. The seagrass area on the east of Egmont Key (about 29 acres) is protected. Both manatees and sea turtles are observed in the Tampa Bay vicinity waters (Figure 16), and, in particular, manatees are occasionally seen in the proximity of the seagrass beds along the eastern shore of Egmont Key. Approximately 20-70 endangered Atlantic loggerhead turtles nest from May to October along the island's shoreline and would benefit from removal of Australian pine whose shallow root system interferes with nest

Figure 14. Vegetation types of Egmont Key National Wildlife Refuge

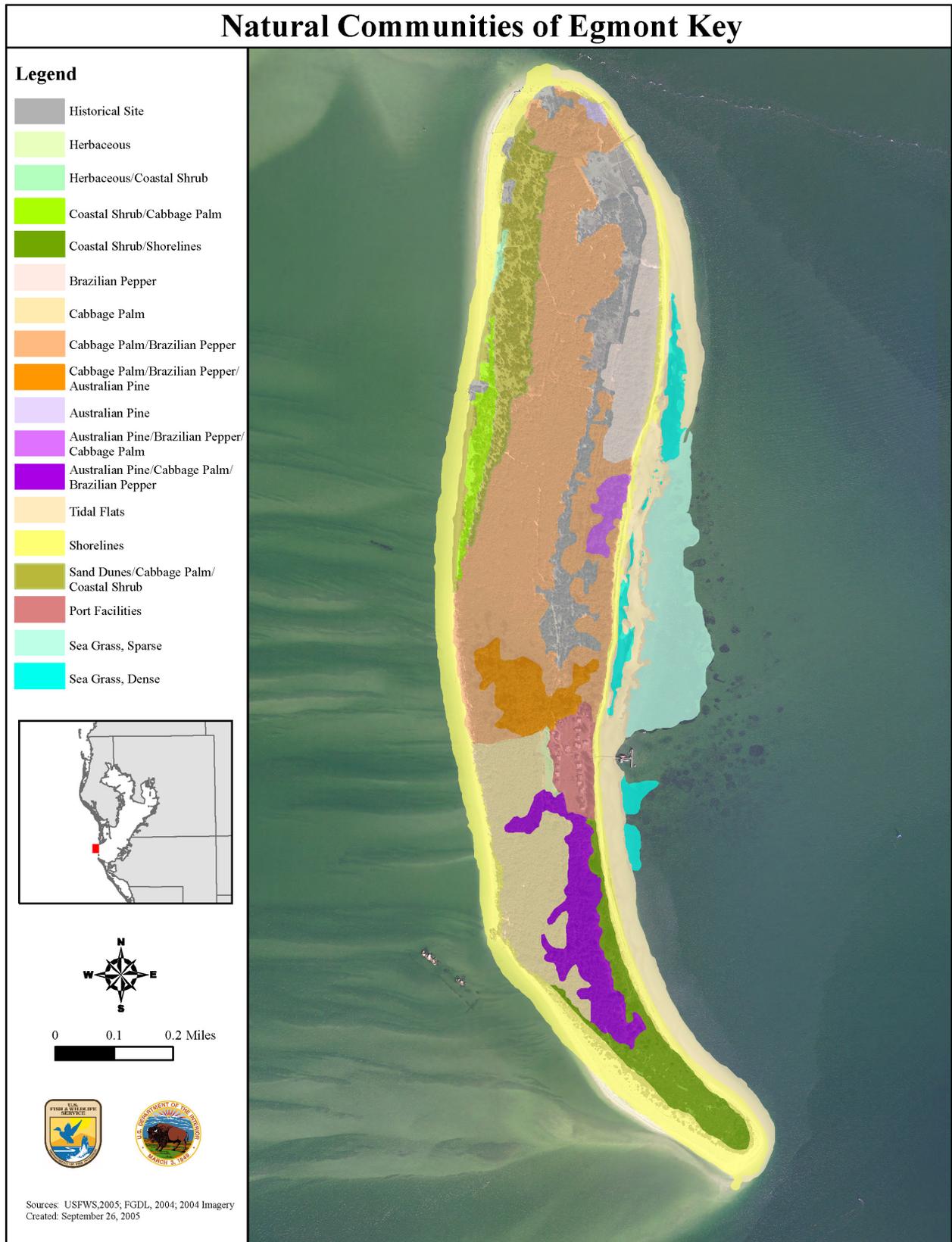
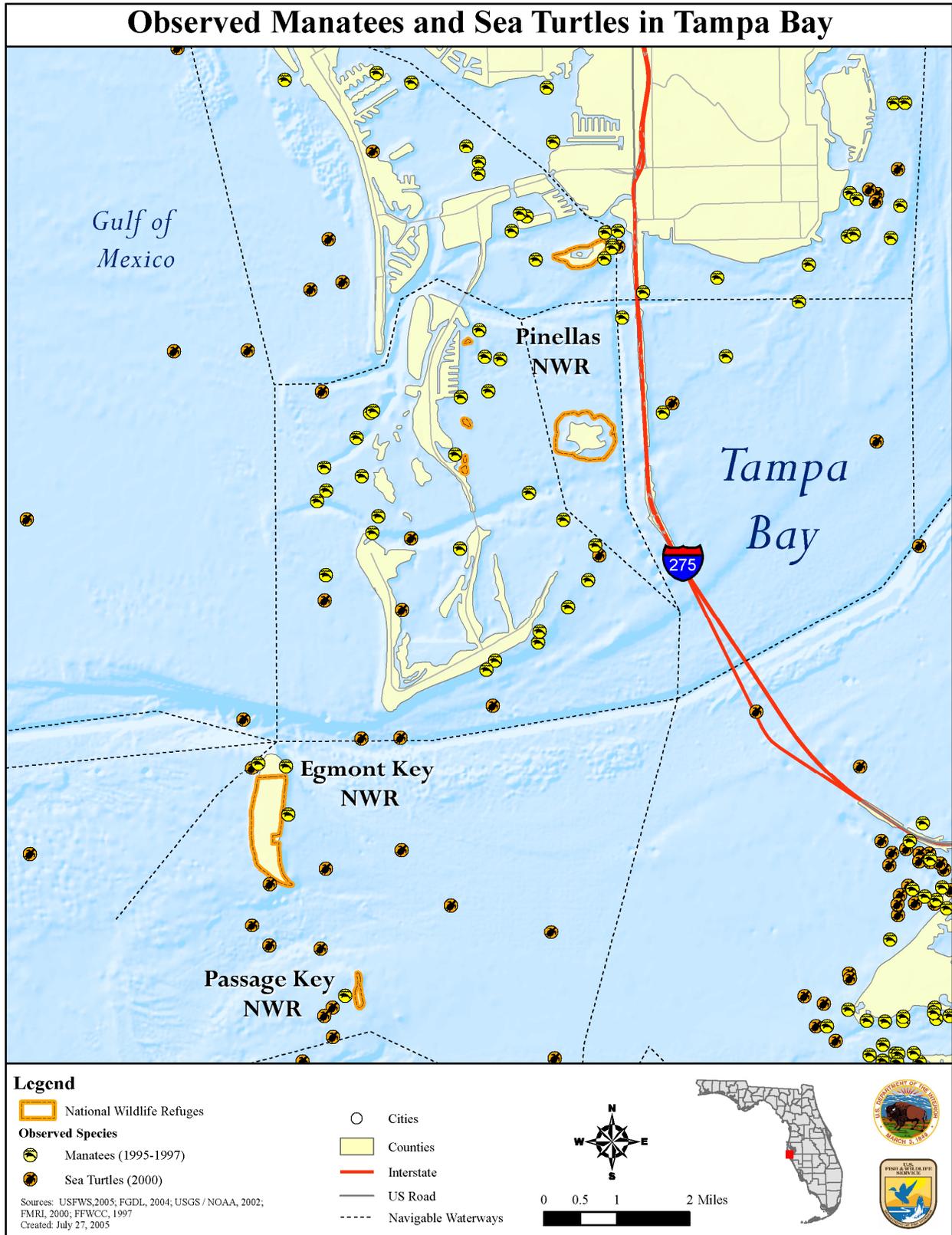


Figure 15. Seagrass beds in Tampa Bay



Figure 16. Observed manatees and sea turtles in Tampa Bay



building. Controlling Brazilian pepper and Australian pine restores natural habitat and also enhances nesting habitat for least terns, a state-listed threatened species. Both exotic plants have become pervasive and have altered the native hammock community habitats, which support the island's large native box turtle populations. There is an ongoing control program for the exotics Brazilian pepper and Australian pine. Garlon 4 herbicide has been applied directly to exotics, Australian pines have been girdled, and much Brazilian pepper has been cut. The south end of Egmont Key (about 97 acres) is a protected wildlife sanctuary. The south end wildlife sanctuary provides the most important resting and nesting site for plovers, terns, and other shorebirds.

Pinellas NWR contains 7 mangrove islands encompassing about 394 acres. The refuge is comprised of Little Bird, Mule, Jackass, Listen, Whale, Tarpon and Indian Keys. The submerged lands in the area of the refuge include hard- and soft-bottom habitats, seagrass beds, and oyster reefs. The shoreline is protected by mangroves. Mangrove areas and scattered openings within the mangrove provide excellent foraging and resting habitat for herons, ibis, wood storks, and waterfowl. The mangrove islands are used as rookeries by the larger wading birds, (herons, ibis, and egrets) and also for nesting by vireos, warblers, and mangrove cuckoos (Pinellas County Department of Engineering and the Department of Environmental Management, August 1987). In the last few years, mangrove habitat has been lost due to erosion from boat wakes, storm tides, tropical storms, and hurricanes.

Three species of mangroves occur within the refuge: red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*). The predominant salt marsh plant is black needlerush (*Juncus roemerianus*). The zonation of the salt marsh normally starts with smooth cordgrass (*Spartina alterniflora*) occurring at the shoreline or behind a fringe of mangrove. Landward of the smooth cordgrass, black rush is usually found. Further landward of the black rush is vegetation such as seashore saltgrass (*Distichlis spicata*), glasswort (*Salicornia perennis*), and saltwort (*Batis maritima*). Five species of marine grasses are found in the refuge area: turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), widgeon grass (*Ruppia maritima*), and *Halophila baillonis* (Caribbean Halophila) (Pinellas County Department of Engineering and the Department of Environmental Management, August 1987). A seagrass sanctuary is located around Tarpon and Indian Keys.

Hundreds of brown pelicans and double-crested cormorants and dozens of herons, egrets, and roseate spoonbills nest within Tarpon and Little Bird Keys. Pinellas provides important mangrove habitat for most long-legged wading species, especially for reddish egrets. The islands and shorelines are subject to erosion and invasion by exotic species, such as Brazilian pepper and Australian pine. All of the mangrove islands of Pinellas NWR are closed to all public use year-round to protect the migratory birds (Kleen and Hunter, June 2006; Florida Department of Environmental Protection, <http://www.dep.state.fl.us/coastal/sites/bocaciega-pinellas/info.htm>).

Passage Key NWR is now a meandering sand bar varying in size from less than 0.5 to 10 acres, depending on meteorologic and hydrologic conditions (USFWS, <http://www.fws.gov/southeast/pubs/PassageFactSheet.pdf>; and USFWS Tampa Bay Refuges Visitor Services Review Report, March 2004). In 1970, Passage Key NWR was designated a Wilderness Area and because of its fragility and small size, it is now closed to all public use. The refuge's objectives are to provide habitat for colonial waterbirds. Hundreds of brown pelicans, laughing gulls, black skimmers, and royal terns nested annually. The small sand bar represented one of the last remaining nesting sites for laughing gulls, black skimmers, and royal terns in Tampa Bay. The key hosted the largest royal tern and sandwich tern nesting colonies in the State of Florida. Small numbers of herons and egrets also nested on the key. Passage Key NWR is closed to public use year-round to protect the migratory birds that use the island.

WILDLIFE

The Tampa Bay area contains more than 200 fish species, including popular species such as snook, redfish, and spotted sea trout. The bay's mangrove-blanketed islands support the most diverse colonial waterbird nesting colonies in North America, annually hosting 40,000 pairs of 25 different species, ranging from the familiar white ibis and great blue heron to the reddish egret—the rarest heron in the nation. Tables 7 and 8 list protected animal and plant species and those species of special concern, respectively, in the Tampa Bay region (Florida Department of Environmental Protection, “Basin Status Report,” November 2001).

Egmont Key NWR – More than 375 different species of birds have been reported in the Tampa Bay area. Bird checklists for Egmont Key list over 110 species of birds (USGS Northern Prairie Wildlife Research Center, “Bird Checklists of the United States, Egmont Key State Park and National Wildlife Refuge” <http://www.npwrc.usgs.gov/resource/birds/chekbird/r4/egmont.htm>). Approximately 38,000 pairs of birds nested on Egmont's beaches in 2007. In past years, instances of human disturbance have caused total failure of all nesting colonies.

In addition to numerous birds, presently, at least 12 reptiles and 4 amphibians are reported on Egmont Key (U.S. Geological Survey, “National Treasures: The Box Turtles of Egmont Key,” http://cars.er.usgs.gov/Education/Egmont_for_PDF.pdf). Tables 9 and 10 are listings of birds, amphibians, reptiles, fish and mammals observed on Egmont Key. Several of these species are non-resident, no longer present, or present on the key for only a part of their life cycle. Formerly, there were deer, raccoons, marsh rabbits, rats, and eastern diamondback rattlesnakes on Egmont Key, but there are no plans to return these species to the refuge. Atlantic loggerhead turtles nest on the island; and large populations of box turtles are resident on the island (due to lack of predators and an abundance of cockroaches as a food source). In addition, gopher tortoises are abundant and conspicuous on Egmont Key. Egmont Key has the highest density populations of gopher tortoises in the state. Observations of black racers and mole skinks suggest behavioral and physiological distinctions that indicate these populations developed in isolation from mainland species, and consequently they are regarded as special natural features of Egmont Key. Several species of wildlife have been reported from the island in the past, yet recent documentation is lacking. Species requiring verification include marsh rabbits, native and/or exotic mice, diamondback terrapins, raccoons and bats. Three species of lizards exist as museum records but have not been recently observed. The presence of feral cats on the island may have contributed to the apparent elimination of several small vertebrate species (Florida Division of Recreation and Parks, February 1998).

Surveys of the flora and fauna of Egmont Key were conducted in 1990. From this and other studies, a list of “designated species” was compiled for Egmont Key. This list of designated species consists of the following (Florida Division of Recreation and Parks, February 1998) (Note: Designated species are those which are listed by the Florida Natural Areas Inventory--FNAI, USFWS, Florida Game and Fresh Water Fish Commission—FGFWFC (currently FWC), and the Florida Department of Agriculture and Consumer Services--FDA as endangered, threatened, or of special concern. Designated species also include those which are under review for inclusion in one of the above categories and those species which are regulated by the Convention on International Trade in Endangered Species--CITES):

- two plant species - Hairy beach sunflower (*Helianthus debilis* ssp. *vestitus*), and Shell mound prickly-pear cactus (*Opuntia stricta*);
- one fish - Common Snook;
- three reptiles - Atlantic loggerhead turtle, Atlantic green turtle, and gopher tortoise;

-
- seven birds - Brown pelican, Snowy egret, Reddish egret, Wood stork, Bald eagle, American oystercatcher, and Least tern; and
 - one mammal - West Indian manatee.

The State of Florida lists six plant species on Egmont Key NWR as threatened (T) or endangered (E): Inkberry (*Scaevola plumieri*)-T, and Prickly pear cactus (*Opuntia stricta*)-T. A seventh species, the Hairy beach sunflower (*Helianthus debilis* ssp. *vestitus*), is proposed for listing (Kleen and Hunter, USFWS, June 2006). Live oaks (*Quercus virginiana* and/or *Q. geminata*) are now absent, but were apparently present on the island in the last century (Florida Department of Environmental Protection, November 1996).

Tables 7 and 8 list plants and animals which are classified as protected or species of special concern in the Tampa Bay area. Those species shown in blue have been observed at Egmont Key NWR. A complete listing of the plants found on Egmont Key NWR is given in "*Egmont Key Unit Management Plan (Review Draft)*," Division of Recreation and Parks, Department of Environmental Protection, State of Florida, February 13, 1998; of which 14 species are thought to be exotic.

In 2007, 550 pairs of black skimmers have nested on Egmont Key NWR, the greatest number to date, due to beach renourishment and nest protection from law enforcement and volunteers. Poor success in the past has been caused by beach erosion and disturbance by humans. Annually, 2,500-5,000 pairs of royal and sandwich terns nest on Egmont Key NWR. Adult and recently fledged royal and sandwich terns regularly rest and feed on the island.

About 150 piping plovers are found in the Tampa Bay area during the non-breeding season (fall, winter, and spring). The island is listed as critical habitat for endangered piping plovers; however, they are only viewed infrequently on Egmont Key NWR usually in the fall or early winter. Least tern populations have been declining and they have been nesting only sporadically on Egmont Key NWR with 135 pairs recorded in 2007. The Tampa Bay area has a population of 100-125 pairs of American oystercatchers. Two to four of these pairs nest on Egmont Key NWR annually. A few pairs (less than 30) of snowy plovers nest in the Tampa Bay area. Currently, none are nesting on Egmont, but they have been observed feeding and resting on the island. More recently, 10-200 pairs of white ibis nested on Egmont Key NWR from 2004 to 2008.

A discussion of the concerns for nesting waterbirds and shorebirds, and transient and wintering shorebirds on Egmont Key NWR are included with the Passage Key NWR discussion, below. Likewise, a discussion of the transient Nearctic-neotropical migratory species breeding, migrating through, or wintering on Egmont Key NWR is included in the Pinellas NWR discussion, below.

Pinellas NWR – Pinellas NWR was established as a breeding ground for colonial bird species. Species nesting in the refuge include brown pelicans, herons, egrets, and cormorants. Pinellas NWR hosted the largest brown pelican rookery in the state. Animal and plant species in the Tampa Bay area, which are protected or of special concern are shown in Tables 7 and 8. FWC has listed animals which are rare, endangered, or species of special concern for the Boca Ciega Bay and Pinellas County Aquatic Preserves, in which Pinellas NWR is located. These are shown in Table 11 (Florida Department of Environmental Protection, <http://www.dep.state.fl.us/coastal/sites/bocaciega-pinellas/info.htm>).

The bird species nesting on Pinellas NWR do so mostly in mangrove woodlands, today mostly on Little Bird Key. Formerly, nesting occurred widely on other keys, especially on Tarpon and Whale Keys but do so today at greatly reduced levels. Tarpon Key, one of the islands within Pinellas NWR, was a significant nesting, resting, and feeding area for a variety of colonially nesting waterbirds

including white ibis, reddish egrets, and roseate spoonbills. Very little nesting has been documented in the last few years, when predator control efforts were reduced and this colony succumbed to the predation of raccoons and possibly fish crows.

- The conservation list for Bird Conservation Region 31 (BCR 31, Peninsular Florida) indicated the following species nesting in Tampa Bay should be considered as in need of conservation attention in refuge planning. The mangrove nesting and roosting waterbirds of specific conservation concern in the Pinellas NWR are (Kleen and Hunter, USFWS, June 2006):

Mangrove nesting and roosting waterbirds

Critical Recovery

Wood Stork

Immediate Management

Reddish Egret

Roseate Spoonbill

Conservation Stewardship

Double-crested Cormorant

Snowy Egret

Other species

Cattle Egret

Black-crowned Night-Heron

Management Attention

Brown Pelican

Tricolored Heron

White Ibis

Glossy Ibis

Little Blue Heron

Great Egret

Anhinga

Great Blue Heron

Green Heron

Yellow-crowned Night-Heron

Regionally, the reddish egret is the highest priority species among long-legged waders found nesting in Tampa Bay. They have not increased overall since the stoppage of the millinery trade. The Tampa Bay area supports the northernmost breeding population along Florida's Gulf Coast and includes at present between 60 and 85 pairs. This population has stabilized in the last few years.

The federally endangered wood storks are not nesting on any refuge lands in the Tampa Bay area, but they do nest in Tampa Bay. The tricolored heron is of increasing concern regionally and in Florida. Because this species is most numerous in coastal habitats, Tampa Bay Refuges provide significant potential for foraging and nesting habitat.

Roseate spoonbills regionally appear to be doing well, but there is concern for the species in Peninsular Florida (especially south Florida). Tampa Bay populations may be important as the northernmost breeding population along Florida's Gulf Coast.

Brown pelicans seem to be doing well elsewhere in the southeast, with the exception of some areas in Florida (and South Carolina). Florida populations are apparently undergoing declines. Brown pelicans are susceptible to entanglement in monofilament line. Pelicans may be attempting to gather monofilament as fine material for nests, thus either getting entangled, or distributing monofilament throughout nesting areas.

White ibis are also of some regional concern, but while the species does breed in Tampa Bay, none are presently nesting on Pinellas NWR proper. This is a wandering species where numbers can fluctuate greatly locally depending on water conditions throughout the state/region. This area can provide important nesting sites when conditions inland are poor. For example, in 2003, 18,000 pairs nested in Tampa Bay due to poor conditions at historical colonies in the Everglades. More recently,

white ibis actually nested on Egmont Key NWR in 2004, for the first time known to the present refuge staff (i.e., during the last 18 years) and again from 2006-2008.

Yellow-crowned night herons nest at edges and are vulnerable to fish crows. They are crustacean specialists and have limited foraging areas. Black-crowned night herons are more widespread and not of much concern overall, but colonies don't exist in the thousands like they used to. Both species have nested on Tarpon and Little Bird Keys, Pinellas NWR.

Although not breeding in Tampa Bay, the keys in Pinellas NWR may represent important post-breeding roost sites for the magnificent frigatebird.

- Mangroves also support a number of landbirds, principal among these are mangrove cuckoo, black-whiskered vireo, and Florida prairie warbler. Landbirds of conservation interest on Tampa Bay Refuges include mangrove breeding species and transient Neartic-neotropical migratory species. The conservation list for Bird Conservation Region 31 (BCR 31, Peninsular Florida) indicated the following species breeding, migrating through or wintering in Tampa Bay (specifically Pinellas and Egmont Key NWRs) should be considered as in need of conservation attention in refuge planning (Kleen and Hunter, USFWS, June 2006). (Note - there is very little active management intended for landbird habitat, other than exotic vegetation control where needed.)

Mangrove breeding species and transient Neartic-neotropical migratory species

Immediate Management

Prairie Warbler
Loggerhead Shrike
Painted Bunting

Conservation Stewardship

Gray kingbird
White-eyed Vireo
Sedge Wren
Cape May Warbler
Black-throated Blue Warbler
Connecticut Warbler
Bobolink

Other species

Peregrine Falcon

Management Attention

Mangrove Cuckoo
Black-whiskered Vireo
Common Ground-Dove
Eastern Towhee
Common Nighthawk
Chuck-will's-widow
Eastern Meadowlark
Northern Flicker
Northern Harrier
Purple Martin
Vesper Sparrow

Passage Key NWR – Passage Key NWR was originally a mangrove island with a freshwater lake, but over the past 100 years, this island refuge has been reduced from 36 acres to a meandering sandbar of .5-10 acres due to the effects of high tides, tropical storms, and hurricanes. Since this refuge is designated wilderness, any attempts to restore it through beach renourishment require additional considerations on impacts to wilderness character (Kleen and Hunter, USFWS, June 2006).

Passage Key NWR was the most important colony for both royal terns and sandwich terns in the State of Florida at one time. Approximately 1,000-2,000 birds including brown pelicans, laughing gulls, royal terns, and black skimmers nested on Passage Key NWR. Among nesting shorebirds, plovers and oystercatcher are the highest priority species, but presently only the American oystercatcher is known to nest here. Wilson's plovers are not nesting on Passage Key NWR, but the potential exists. Snowy plovers also are not nesting here, but do occur elsewhere in Tampa Bay.

Among the colonial nesting species, black skimmers and least terns are the highest priority species nesting on Passage Key NWR and was the most secure nesting site in Tampa Bay. This island is closed to the public year-round to protect nesting, resting, and migrating birds, but illegal access by the public cause birds to abandon their nests.

Large and important colonies of brown pelican, laughing gull, royal and sandwich terns occurred on Passage Key NWR. However, human disturbance of nesting shorebirds and depredation by fish crows have resulted in poor reproductive success. Currently, no nesting is occurring since the island is submerged at high tide.

- The conservation list for Bird Conservation Region 31 (BCR 31, Peninsular Florida) indicates the following beach nesting waterbird and shorebird species in Tampa Bay (viz. Passage Key and Egmont Key NWRs) should be considered as in need of conservation attention in refuge planning ((Kleen and Hunter, USFWS, June 2006):

Beach nesting waterbird and shorebird species

Critical Recovery

Snowy Plover

Conservation Stewardship

Willet

Royal Tern

Other species

Black-necked Stilt

Caspian Tern

Management Attention

Wilson's Plover

American Oystercatcher

Brown Pelican

Least Tern

Sandwich Tern

Laughing Gull

Gull-billed Tern

Black Skimmer

- Passage Key and Egmont Key NWRs also provide important foraging and roosting habitat for transient and wintering shorebirds. The conservation list for Bird Conservation Region 31 (BCR 31, Peninsular Florida) indicates the following migrating or wintering species in Tampa Bay should be considered as in need of conservation attention in refuge planning (Kleen and Hunter, USFWS, June 2006):

Transient and wintering shorebirds

Critical Recovery

Piping plover

Long-billed Curlew

Conservation Stewardship

Willet

Black-bellied Plover

Semipalmated Plover

Management Attention

Marbled Godwit

Semipalmated Sandpiper

Short-billed Dowitcher

Least Sandpiper

Stilt Sandpiper

Red Knot

Sanderling

Western Sandpiper

Dunlin

Whimbrel

Ruddy Turnstone

Table 7. Protected animal and plant species in the Tampa Bay Basin

| Scientific Name* | Common Name | Federal Protection Status | State Protection Status | FNAI Global Rank | FNAI State Rank |
|--------------------------------|-----------------------------|---------------------------|-------------------------|------------------|-----------------|
| AMPHIBIANS AND REPTILES | | | | | |
| Alligator mississippiensis | American alligator | T(S/A) | LS | G5 | S4 |
| Caretta caretta | Loggerhead turtle | LT | LT | G3 | S3 |
| Chelonia mydas | Green turtle | LE | LE | G3 | S2 |
| Drymarchon corais couperi | Eastern indigo snake | LT | LT | G4T3 | S3 |
| Eretmochelys imbricata | Hawksbill turtle | LE | LE | G3 | S1 |
| Gopherus polyphemus | Gopher tortoise | N | LT | G3 | S3 |
| Lepidochelys kempii | Kemp's Ridley turtle | LE | LE | G1 | S1 |
| BIRDS | | | | | |
| Ajaia ajaja | Roseate spoonbill | N | LS | G5 | S2 S3 |
| Aramus guarana | Limpkin | N | LS | G5 | S3 |
| Charadrius melodus | Piping plover | LT | LT | G3 | S2 |
| Egretta caerulea | Little blue heron | N | LS | G5 | S4 |
| Egretta rufescens | Reddish egret | N | LS | G4 | S2 |
| Egretta thula | Snowy egret | N | LS | G5 | S4 |
| Egretta tricolor | Tricolored heron | N | LS | G5 | S4 |
| Eudocimus albus | White ibis | N | LS | G5 | S4 |
| Haliaeetus leucocephalus** | Bald eagle | LT | LT | G4 | S3 |
| Grus Canadensis pratensis | Florida sandhill crane | N | LT | G5T2T3 | S2 S3 |
| Haematopus palliatus | American oystercatcher | N | LS | G5 | S3 |
| Mycteria americana | Wood stork | LE | LE | G4 | S2 |
| Pelecanus occidentalis | Brown pelican | N | LS | G4 | S3 |
| Rynchops niger | Black skimmer | N | LS | G5 | S3 |
| Sterna antillarum | Least tern | N | LT | G4 | S3 |
| MAMMALS | | | | | |
| Podomys floridanus | Florida mouse | N | LS | G3 | S3 |
| Sciurus niger shermani | Sherman's fox squirrel | N | LS | G5T2 | S2 |
| Trichechus manatus | Manatee | LE | LE | G2 | S2 |
| PLANTS | | | | | |
| Asclepias curtissii | Curtiss' milkweed | N | LE | G3 | S3 |
| Bigelovia nuttalli | Nuttall's rayless goldenrod | N | LE | G3g4 | S1 |
| Chrysopsis floridana | Florida golden aster | LE | LE | G1 | S1 |
| Glandularia tampensis | Tampa vervain | N | LE | G1 | S1 |
| Gossypium hirsutum | Wild cotton | N | LE | G4G5 | S3 |
| | | | | | |
| Opuntia stricta | Prickly pear cactus | | T | | |
| Scaevola plumier | Inkberry | | T | | |
| Pteroglossaspis ecristata | Giant orchid | N | LT | G2 | S2 |

* Species listed in boldface type use or live in freshwater, saltwater, and/or wetland communities.

** Proposed for federal delisting because of the species' recovery.

Species shown in blue have been observed at Egmont Key NWR.

Note: The Federal Protection Status column indicates the official federal endangerment status or level of legal protection, under the U.S. Endangered Species Act Classification, for the plant or animal species, subspecies, or variety as proposed or determined by the U.S. Fish and Wildlife Service or the National Oceanic and Atmospheric Administration (marine species). The classifications are as follows:

LE = Listed as Endangered.

LT = Listed as Threatened.

T(S/A) = Threatened due to similarity of appearance.

N = Not currently listed, nor currently being considered for listing.

The State Protection Status column shows the official state endangerment status or level of legal protection, as follows:

Animals listed by Florida Fish and Wildlife Conservation Commission:

LE = Listed as Endangered.

LT = Listed as Threatened.

LS = Listed as Species of Special Concern.

N = Not currently listed, nor currently being considered for listing.

Plants listed by Florida Department of Agriculture and Consumer Services (FDACS):

LE = Listed as Endangered.

LT = Listed as Threatened.

N = Not currently listed, nor currently being considered for listing.

Table 8. Non-listed animal and plant species of special concern in the Tampa Bay Basin

| Scientific Name* | Common Name | FNAI Global Rank | FNAI State Rank |
|---|--|------------------|-----------------|
| FISH | | | |
| Microphis brachyurus | Opossum pipefish | G4G5 | S2 |
| AMPHIBIANS AND REPTILES | | | |
| Crotalus adamanteus | Eastern diamondback rattlesnake | G4 | S3 |
| BIRDS | | | |
| Casmerodius albus | Great egret | G5 | S4 |
| Ixobrychus exilis | Least bittern | G5 | S4 |
| Nycticorax nycticorax | Black-crowned night-heron | G5 | S3 |
| Nyctanassa violacea | Yellow-crowned night-heron | G5 | S3 |
| Plegadis falcinellus | Glossy ibis | G5 | S2 |
| Rallus longirostris scottii | Florida clapper rail | G5T3 | S2 |
| Sterna caspia | Caspian tern | G5 | S2 |
| Sterna maxima | Royal tern | G5 | S3 |
| Sterna sandvicensis | Sandwich tern | G5 | S2 |
| PLANTS | | | |
| Helianthus debilis spp. vestitus | Hairy beach sunflower | G5T2 | S2 |
| Rhynchospora culixa | Georgia beakrush | G1 | SH |

* Species listed in boldface type use or live in freshwater, saltwater, and/or wetland communities.

Species shown in blue have been observed at Egmont Key NWR.

Note:

The Florida Natural Areas Inventory Global Rank characterizes relative rarity or endangerment worldwide, with G1 being critically imperiled globally because of extreme rarity or because of extreme vulnerability to extinction, and G5 being demonstrably secure globally. Similarly, the State Rank of S1 through S5 characterizes relative rarity or endangerment in Florida. The rankings are based on many factors, the most important being the estimated number of occurrences, estimated abundance (number of individuals), range, estimated adequately protected occurrences, relative threat of destruction, and ecological fragility.

Sources:

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Table 9. Birds observed at Egmont Key National Wildlife Refuge

| <u>Common Name</u> | <u>Scientific Name</u> |
|----------------------------|----------------------------------|
| Mottled Duck | <i>Anas fulvigula</i> |
| Blue-winged Teal | <i>Anas discors</i> |
| Ring-necked Duck | <i>Aythya collaris</i> |
| Lesser Scaup | <i>Aythya affinis</i> |
| Red-breasted Merganser | <i>Mergus serrator</i> |
| Common Loon | <i>Gavia immer</i> |
| Horned Grebe | <i>Podiceps auritus</i> |
| Northern Gannet | <i>Morus bassanus</i> |
| American White Pelican | <i>Pelecanus erythrorhynchos</i> |
| Brown Pelican | <i>Pelecanus occidentalis</i> |
| Double-crested Cormorant | <i>Phalacrocorax auritus</i> |
| Anhinga | <i>Anhinga anhinga</i> |
| Magnificent Frigatebird | <i>Fregata magnificens</i> |
| Great Blue Heron | <i>Ardea herodias</i> |
| Great Egret | <i>Casmerodius albus</i> |
| Snowy Egret | <i>Egretta thula</i> |
| Little Blue Heron | <i>Egretta caerulea</i> |
| Tricolored Heron | <i>Egretta tricolor</i> |
| Reddish Egret | <i>Egretta rufescens</i> |
| Cattle Egret (e) | <i>Bubulcus ibis</i> |
| Green Heron | <i>Butorides striatus</i> |
| Black-crowned Night-Heron | <i>Nycticorax nycticorax</i> |
| Yellow-crowned Night-Heron | <i>Nyctanassa violacea</i> |
| White Ibis | <i>Eudocimus albus</i> |
| Glossy Ibis | <i>Plegadis falcinellus</i> |
| Roseate Spoonbill | <i>Ajaia ajaja</i> |
| Wood Stork | <i>Mycteria americana</i> |
| Black Vulture | <i>Coragyps atratus</i> |
| Turkey Vulture | <i>Cathartes aura</i> |

| <u>Common Name</u> | <u>Scientific Name</u> |
|------------------------|------------------------------------|
| Osprey | <i>Pandion haliaetus</i> |
| Swallow-tailed Kite | <i>Elanoides forficatus</i> |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> |
| Red-shouldered Hawk | <i>Buteo lineatus</i> |
| Northern Harrier | <i>Circus cyaneus</i> |
| American Kestrel | <i>Falco sparverius</i> |
| Merlin | <i>Falco columbarius</i> |
| Peregrine Falcon | <i>Falco peregrinus</i> |
| Purple Gallinule | <i>Porphyryla martinica</i> |
| Common Moorhen | <i>Gallinula chloropus</i> |
| Black-bellied Plover | <i>Pluvialis squatarola</i> |
| Semipalmated Plover | <i>Charadrius semipalmatus</i> |
| Piping Plover | <i>Charadrius melodus</i> |
| Wilson's Plover | <i>Charadrius wilsonia</i> |
| Killdeer | <i>Charadrius vociferus</i> |
| Snowy Plover | <i>Charadrius alexandrinus</i> |
| American Oystercatcher | <i>Haematopus palliatus</i> |
| Black-necked Stilt | <i>Himantopus mexicanus</i> |
| Solitary Sandpiper | <i>Tringa solitaria</i> |
| Willet | <i>Catoptrophorus semipalmatus</i> |
| Whimbrel | <i>Numenius phaeopus</i> |
| Long-billed Curlew | <i>Numenius americanus</i> |
| Marbled Godwit | <i>Limosa fedoa</i> |
| Ruddy Turnstone | <i>Arenaria interpres</i> |
| Red Knot | <i>Calidris canutus</i> |
| Sanderling | <i>Calidris alba</i> |
| Western Sandpiper | <i>Calidris mauri</i> |
| Least Sandpiper | <i>Calidris minutilla</i> |
| Dunlin | <i>Calidris alpina</i> |
| Stilt Sandpiper | <i>Calidris himantopus</i> |
| Semipalmated Sandpiper | <i>Calidris pusilla</i> |
| Short-billed Dowitcher | <i>Limnodromus griseus</i> |
| Laughing Gull | <i>Larus atricilla</i> |
| Ring-billed Gull | <i>Larus delawarensis</i> |

| <u>Common Name</u> | <u>Scientific Name</u> |
|---------------------------|-----------------------------------|
| Herring Gull | <i>Larus argentatus</i> |
| Great Black-backed Gull | <i>Larus marinus</i> |
| Least Tern | <i>Sterna antillarum</i> |
| Gull-billed Tern | <i>Sterna nilotica</i> |
| Forster's Tern | <i>Sterna forsteri</i> |
| Royal Tern | <i>Sterna maxima</i> |
| Sandwich Tern | <i>Sterna sandvicensis</i> |
| Black Skimmer | <i>Rynchops niger</i> |
| Caspian Tern | <i>Sterna caspia</i> |
| Common Tern | <i>Sterna hirundo</i> |
| Rock Dove (Pigeon) (e) | <i>Columba livia</i> |
| Mourning Dove | <i>Zenaida macroura</i> |
| Common Ground-Dove | <i>Columbina passerina</i> |
| Mangrove Cuckoo | <i>Coccyzus minor</i> |
| Black-billed Cuckoo | <i>Coccyzus erythrophthalmus</i> |
| Barn Owl | <i>Tyto alba</i> |
| Eastern Screech-Owl | <i>Otus asio</i> |
| Common Nighthawk | <i>Chordeiles minor</i> |
| Chuck-will's-widow | <i>Caprimulgus carolinensis</i> |
| Ruby-throated Hummingbird | <i>Archilochus colubris</i> |
| Belted Kingfisher | <i>Ceryle alcyon</i> |
| Red-headed Woodpecker | <i>Melanerpes erythrocephalus</i> |
| Northern Flicker | <i>Colaptes auratus</i> |
| Eastern Wood-Pewee | <i>Contopus virens</i> |
| Acadian Flycatcher | <i>Empidonax virescens</i> |
| Eastern Phoebe | <i>Sayornis phoebe</i> |
| Gray Kingbird | <i>Tyrannus dominicensis</i> |
| White-eyed Vireo | <i>Vireo griseus</i> |
| Black-whiskered Vireo | <i>Vireo altiloquus</i> |
| American Crow | <i>Corvus brachyrhynchos</i> |
| Fish Crow | <i>Corvus ossifragus</i> |

| <u>Common Name</u> | <u>Scientific Name</u> |
|-------------------------------|---------------------------------|
| Carolina Wren | <i>Thryothorus ludovicianus</i> |
| Sedge Wren | <i>Cistothorus platensis</i> |
| Barn Swallow | <i>Hirundo rustica</i> |
| Purple Martin | <i>Progne subis</i> |
| Tree Swallow | <i>Tachycineta bicolor</i> |
| Blue-gray Gnatcatcher | <i>Poliophtila caerulea</i> |
| American Robin | <i>Turdus migratorius</i> |
| Gray Catbird | <i>Dumetella carolinensis</i> |
| Northern Mockingbird | <i>Mimus polyglottos</i> |
| Brown Thrasher | <i>Toxostoma rufum</i> |
| European Starling (e) | <i>Sturnus vulgaris</i> |
| Northern Parula Warbler | <i>Parula americana</i> |
| Magnolia Warbler | <i>Dendroica magnolia</i> |
| Cape May Warbler | <i>Dendroica tigrina</i> |
| Black-throated Blue Warbler | <i>Dendroica caerulescens</i> |
| Yellow-rumped Warbler | <i>Dendroica coronata</i> |
| Black-throated Green Warbler | <i>Dendroica virens</i> |
| Prairie Warbler | <i>Dendroica discolor</i> |
| Palm Warbler | <i>Dendroica palmarum</i> |
| Ovenbird | <i>Seiurus aurocapillus</i> |
| Common Yellowthroat | <i>Geothlypis trichas</i> |
| Hooded Warbler | <i>Wilsonia citrina</i> |
| Blackburnian Warbler | <i>Dendroica fusca</i> |
| Blackpoll Warbler | <i>Dendroica striata</i> |
| American Redstart | <i>Setophaga ruticilla</i> |
| Prothonotary Warbler | <i>Protonotaria citrea</i> |
| Connecticut Warbler | <i>Oporornis agilis</i> |
| Scarlet Tanager | <i>Piranga olivacea</i> |
| Rufous-sided (Eastern) Towhee | <i>Pipilo erythrophthalmus</i> |
| Vesper Sparrow | <i>Poocetes gramineus</i> |
| Northern Cardinal | <i>Cardinalis cardinalis</i> |
| Rose-breasted Grosbeak | <i>Pheucticus ludovicianus</i> |
| Indigo Bunting | <i>Passerina cyanea</i> |

| <u>Common Name</u> | <u>Scientific Name</u> |
|----------------------|------------------------------|
| Painted Bunting | <i>Passerina ciris</i> |
| Blue Grosbeak | <i>Guiraca caerulea</i> |
| Bobolink | <i>Dolichonyx oryzivorus</i> |
| Eastern Meadowlark | <i>Sturnella magna</i> |
| Red-winged Blackbird | <i>Agelaius phoeniceus</i> |
| Boat-tailed Grackle | <i>Quiscalus major</i> |
| Brown-headed Cowbird | <i>Molothrus ater</i> |
| Common Grackle | <i>Quiscalus quiscula</i> |
| House Sparrow (e) | <i>Passer domesticus</i> |

(e) – *exotic, non-native*

Sources:

"Egmont Key Unit Management Plan (Review Draft)," Division of Recreation and Parks, Department of Environmental Protection, State of Florida, Feb 1998.

"Bird Checklists Of The United States, Egmont Key State Park And National Wildlife Refuge," Northern Prairie Wildlife Research Center, USGS,
<http://www.npwrc.usgs.gov/resource/birds/chekbird/r4/egmont.htm>

"Official State List Of The Birds Of Florida," Florida Ornithological Society Records Committee,
<http://www.fosbirds.org/recordcommittee/statelistfebruary2005.htm>

"Tampa Bay Refuges, St. Petersburg, FL – Egmont Key Refuge, Pinellas Refuge, Passage Key Refuge," (draft) Biological Review Report, by J. Kleen and C. Hunter, U.S. Fish & Wildlife Service, June, 2006.

Table 10. Amphibians, reptiles, fish and mammals observed at Tampa Bay Refuges

FROGS AND TOADS

| <u>Common Name</u> | <u>Scientific Name</u> |
|-----------------------------|---------------------------------|
| Eastern Narrow-mouthed Toad | <i>Gastrophryne carolinesis</i> |
| Squirrel Treefrog | <i>Hyla squirella</i> |

SNAKES

| <u>Common Name</u> | <u>Scientific Name</u> |
|----------------------|--------------------------------------|
| Southern Black Racer | <i>Coluber constrictor priapus</i> |
| Eastern Diamondback | <i>Crotalus adamanteus</i> |
| Corn Snake | <i>Elaphe guttata guttata</i> |
| Yellow Rat Snake | <i>Elaphe obsoleta quadrivittata</i> |
| Eastern Kingsnake | <i>Lampropeltis getula getula</i> |
| Florida Kingsnake | <i>Lampropeltis getula floridana</i> |

LIZARDS

| <u>Common Name</u> | <u>Scientific Name</u> |
|-------------------------------|--|
| Green Anole | <i>Anolis carolinensis</i> |
| Brown Anole (e) | <i>Anolis sagrei</i> |
| Six-lined Racerunner | <i>Cnemidophorus sexlineatus sexlineatus</i> |
| Mole Skink | <i>Eumeces egregius</i> |
| Southeastern Five-lined Skink | <i>Eumeces inexpectatus</i> |

TURTLES

| <u>Common Name</u> | <u>Scientific Name</u> |
|-----------------------|----------------------------------|
| Atlantic Loggerhead | <i>Caretta caretta</i> |
| Gopher Tortoise | <i>Gopherus polyphemus</i> |
| Florida Box Turtle | <i>Terrepenne carolina bauri</i> |
| Atlantic Green Turtle | <i>Chelonia mydas mydas</i> |

FISH

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------|--------------------------------|
| Speckled Worm Eel | <i>Myrophis punctatus</i> |
| Spotted Seatrout | <i>Cynoscion nebulosus</i> |
| Spotted Moray | <i>Gymnothorax moringa</i> |
| Tarpon | <i>Megalops atlanticus</i> |
| Common Snook | <i>Centropomus undecimalis</i> |
| Mosquitofish | <i>Gambusia sp.</i> |
| Striped Mullet | <i>Mugil cephalus</i> |

| | |
|---------------------|------------------------------------|
| Redfish | <i>Sciaenops ocellatus</i> |
| Barracuda | <i>Sphyraena barracuda</i> |
| Atlantic Spadefish | <i>Chaetodipterus faber</i> |
| Blacktip Shark | <i>Carcharhinus limbatus</i> |
| Bonnethead Shark | <i>Sphyrna tiburo</i> |
| Bull Shark | <i>Carcharhinus leucas</i> |
| Burrfish | <i>Chilomycterus</i> sp. |
| Pigmy File Fish | <i>Monacanthus setifer</i> |
| Florida Pompano | <i>Trachinotus carolinus</i> |
| Gafftopsail Catfish | <i>Bagre marinus</i> |
| Nassau Grouper | <i>Epinephelus striatus</i> |
| Nurse Shark | <i>Ginglymostoma cirratum</i> |
| Pinfish | <i>Lagodon rhomboides</i> |
| Scrawled Cowfish | <i>Lactophrys quadricornis</i> |
| Sharksucker | <i>Echeneis naucrates</i> |
| Sheepshead | <i>Archosargus probatocephalus</i> |
| Gray Snapper | <i>Lutjanus griseus</i> |

MAMMALS

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------------|---------------------------------------|
| Common pilot whale | <i>Globicephala melaena</i> |
| Short-finned pilot whale | <i>Glogicephala macrorhynchus</i> |
| Bottle-nosed dolphin | <i>Tursiops truncatus</i> |
| Risso's dolphin | <i>Grampus griseus</i> |
| West Indian manatee | <i>Manatus trichechus latirostris</i> |
| Feral cat (e) | <i>Felis domesticus</i> |
| Roof rat (e) | <i>Rattus rattus</i> |

(e) – exotic, non-native

Sources:

"Egmont Key Unit Management Plan (Review Draft)," Division of Recreation and Parks, Department of Environmental Protection, State of Florida, February 13, 1998.

"Fish Checklists of the United States Egmont Key State Park and National Wildlife Refuge," Northern Prairie Wildlife Research Center, USGS,
<http://www.npwrc.usgs.gov/resource/birds/chekbird/r4/fislist.htm>

"Amphibian and Reptile Checklists of the United States, Egmont Key State Park and National Wildlife Refuge," Northern Prairie Wildlife Research Center, USGS,
<http://www.npwrc.usgs.gov/resource/birds/chekbird/r4/egmamp.htm>

Table 11. Rare, endangered and species of special concern at the Tampa Bay Refuges

| Common Name | Scientific Name | State | Federal |
|------------------------|---------------------------------------|--------------|----------------|
| Reptiles | | | |
| American alligator | <i>Alligator mississippiensis</i> | SSC | T (s/a) |
| Atlantic loggerhead | <i>Caretta caretta</i> | T | T |
| Green sea turtle | <i>Chelonia mydas</i> | E | E |
| Leatherback sea turtle | <i>Dermochelys coriacea</i> | E | E |
| Eastern indigo snake | <i>Drymarchon corais couperi</i> | T | T |
| Birds | | | |
| Roseate spoonbill | <i>Ajaia ajaja</i> | SSC | n/a |
| Little blue heron | <i>Egretta caerulea</i> | SSC | n/a |
| Snowy egret | <i>Egretta thula</i> | SSC | n/a |
| Tricolor heron | <i>Egretta tricolor</i> | SSC | n/a |
| Bald eagle | <i>Haliaeetus leucocephalus</i> | T | T |
| Wood stork | <i>Mycteria americana</i> | E | E |
| Brown pelican | <i>Pelecanus occidentalis</i> | SSC | n/a |
| Mammals | | | |
| Florida manatee | <i>Trichechus manatus latirostris</i> | E | E |

State listings are taken from the Florida Fish and Wildlife Conservation Commission. Federal listings are taken from the United States Fish and Wildlife Service. E= Endangered; T= Threatened; T (s/a)= Threatened due to similarity in appearance; SSC= Species of Special Concern; n/a= information not available or no designation listed

Source: Tampa Bay Aquatic Preserves Information Page, Florida Department of Environmental Protection, <http://www.dep.state.fl.us/coastal/sites/bocaciega-pinellas/info.htm>

CULTURAL RESOURCES

The vast majority of cultural resource information available for the Tampa Bay Refuges focuses on Egmont Key NWR. Cultural resource information is very limited for Passage Key NWR. Hurricanes and erosion have reduced the 60-acre island with a freshwater lake and lush vegetation to its present state of a less than a 5-acre shallow, sandy shoal (Section A, Chapter II). Cultural resource information is unknown (and most likely nonexistent) for the islands comprising the Pinellas NWR due to their nature as low-lying mangrove islands. Passage Key was an important navigational landmark for early Spanish and British sailors. The island was first identified on nautical charts as "Isla de San Francisco y Leon," then "Burnaby Island," and later "Cayo del Pasaje," or Passage Key.

Archaeological

An archaeological survey (for aboriginal resources) was conducted on Egmont Key NWR in the 1970s (Florida Department of Environmental Protection, November 1996; Grange, 1977). Although no sites were recorded, pre-Columbian use/occupancy of the island by Native Americans may have occurred. A pottery shard was found and authenticated by Walt Marder, Florida's Department of Historical Resources, to be the same type that was manufactured for 2,000 years until the first contact with Europeans (Florida Department of Environmental Protection, February 1998). The primary cultural resources on Egmont Key NWR are the lighthouse (8 HI 117A) and the resources of the Fort Dade sites (8 HI 117), shown in Figure 17. The following is a quotation taken from "Resource Management Audit, Egmont Key," by the Florida Division of Recreation and Parks, District 4, November 4, 1996:

"The cultural resources of Egmont Key are the derelict remains of an abandoned U.S. Army post (Fort Dade). Most structures were built for limited life spans, due in part to the Army's understandings of changing ordnance technologies and defensive philosophies of the period from 1898 through 1945. Support structures, such as workshops and garages, were built to be short-lived. Indeed, none exists as more than a floor. The historical structures on the island have been variously impacted by shoreline erosion, arson fires, vandalism, and the passage of time. While the lighthouse is in good condition, meaning it is structurally sound, it is not in pristine condition—the cupola is missing, railings are rusted, etc. The conditions of the concrete or masonry structures associated with Fort Dade range from fair (batteries Mellon and McIntosh) to poor (those that have lost structural integrity (batteries Page and Burchsted; now rubble in the Gulf of Mexico). Unless the erosion of the island is halted, structures including the remaining batteries and possibly the icehouse/dining hall are also likely to be lost in the next few years. Battery Howard suffered significant damage within the last year and during a storm event, and batteries Mellon and McIntosh could be seriously impacted during a significant storm. Storms surge into the power plant/dining hall (only ~60 feet from surf); vandals are literally knocking holes through the walls. Sections of an extensive brick road system are in fair-good condition, although previous managing agencies are said to have mined the roadway for brick in the past. The storm water drainage system associated with the roads and other semi-permanent elements of Fort Dade are clogged. Some are partially collapsed. Wood-frame structures associated with the Fort lost structural integrity long ago."

Historical

The following discussion is largely taken from "Egmont Key Unit Management Plan (Review Draft)," by the Florida Division of Recreation and Parks, February 1998):

Situated at the mouth of Tampa Bay, Egmont Key has long been recognized for its strategic military location. Egmont Key may have been first visited in 1757 by Francisco Maria Celi, pilot of the Spanish Fleet, who named it "Isla de San Blas y Barreda". At that time, Celi reported finding a canoe on the island. This may be the only historical evidence that Indians visited the site. Since there is no freshwater source, and travel to the island entailed crossing open, often rough water, it is likely that Egmont Key was only used periodically by Indians for hunting, crabbing, and shellfishing.

After the United States obtained control of Florida in 1821 with the signing of the Adams-Onis Treaty, several unsuccessful attempts were made at homesteading the island. Probably the same factors which discouraged the Indians from settling Egmont Key also made life very difficult for other would-be settlers.

In 1846, Congress authorized the construction of the Egmont Key lighthouse at the northern end of the island. It was completed in May 1848 and was partially destroyed by two hurricanes in September of that year. During the first hurricane in September of 1848, Marvel Edwards, Egmont Key's first lighthouse tender, placed his family in a boat during the hurricane and waded out to the highest point of the island in the center of the key where there were some large cabbage palms. Edwards tied the boat to the palms and during the night, rode out the violence of the storm, his bobbing craft rising with the high water almost to the top of the palms. By morning, though exhausted by the ordeal, the family had survived. Returning to the lighthouse, they found it badly damaged and all their possessions destroyed. When the keeper saw the damage to the lighthouse, he rowed off to Tampa and never returned. Tides 15 feet above normal washed over the island and damaged the light. Another storm in 1852 did additional damage and prompted Congress to appropriate funds to rebuild the lighthouse and lightkeeper's residence (Florida Division of Recreation and Parks, "Egmont Key State Park History," <http://www.floridastateparks.org/egmontkey/History.cfm>). A second lighthouse designed to "withstand any storm", was completed in 1858. The new tower was 87 feet high and was fitted with an Argand kerosene lamp and fixed Fresnel lens. The lighthouse, still in service today, is situated at latitude 27 degrees, 36 minutes, 4 seconds N and longitude 82 degrees, 45 minutes, 40 seconds W.

At the end of the third Seminole War in 1858, Egmont Key was used by the U.S. Army to detain Seminole prisoners until they could be transported to Arkansas Territory (Florida Division of Recreation and Parks, "Egmont Key State Park History," <http://www.floridastateparks.org/egmontkey/History.cfm>). One of the most dramatic scenes took place on Egmont Key in 1858 at the conclusion of the Billy Bowlegs War, the final Indian War in Florida. Billy Bowlegs was the last Seminole Indian chief remaining in South Florida. He surrendered with his weary band of 138 followers in Fort Myers on May 4, 1858. The tribesmen were transported to Egmont Key for their final Florida rendezvous before being shipped across the Gulf of Mexico to a reservation in Arkansas. One proud Seminole warrior - Tiger Tail - could not endure the humility of being taken from his native Florida. In the morning, the Indians were to leave Egmont Key, Tiger Tail ground up a quantity of finely ground glass and swallowed it with a glass of water. Tiger Tail's suicide tragically ended the era of Florida Indians (Florida Vacation and Travel Guide, "History of Anna Maria Island," <http://www.2fla.com/history.htm>).

In February 1849, Colonel Robert E. Lee visited the area and recommended that Egmont Key and neighboring Mullet Key be reserved by the government for military purposes. Before the Civil War the area was a haven for runaway slaves. At the onset of the Civil War, Confederate troops who had occupied Egmont Key, removed the lighthouse's Fresnel lens to deny the Union Navy the use of the beacon. The island was captured by Union forces in 1861 and held until 1865 as the blockade headquarters for the Tampa Bay area, during which time it was also a military prison and a refuge for southern pro-Union sympathizers. From here Union troops sailed up the Manatee River and destroyed the sugar mills of the Gamble and Braden plantations (Florida Vacation and Travel Guide, "History of Anna Maria Island," <http://www.2fla.com/history.htm>). In 1864, the city of Tampa was captured by the Union troops, and an unsuccessful attempt was made to recover the Fresnel lens. The lens was returned at the end of the Civil War, and the lighthouse resumed normal operations in 1866. A cemetery for Union and Confederate soldiers was opened on the island in 1864. The cemetery was closed in 1909 and the bodies were moved to military cemeteries at other locations.

In 1898, the Spanish-American War broke out, and Fort Dade was established on Egmont Key with temporary gun batteries. Later, the actual construction of Fort Dade began and continued until 1916. During this time period, over 70 buildings were constructed, including a bakery, a movie theater, a post office, a morgue, a 13-bed hospital, a gymnasium with a bowling alley, a stable, a guard house, and a tennis court. In addition, brick streets were laid and five gun emplacements were constructed. The Spanish never attacked Florida and the guns were never fired in defense of the coast.

The hospital at Fort Dade was used to quarantine all American soldiers returning from Cuba for ten days. During World War I, Fort Dade was used as a training center for National Guard Coast Artillery Units. Fort Dade was deactivated in 1923, although the military still utilized the island for coastal submarine watch and aerial exercises in World War II. A summary of the Military history of Egmont Key was prepared by Roger T. Grange.

In 1928, the Tampa Bay Pilots Association (TBPA), which guides ships through Tampa Bay, was granted a 99-year lease to five acres on Egmont Key, to serve as their base of operations.

The U.S. Lighthouse Service was transferred in 1939 to the U.S. Coast Guard (USCG) which has maintained a light station on Egmont Key ever since. In the 1940's, the USCG replaced the existing lighthouse lens with a double aviation beacon. With the advent of radio communications, they also set up a radio direction finder (RDF), which is used extensively for air and sea navigation. This transmitter now serves as part of the Differential Global Positioning System (DGPS) and is used for surveying, research and transportation. Egmont Key was put to military use again during World War II, as a harbor patrol station and an ammunition storage facility.

In the 1970's, Egmont Key was recognized as valuable wildlife habitat for nesting shorebirds and sea turtles, and on July 10, 1974, it became a National Wildlife Refuge, managed by the USFWS. In December of 1978, Egmont Key was entered on the National Register of Historic Places.

In July, 1990, the USCG replaced the lighthouse's double aviation beacon with a single beacon, which increased the light's range from 28 to 32 miles. Presently, it is one of the brightest lighthouses in Florida.

Due to staffing limitations and increased public visits, the USFWS was unable to protect the resources of the island on its own. The Florida Park Service began operations at Egmont Key on October 1, 1989, as part of a cooperative agreement with the USFWS.

SOCIOECONOMIC ENVIRONMENT

Regional Demographics and Economy

The Tampa Bay Refuges (Pinellas, Egmont Key, and Passage Key) all lie within the Tampa-St. Petersburg-Clearwater Metropolitan Statistical Area (MSA). According to the 2005 American Community Survey (U.S. Census Bureau 2005), the population of the Tampa-St. Petersburg-Clearwater MSA was almost 2.6 million – the largest metro area in Florida, and the second largest in the southeastern U.S. (Table 12). The population of the Tampa-St. Petersburg-Clearwater MSA has more than doubled since 1970, when the population was 1,105,553. In the last 5 years, the population of the MSA has increased by about 8.5 percent (Table 12). The Tampa Bay area (and Hillsborough County in particular) has a diverse mix of different cultures and it also has a large community of Latin Americans, the largest minority in the Tampa Bay region. The Tampa Bay region ranks second in the state in terms of homelessness (Tampa Bay Regional Planning Council, September 2005).

The per-capita income of the Tampa-St. Petersburg-Clearwater MSA is comparable with the national average. Given the growth, proximity, and the socioeconomic pressures of the MSA, development impacts are likely to be felt on Egmont Key NWR. (Because of their small size and importance as nesting and breeding grounds for brown pelicans and colonial waterbirds, the public is not allowed entry to Pinellas and Passage Key NWRs.) Egmont Key NWR is the only island open to the public in Tampa Bay and has been traditionally visited for many years as a primary recreation destination (USFWS, “Visitor Services Review Report (draft),” March 2004). In recent years, Egmont Key NWR has drawn approximately 130,000-170,000 visitors annually, with many of these being local citizens, bird watchers, beach combers, and school children. The MSA’s elementary and high school enrollment was estimated to be about 396,000 students in 2005.

The Tampa Bay area is a center for shipping, business, industry, and tourism. Three seaports now flourish along the bay’s borders, in Tampa, St. Petersburg, and in northern Manatee County. The largest of these, the Port of Tampa, consistently ranks among the busiest ports in the nation. Combined, the three ports contribute an estimated \$15 billion to the local economy and support 130,000 jobs (Tampa Bay Estuary Program, May 2006). The Port of Tampa handles nearly half of all seaborne commerce passing through the state (and almost as much cargo as all Florida’s other deepwater ports combined), and it is home to a rapidly growing cruise ship industry. The Tampa Port is the nation’s seventh largest port. Because it is the closest deep-water port to the Panama Canal, the port is home to a diverse traffic base with terminal facilities encompassing container, bulk, break bulk, ro-ro (role-on roll-off), and project cargoes. It is North America’s largest dockside cold storage terminal and home to numerous cruise lines. The Tampa Bay area’s main industries include citrus canning (it’s the citrus canning capitol of the world), shrimping, fabricated steel, electronic equipment, cigars, beer, paint, and fertilizers. More than 4 billion gallons of oil, fertilizer products, and other potentially hazardous materials pass through Tampa Bay each year.

Services and retail trade dominate the economy of the MSA. Tampa is not as heavily dependent on tourism as other major cities in Florida. The combination of shipping, tourism, a large retirement community, and a strong manufacturing base contributed to the Bay area’s insulation against adverse changes in the economy.

Figure 17. Cultural resources of Egmont Key National Wildlife Refuge



Outdoor Recreational Economics

The wildlife resources of the three Tampa Bay Refuges are economically important. In addition to the commercial and recreational fishing, ecotourism, including wildlife viewing and photography, and environmental interpretation are increasingly being seen as economically important to local businesses. As the population increases and the number of places left to enjoy wildlife decreases, the refuges may become even more important to the local community. It benefits the community directly by providing recreational and employment opportunities for the local population and indirectly by attracting tourists from outside the area to generate additional income to the local economy. Table 13 presents information summarizing the economic value of wildlife watching in Florida by U.S. residents.

REFUGE ADMINISTRATION AND MANAGEMENT

LAND PROTECTION AND CONSERVATION

Erosion is a significant issue for all three refuges in the Tampa Bay area. One of the objectives for Egmont Key NWR is to conserve and protect the barrier island habitat and preserve historical structures of national significance that are located on the refuge. In 1877, Egmont Key was 539 acres. By 1969, the island was reduced to 405 acres, and in 1974, the year it was designated a national wildlife refuge, the island was 392 acres. Today, the island is approximately 275 acres. The result of this loss has been a serious degradation of the island's natural areas and cultural resources. Beach habitat has been lost, and structures associated with Fort Dade have also been impacted—two of the gun batteries are now in the Gulf of Mexico and other structures (three other gun batteries and the icehouse/mess hall) are in danger of being lost in the near future. In 1999-2000, and again in 2006, the northwest beach area has been renourished as part of a project operated by the USACE.

Pinellas NWR is made up of several mangrove islands and totals 394 acres. One of the objectives for Pinellas NWR is to conserve and protect the mangrove island habitat. Erosion on these islands is being addressed by vegetative plantings and placement of oyster domes and oyster shell bags along the shorelines by volunteers.

Passage Key NWR, when established, was a 60-acre mangrove island with a freshwater lake. A 1921 hurricane destroyed the island. Today, it is a 0.5 to 10-acre meandering sand bar and submerged lands, and is managed as an intermittent island.

VISITOR SERVICES

Egmont Key NWR is the only island that is open to the public within the Tampa Bay Refuges. The island is accessed by boat and receives about 130,000 to 170,000 visitors annually. If not managed properly, increasing visitor use and non-related wildlife-dependent recreation brings increasing risks to fragile fish and wildlife resources and other natural, cultural, and historical resources associated with the refuges.

Table 12. Demographics of the Tampa Bay Region

| Characteristic | Tampa St.Petersburg Clearwater MSA^b | Pinellas County | Hillsborough County | Pasco County | Manatee County | United States |
|---|---|----------------------------|--------------------------------|-------------------------|---------------------------|----------------------|
| <u>Demographic</u> | | | | | | |
| Population (number) | 2,596,556 | 905,158 | 1,111,717 | 423,356 | 300,828 | 288,378,137 |
| Total Land Area (sq. miles) | 2,554.0 | 280.0 | 1,051.0 | 745.0 | 741.0 | 3,537,438.0 |
| Population Density (pop./sq. mile) | 1,017 | 3,233 | 1,058 | 568 | 406 | 82 |
| <u>Race/Ethnicity (% of Population)</u> | | | | | | |
| White | 81.4 | 84.1 | 74.1 | 91.8 | 84.1 | 74.4 |
| Black/African American | 11.1 | 9.9 | 16.0 | 2.9 | 8.2 | 12.1 |
| Hispanic/Latino (of any race) | 13.2 | 6.3 | 21.4 | 8.4 | 11.4 | 14.5 |
| Asian | 2.5 | 2.8 | 3.0 | 1.5 | 1.4 | 4.3 |
| <u>Education (% of population over 25)</u> | | | | | | |
| High School degree | 85.5 | 87.3 | 84.1 | 85.8 | 85.1 | 84.2 |
| College degree | 24.5 | 26.2 | 27.2 | 17.7 | 26.0 | 27.2 |
| <u>Economic</u> | | | | | | |
| Median Household Income | \$ 41,852 | \$ 40,694 | \$ 45,129 | \$ 39,562 | \$ 44,414 | \$ 46,242 |
| Per capita Income | \$ 25,020 | \$ 27,137 | \$ 25,086 | \$ 22,108 | \$ 25,925 | \$ 25,035 |
| Families below poverty level (%) | 9.3% | 8.6% | 10.2% | 8.7% | 6.7% | 10.2% |
| Individuals below poverty level (%) | 12.0% | 11.1% | 13.0% | 11.3% | 10.0% | 13.3% |

^a U.S. Department of Commerce, U.S. Census Bureau, 2005 American Community Survey

^b The Tampa-St.Petersburg-Clearwater Metropolitan Statistical Area (MSA) is comprised of four counties: Pinellas, Hillsborough, Pasco, and Hernando

Table 13. Activities in Florida by U.S. residents
Wildlife Watching (observing, photographing, or feeding wildlife)

| | |
|---|-----------------|
| Total wildlife-watching participants | 3,240,000 |
| Nonresidential (away from home) | 1,503,000 |
| Residential (at home) | 2,635,000 |
| Total expenditures | \$1,575,481,000 |
| Trip-related | \$675,384,000 |
| Equipment and other | \$900,097,000 |
| Average per participant | \$.486 |
| Trip and equipment expenditures by nonresidents in Florida | \$.401,128,000 |

Source:

“2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau, revised March 2003,
<http://www.census.gov/prod/www/abs/fishing.html>

For the most part, none of the priority public uses are actively promoted by the Service at the Tampa Bay Refuges and their surrounding access sites (boat ramps and fishing piers). There are excellent opportunities for wildlife observation, wildlife photography, environmental education and interpretation, and outreach. Fishing is a primary public use off-shore, with the state and local governments providing primary enforcement oversight for the waterways.

The Tampa Bay Refuges currently do not have a Visitor Services Plan. Egmont Key NWR has beach access on the north section of the island and a small access area on the eastern side of the island where visitors can observe and photograph the refuge wildlife, particularly shorebirds. There is a small trail system and other areas on the northern portion of the island which provide other opportunities for wildlife observation, and one is almost certain to view a gopher tortoise among other wildlife species. Visitors can also view wildlife from boats at a more distant vantage at Passage Key and Pinellas NWRs. The Service currently provides no environmental education programs at the Tampa Bay Refuges. There are no interpretive panels related to the historic remains on the island and only a few related to the wildlife, and there is a limited outreach program.

There is some signage on the refuge islands, predominantly boundary signs identifying closed areas. On Egmont Key NWR there are a couple of signs indicating the Service and Florida State Park management partnership, and a few directional signs posted by the state park. Some of the Fort Dade building sites, remains, and the Guard House Building have identification signs posted, however these signs are not consistent—some were posted by the state, others by the Service, and volunteers have posted their own signs which are beginning to deteriorate. There is one restroom available at times to the public and no potable water available to the public.

PERSONNEL, OPERATIONS, AND MAINTENANCE

The Tampa Bay Refuges are administered by the Chassahowitzka National Wildlife Refuge Complex (NWR Complex) in Crystal River, Florida, with one refuge operations specialist assigned to the Tampa Bay Refuges. The 10-person staff is responsible for the Chassahowitzka NWR Complex and

the Tampa Bay Refuges. The staff includes the refuge manager, GS-485-13; deputy refuge manager, GS-485-11/12; office assistant, GS-303-07; wildlife biologist, GS-486-11; visitor services specialist, GS-025-09/11; (2) park ranger/LE, GS-025-07/09; refuge operations specialist/LE, GS-485-09/11 (assistant refuge manager); small craft operator, WG-5786-08; and maintenance mechanic, WG-4749-07/08.

Egmont Key NWR has been cooperatively managed with the FPS through a cooperative agreement signed in 1989. Under the terms of this agreement, the FPS would manage public use activities and natural and cultural resources, and the Service would continue to manage the wildlife resources on the island and review the FPS resource management and land use. There is one full-time state park manager assigned to Egmont Key NWR. The USCG owns 55 acres at the north end of the island which includes the lighthouse. The Tampa Bay Pilots Association leases a 10-acre tract of land along the east side of the island, 5 acres of which is leased from the Service.

The refuge has boats, vehicles, ATVs, and other equipment vital to pursuing its purpose. The boats are stored at the Eckerd College boat yard in south St. Petersburg. Most of the staff works out of the offices at the Chassahowitzka NWR Complex, which is about 100 miles driving distance from the Tampa/St. Petersburg metro area. However, a small office in the St. Petersburg area is being leased. The refurbished guard house building on Egmont Key NWR is also the property of the Service. Under an agreement with the Tampa Bay Pilots Association, the refuge staff has use of one of the Pilots' cabins. The refuge installed a storage shed and carport which houses refuge vehicles including ATVs and a mule. The refuge staff may also use the Pilots' dock. The Pilots Association also assists refuge staff with transportation of equipment, supplies, and/or people as needed.

Access to the refuge islands is by boat only. Egmont Key NWR is the only island that allows public access, and it has some trails that need to be maintained to allow access to different areas of the refuge. Passage Key and Pinellas NWRs have no trails or roadways.

III. Plan Development

SUMMARY OF ISSUES, CONCERNS, AND OPPORTUNITIES

The planning team identified a number of issues, concerns, and opportunities related to fish and wildlife protection, habitat restoration, recreation, and management of threatened and endangered species. Additionally, the planning team considered federal and state mandates, as well as applicable local ordinances, regulations, and plans. An initial planning meeting for the Draft CCP/EA was held October 12, 2005, which included representatives from the FWC and the FDEP, among other agencies. The team also directed the process of obtaining public input by holding three public scoping meetings for the Tampa Bay Refuges. The meetings were held in Hillsborough, Pinellas, and Manatee Counties in February 2006. Comment forms were available at these meetings and at headquarters for submittal via mail or e-mail. The refuge staff also held two public meetings to solicit public reaction to the proposed alternatives in the Draft CCP/EA. A 30-day public review and comment period of the Draft CCP/EA was provided. Oral comments made at the meetings were duly noted. All public and advisory team comments were considered; however, some issues important to the public fall outside the scope of the decision to be made within this planning process. The team considered all issues that were raised throughout the planning process, and has developed a plan that attempts to balance the competing opinions regarding important issues. The team identified those issues that, in the team's best professional judgment, are most critical to the refuges. A summary of these issues follows. Appendix D addresses both scoping and Draft CCP/EA public comments.

FISH AND WILDLIFE POPULATION MANAGEMENT

Threatened and Endangered Species

Recovery and protection of threatened and endangered plants and animals are important responsibilities delegated to the Service and its national wildlife refuges. The Tampa Bay Refuges provide habitat and protection for the threatened piping plover and Atlantic loggerhead turtle, and for the endangered manatee.

One or two piping plovers have been observed on Egmont Key NWR from September to December each year. Egmont Key NWR is designated as critical habitat for the piping plover. Passage Key NWR could also be used as wintering habitat by piping plovers. Erosion of beach habitat is a serious problem on Egmont Key and Passage Key NWRs.

Approximately 20 to 60 Atlantic loggerhead sea turtles nests have been recorded annually on Egmont Key NWR. Egmont Key is listed as an "index nesting beach" by FWC. This designation means that it is an important site for determining an index of sea turtle population status and trends along the Atlantic (and Gulf) Coast of the United States to determine progress towards recovery. Passage Key NWR has also been used by loggerhead sea turtles for nesting.

The number of loggerhead turtle nests may be declining due to loss of habitat caused by severe erosion occurring along the west beach of Egmont Key NWR. The greatest threat to sea turtle nests is severe beach erosion caused by high tides, storm tides, tropical storms, and hurricanes. Fire ants and ghost crabs occasionally invade sea turtle nests and destroy the eggs.

Small numbers of West Indian manatees have been observed in the seagrass beds along the east side of Egmont Key NWR and occasionally around Passage Key and Pinellas NWRs during the spring and summer. These areas are outside refuge jurisdiction; however, efforts need to be made to protect the manatees and their habitats near refuge lands.

State-Listed Species

Gopher tortoises are listed as a threatened species in Florida. Approximately 1,300 to 1,700 gopher tortoises live on Egmont Key NWR. Illegal poaching, recreational collecting, and malicious harming of gopher tortoises have been documented.

Two plant species, inkberry and prickly pear cactus, and one other species that is proposed for listing, the hairy beach sunflower, grow on Egmont Key NWR. Active management, in cooperation with the FPS, would be required to protect these plants from invasive exotic species and human activity.

Mangrove-Nesting and Roosting Waterbirds

The current mangrove nesting areas in the Tampa Bay Refuges are on Pinellas NWR, with some nesting occurring in the mangroves on Egmont Key NWR. The bird species nesting on Pinellas NWR do so mostly in mangroves, predominantly on Little Bird Key. In years past, nesting occurred widely on other keys, especially on Tarpon Key and Whale Key.

Mangrove nesting and roosting waterbirds are in need of protection and include many species of concern. The long-legged wader, the reddish egret, a Florida State-Listed Species of Special Concern, is found nesting in the Tampa Bay area. Its population has stabilized in the last few years after the stoppage of the millinery trade. The roseate spoonbill, brown pelican, tricolored heron, and white ibis, four other State-Listed Species of Special Concern, as well as the yellow-crowned night heron and black-crowned night heron are some of the other species found nesting on the refuge. Although not breeding in Tampa Bay, the keys in Pinellas NWR may represent important post-breeding roost sites for the magnificent frigatebird.

Tarpon Key was an important nesting, resting, and feeding area for a variety of colonially nesting waterbirds including the white ibis, reddish egret, and roseate spoonbill. Very little nesting has been documented since 2002 when consistent predator control efforts ceased and this colony succumbed to raccoons and possibly fish crows. In addition, some of the mangrove habitat has been lost due to erosion from boat wakes and storm surges. Exotic vegetation, particularly the Brazilian pepper and the Australian pine, is spreading on the islands replacing the native vegetation and habitat. Although all the islands in the Pinellas NWR are closed to all public use, illegal access by the public still occurs and causes birds to abandon their nests or flushes the birds from their nests, allowing predators to invade. Improper disposal of monofilament fishing line and trash, and oil spills have caused mortalities among the birds.

Beach-Nesting Waterbirds and Shorebird Species

Optimal beach habitat for birds is becoming scarce as private land is being developed. Egmont Key NWR has two wildlife sanctuaries totaling 97 acres on the south end and the east side of the island to protect nesting, resting, and feeding birds. These sanctuaries are closed to the public year-round. The northwest beach is closed seasonally to protect black skimmer and least tern nesting colonies. Passage Key NWR is a wilderness area which is closed to the public year-round. Approximately 38,000 pairs of birds nested on Egmont's beaches in 2007, up from 50 pairs in 1998. Approximately 3000 pairs of birds including brown pelicans, laughing gulls, royal terns, and black skimmers nested

on Passage Key NWR in 2003. However, Passage Key NWR became an intermittent island in 2005, sometimes becoming almost completely submerged.

Large and important colonies of brown pelican, laughing gull, and royal and sandwich terns occur on Egmont Key NWR and historically on Passage Key NWR. The sandwich tern, in particular, has a strong presence on Egmont Key NWR and historically on Passage Key NWR. Ninety percent of sandwich tern pairs in peninsular Florida reside in the Tampa Bay area, 66 percent of those are on Egmont and Passage Key NWRs. Laughing gulls have shown a 60 percent decline in the past 25 years in Florida. Among nesting shorebirds, plovers and the oystercatcher are the highest priority species. Among the colonial nesting species, black skimmers and least terns are the highest priority species.

Similar to the mangrove-nesting and roosting waterbirds, the major issues that threaten the beach-nesting waterbirds and shorebird species populations are predators (dogs, rats and fish crows), human disturbance both inside and outside of the closed areas, erosion of beach habitat, invasive plant species (Brazilian pepper and Australian pine) and other native plants (sea oats and low herbaceous plants), reducing nesting habitat for terns and skimmers. Improper disposal of monofilament lines and trash poses threats. Also, oil spills pose threats.

Landbirds

Landbirds of conservation interest on Tampa Bay Refuges include mangrove breeding species on Pinellas NWR, and transient nearctic-neotropical migratory species on Pinellas and Egmont Key NWRs. Mangroves support a number of landbirds of continental and regional concern, specifically, the mangrove cuckoo, black-whiskered vireo, and the Florida prairie warbler. The gray kingbird is a species of local interest. Dozens of nearctic-neotropical migratory species regularly pass through Tampa Bay and are priorities on the national level or within specific physiographic regions. Availability of extensive and diverse mangrove and hardwood hammock habitats would accommodate the invertebrate, fruit, and nectar demands of most in-transit forest-dwelling species.

Mosquito control on adjacent lands may indirectly affect insectivore food supplies for both breeding and migratory landbirds. Currently, the status and trends of Florida's mangrove-associated landbird species is undetermined, particularly in the Tampa Bay region.

Reptiles

Gopher tortoises were addressed under state-listed species. Egmont Key NWR also supports very high densities of Florida box turtles. The exotic Brazilian pepper thickets on Egmont Key NWR create a microclimate conducive to box turtles and their favorite food, cockroaches. Attempts to eliminate exotic plant species from the refuges would reduce the Brazilian pepper thickets. Use of prescribed fire to restore habitat conditions could also negatively affect box turtle densities. Like the gopher tortoise, the box turtle is threatened by illegal poaching, recreational collecting, and malicious harming of the animals.

Diamondback terrapins nest in the uplands of Tarpon Key, Pinellas NWR. This species is considered to be in decline through much of their distribution because of habitat loss and from drowning due to being caught in crab traps.

A male specimen of the mole skink was identified on Egmont Key NWR among sea oats and Australian pine. The specimen found was thought to have unique features suggesting that the island's population could represent an undescribed subspecies. More information is required. Like the box turtle, reduction of exotic plant species and sea oats could compromise the mole skink's habitat.

HABITAT MANAGEMENT

Erosion

Erosion on the Tampa Bay Refuges is a major habitat management concern. Beach erosion management has included beach renourishment on Egmont Key NWR. However, beach renourishment done too frequently could lead to depletion of invertebrates in the substrate that may not be able to recover from the last event. Depletion of the invertebrates would temporarily impact foraging shorebirds. Managing Passage Key NWR by use of beach renourishment may be in conflict with its wilderness area designation. Maintenance of the wilderness character of this refuge requires minimum active management of the land, allowing natural process to control the conditions. However, if erosion of Passage Key NWR continues, the island may become submerged for extended periods of time and may no longer serve the purpose of a nesting island for migratory birds. Stabilization of beach and mangrove habitats with native vegetation, such as Spartina alterniflora, or by use of oyster shells is also important.

Native Habitat Conditions and Exotic Plant Species

Returning the refuges to their likely native habitat conditions prior to European settlement of the island is a goal of the Service. A decision must be made regarding what type of native habitat would be most suitable today. The control and/or removal of exotic plant species, particularly Brazilian pepper and Australian pine, are required to protect native habitat for priority species on the refuges. Prescribed burning is one method that could help eliminate exotic plants, however, the fire could negatively impact wildlife populations if improperly managed. The removal of exotic plant species could also disturb nesting birds if done during certain times of the year or by certain means. Removal of Brazilian pepper and sea oats from the refuges could reduce habitat for the box turtle and mole skink respectively; however, these are not the priority species.

Sea Grasses

Sea grasses surrounding the refuge islands are important foraging area for manatees, and habitat for other wildlife. Protection of these areas is important, but is outside the jurisdiction of the Service.

Global Warming and Sea Level Rise

Florida's coasts and coastal national wildlife refuges are expected to be negatively impacted by sea level rise in the next century. Some species may initially gain more access to habitat as sea level rises and certain habitats advance while other habitats deteriorate and recede. Despite an apparent initial benefit to some species in the short term, the long-term impacts of sea level rise are expected to be primarily negative for most species. Changes to Florida's coastal habitats would alter habitats including sea grasses, salt marsh, freshwater marsh, mangroves, hardwood swamp, cypress swamp, tidal flats, and beaches. Changes to Florida's coastal habitats would impact Florida's wildlife including gamefish species and shorebirds (McMahon 2006).

Global warming can lead to other stressors besides sea level rise which could also threaten coastal refuges. Global warming will result in altered precipitation patterns such as more intense hurricanes and more extreme rainfalls and droughts. Global warming will also result in higher average air and water temperatures that foster increased algal blooms and hypoxic conditions that are damaging to fish and other aquatic species, coral bleaching, and marine diseases (McMahon 2006).

Sea Level Affecting Marshes Model (SLAMM) analysis was run for Egmont Key and Pinellas NWRs using SLAMM versions 4.1 for Egmont Key NWR and SLAMM version 5.0 for Pinellas NWR. Egmont Key NWR is projected to experience a loss of coastal habitats including dry land, tidal flats, and salt marsh in the next century, as well as a slight decrease in estuarine open water. The refuge would experience a considerable increase in open-ocean (McMahon 2006). The area around Pinellas NWR is predicted to lose tidal flats due to inundation and erosion. According to the SLAMM simulations run, the primary dynamic affecting mangrove abundance at Pinellas NWR is the rate of mangrove accretion as compared to the rate of sea level rise. Because mangroves generally accrete at a high rate, they are more resilient to sea level rise. However, once sea level rise exceeds mangrove accretion rates, all mangroves are predicted to quickly disappear (Clough 2008).

Passage Key NWR is an intermittent island and much or all of its land mass could be lost because of sea level rise. As the sea level rises and changes occur, adaptive management of the changing habitat would be required, and the Service would consider acquiring new lands to provide habitat for priority species.

See Clough 2008 and McMahon 2006, listed in Appendix B.

RESOURCE PROTECTION

Because of their small size and importance to nesting, migrating, and roosting shorebirds and other waterbirds, Pinellas and Passage Key NWRs are closed to all public use year-round. Two wildlife sanctuaries on Egmont Key NWR, one located on the south end and the other located on the east or bay side of the island, are closed to the public year-round to protect the birds and the sea grass beds. The northwest beach of Egmont Key NWR is closed seasonally to protect black skimmer and least tern nesting colonies. Illegal access to these areas threatens the wildlife and habitat. The sea grass habitat is outside the Service's jurisdiction. Generally, urban development and its associated recreational encroachment and potential water and air contamination threaten all refuge resources.

Overflights from recreational ultralights, small planes, and news aircraft during oil spills or other events can disturb the birds. Flushed birds leave their nests making the eggs and chicks vulnerable to predators and the elements. FAA navigation charts show "recommendations" to fly above 2,000 feet over national wildlife refuges and other special areas, but it is not enforced. If harassment (flushing a bird off of a nest) occurs to an endangered or threatened species, aircraft operators would be in violation of the Endangered Species Act. If a bird is killed or "take" occurs, they may be violating the Migratory Bird Treaty Act.

On Egmont Key NWR, there are historical structures of national significance, including remnants of Fort Dade and the lighthouse. Erosion at the shoreline and mistreatment by the public are compromising the structures. Some of the fort structures are now surrounded by water and swimmers dive to explore them. In addition, accumulation of fuel loads on Egmont Key NWR has increased the risk of wildfires on the island. Fire management, including suppression of fires or removal of the fuel loads, would be required to prevent property and cultural resources damages due to uncontrolled fire.

VISITOR SERVICES

There is a general lack of awareness regarding the Service's mission, purpose, and management objectives, particularly as it relates to the Tampa Bay Refuges. Minimal outreach is being conducted, and environmental education and interpretation opportunities are lacking at the refuges.

Tampa Bay Refuges staff has not promoted wildlife-dependent recreation at the three refuges. Passage Key and Pinellas NWRs are closed for public use; however, there are still opportunities for

wildlife observation and photography from the water. Egmont Key NWR has very good vantage points for wildlife observation and photography, and the Service could provide good opportunities for environmental education and interpretation. However, lack of facilities at the refuge and staff located off-site and outside the Tampa Bay/St. Petersburg vicinity undermines these opportunities. Currently, there is an informational sea turtle panel on Egmont Key NWR's west beach. Fishing is allowed in the waters surrounding Pinellas NWR and fishing from shore is allowed on Egmont Key NWR. Off-shore fishing around Pinellas NWR may disturb the birds nesting near shore.

Problems are occurring on Egmont Key NWR due to overcrowding and overuse. Unregulated commercial tours bring over 70,000 visitors to Egmont Key NWR annually. Boaters, anglers, swimmers, and sunbathers gather at Egmont Key NWR where there is no available freshwater for public consumption and sanitation facilities are sparse or unavailable.

REFUGE ADMINISTRATION

The Tampa Bay Refuges are administered by the staff headquartered at Chassahowitzka NWR Complex. One refuge operations specialist is assigned to the Tampa Bay Refuges. Limited staff assigned specifically to the Tampa Bay Refuges and the lack of facilities (office, freshwater, and sanitation facilities) located at the refuges has prevented the refuges from realizing their full potential. Environmental education and interpretation opportunities have not been realized and Service refuge regulations have not been adequately enforced.

Overcrowding and overuse of Egmont Key NWR has become an issue. Lack of a controlled access point to the island and unregulated commercial tours have contributed to the problem. In addition, the carrying capacity of the island has not been determined, which would be required to manage the refuge and park properly.

Jurisdictional issues exist regarding the management and operation of the refuges and the cooperative agreement with FPS for Egmont Key NWR. The Service and the FPS, who jointly manage Egmont Key NWR and State Park, have conflicting missions, purposes, and management objectives for Egmont Key. The Service's main priority is to protect the fish and wildlife and their respective habitats. The FPS manages the public use activities at the State Park which allows for recreation unrelated to wildlife. The FPS also assists the Service in resource management. Common and consistent rules and regulations need to be adopted for the refuge and park for effective, coordinated management.

USCG property (55 acres) at the north end of Egmont Key is currently controlled by the Bureau of Land Management. The Tampa Bay Pilots Association leases a 5-acre tract of land from Hillsborough County on the eastern edge of the island, about mid-island and it leases another 5 acres from the Service. These lands are not being managed in a manner consistent with the Service land on the island. Exotic vegetation control, fire management planning, and signage are fairly non-existent for the combined 60 acres which compromise the Service's goals and objectives for Egmont Key NWR.

Wilderness Review

Refuge planning policy requires a wilderness review as part of the comprehensive conservation planning process. The Service inventoried other refuge lands within the planning area and found no areas that meet the eligibility criteria for a wilderness study area as defined by the Wilderness Act. Therefore, the suitability of refuge lands for wilderness designation was not further analyzed in the Draft CCP/EA. The results of the wilderness review are included in Appendix H.

IV. Management Direction

INTRODUCTION

The Service manages fish and wildlife habitats considering the needs of all resources in decision-making. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the Improvement Act is for the Service to maintain the ecological health, diversity, and integrity of refuges. Public uses are allowed if they are appropriate and compatible with wildlife and habitat conservation.

Described below is the comprehensive conservation plan for managing the refuge over the next 15 years. This management direction contains the goals, objectives, and strategies that will be used to achieve the refuge vision.

Three alternatives for managing the refuge were considered: Alternatives A – Current Management – No Action, B – Moderately Expanded Program, and C – USFWS Manages all of Egmont Key and Expands Programs. Each of these alternatives was described in the Environmental Assessment, which was Section B of the Draft Comprehensive Conservation Plan for the Tampa Bay Refuges. The Service chose Alternative B, Moderately Expanded Programs, as the preferred management direction.

Implementing the preferred alternative will result in the Service directing and coordinating more of the activities that affect the refuges such as wildlife surveying and research, and habitat conservation. Wildlife surveying will be expanded and the Service will initiate research related to the gopher tortoises, sea turtles, migratory birds, and other species. Greater predator control and greater regulation of illegal access to closed areas will be accomplished by hiring a biological technician and a full-time law enforcement officer for the Tampa Bay Refuges. A visitor services center with restroom facilities will be developed at the Egmont Key NWR guard house, providing educational opportunities related to the wildlife and cultural resources. Wildlife photography and observation opportunities will also be enhanced by allowing limited access to closed areas and by the construction of an observation tower on Egmont Key NWR for better viewing of the wildlife. Increased public use opportunities including outreach and interpretation will be accomplished with the addition of a public use specialist.

VISION

The Tampa Bay Refuges provide essential wildlife habitat with opportunities for research, the protection of cultural resources, and quality environmental and outdoor recreation. Egmont Key, Pinellas, and Passage Key NWRs are a vital link in the Tampa Bay area for nesting, resting, and wintering migratory birds, threatened and endangered species, and resident wildlife. Protecting these refuges with their diverse, but declining habitats and abundant wildlife and cultural resources is critical for ensuring the enjoyment and use of the islands by future generations.

GOALS, OBJECTIVES, AND STRATEGIES

The goals, objectives, and strategies presented are the Service's response to the issues, concerns, and needs expressed by the planning team, the refuge staff and partners, and the public. Chapter V, Plan Implementation, identifies the projects associated with the various strategies.

These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the Improvement Act, the mission of the Refuge System, and the purposes and vision of the Tampa Bay Refuges. The Service intends to accomplish these goals, objectives, and strategies within the next 15 years.

Goal 1 – Provide Habitat and Protection for Migratory Birds, Mangrove-Nesting and Roosting Waterbirds, and Beach-Nesting Waterbird and Shorebird Species.

Discussion: The purposes of the refuges are to protect and provide habitat for nesting, feeding, and resting migratory birds, colonial-nesting waterbirds, and native birds; to conserve and protect the barrier island habitat; and to provide critical habitat for trust species.

Erosion is the foremost problem for Egmont Key and Passage Key NWRs, and is an issue for Pinellas NWR as well. Exotic and invasive vegetation, particularly Brazilian pepper and Australian pine, have altered natural habitats which support the trust species on the refuges. In addition, a hazardous substance spill from the heavy recreational and commercial traffic in Tampa Bay and the Egmont Channel has the potential to adversely impact the refuges.

Objective 1: Within 5 years of reaching staffing goals, develop baseline data and monitoring programs to evaluate the status and trends of migratory and resident bird species on the refuge to support healthy populations in the region.

Discussion: The Service conducts bird surveys on a monthly basis when able, and peak nesting surveys are also conducted by the Service staff with partners. The surveys all need to be lead and coordinated by the Service to ensure standardized monitoring techniques are utilized and the data is compiled and assessed comprehensively. Additional surveys and increased frequency of some current surveying is required to accurately determine the status and trends of the bird populations.

Strategies:

- Service leads the bird surveys. The surveying is done on a monthly basis and includes data on counts, species, and distribution per island and zone.
- Service continues to conduct annual peak nesting bird surveys with partners.
- Service leads and coordinates additional surveys with partners such as the International Shorebird Survey, Audubon Christmas Bird Count, and the International Piping Plover Survey.
- Existing data is summarized/analyzed to compare historical data with current data, especially where declines are noted.

Objective 2: Restore Egmont Key NWR to a 300-acre island and maintain the island with no net loss within the 15-year life of this CCP.

Discussion: Egmont Key NWR has lost nearly half of its acreage since 1877, and has lost nearly one third since 1969. In 1877, Egmont Key was 539 acres, and in 1974, when it was designated a national wildlife refuge, it was 392 acres. Now the refuge portion of the island is 240-250 acres. Current beach renourishment activities on Egmont Key NWR are facilitated on irregular intervals through other organizations that coordinate with the USACE. The renourishment efforts have focused primarily on the northwest end of the island where the cultural and historical resources are located and the beach is open to the public. The beach is eroding along the entire west side of the island. A more comprehensive approach is needed to mitigate the loss of beach and to maintain the

island. The environmental impacts of long-term beach renourishment would be evaluated and addressed prior to implementing routine beach renourishment at the refuge.

Strategies:

- Service continually encourages involvement of the Friends Group and wildlife-oriented non-governmental organizations to support continued beach renourishment on Egmont Key NWR.
- Service monitors the effects of current and future beach renourishment on invertebrates and wildlife.
- Develop a long-term beach renourishment plan for all of Egmont Key NWR which would determine the location, frequency, quantity of material, etc., for routine beach renourishment on the island. Service would routinely coordinate directly with the USACE for implementation.
- Explore possibility of restoring the natural sand drift to the island.
- Explore possibility of hard armoring (installation of rock jetties, rip rap) to prevent erosion of the island.

Objective 3: Maintain Pinellas Refuge islands at current acreage with no net loss.

Discussion: Some mangrove habitat has been lost due to erosion from boat wakes, storm tides, tropical storms, and hurricanes. Renourishment to prevent further erosion and to allow mangrove seedlings to be established is recommended.

Strategies:

- Service and partners install oyster shell bars as needed near the edge of islands to aid in shoreline stabilization.
- Service and partners plant smooth cordgrass (*Spartina alterniflora*) as needed near the shoreline of the islands to allow mangrove seeds to take root.
- Coordinate with the state to create an idle speed zone between Little Bird Key and the nearby sea wall to reduce the impact of boat wakes.

Objective 4: Restore Passage Key NWR to 36 acres and maintain with no net loss within the 15-year life of this CCP.

Discussion: Restoring Passage Key NWR would require some interpretation of the Wilderness Act to determine the “minimum tool necessary” to accomplish the task. The erosion of Passage Key NWR is caused in some part by human activity in the Tampa Bay (heavy boat traffic and dredging), as well as by storms. Currently, the island ranges in size from 0.5-10 acres, and can be virtually submerged for periods of time. If Passage Key NWR becomes submerged for extended periods of time, it would no longer serve the purpose of providing habitat for colonial waterbirds.

Strategies:

- Service continually encourages involvement of the Friends Group and wildlife-oriented non-governmental organizations to support beach renourishment on Passage Key NWR, as allowed by wilderness designation.

-
- Service routinely coordinates directly with the USACE and includes Passage Key NWR as part of the long-term beach renourishment plan for Egmont Key NWR, as allowed by wilderness designation.
 - Explore the possibility of installing oyster domes to reduce wave action that causes erosion of Passage Key NWR.

Objective 5: Complete eradication of exotic and invasive vegetation on all refuge islands within 5 years of the date of this CCP.

Discussion: To maintain the natural diversity of wildlife and habitat, pervasive exotic and invasive species must be controlled.

Strategies:

- Increase Service exotic control efforts by hiring one biological technician.
- Service staff, partners, and contractors use mechanical, chemical, and/or manual means to remove exotic and invasive vegetation from the refuges.
- After the initial removal of exotic and invasive vegetation, utilize prescribed fire approximately every 3 years on Egmont Key NWR.
- Monitor the effects of prescribed fire on wildlife and vegetation.
- Restore habitat, especially on Egmont Key NWR where Brazilian pepper has been removed, with native plants.
- Continue to monitor refuges for reinfestation and treat as needed.

Objective 6: Maintain 15 acres of nesting tern and skimmer habitat on Egmont Key NWR within 5 years of the date of this CCP. Increase acreage as tern and skimmer populations increase.

Discussion: Terns typically nest in open areas with sparse, short vegetation. Their nests consist of depressions in the sand or eggs are merely laid on the surface of more solid substrates such as rocks, crushed shells, or gravel. Areas where terns typically nest on Egmont Key NWR are being overgrown with native plants, reducing the size of the area suitable for nesting. Skimmers nest on sandy or gravelly bars and beaches at the refuge.

Strategies:

- Remove or reduce native plants in and around tern and skimmer nesting habitat manually, mechanically, or by the use of prescribed fire.
- Seasonally close beach habitat within the public use areas on the island with twine and flagging to encourage beach-nesting birds.

Objective 7: Within 1 year of becoming a member of the Tampa Bay Refuges staff, ensure personnel are familiar with the County Spill Response Plans, and, in the event of a spill, know how to react to protect the refuges' wildlife and habitat.

Discussion: Vessels containing billions of gallons of oil and other hazardous substances pass through Tampa Bay and Egmont Channel annually. Cargo ships, cruise ships, and recreational boats add to the heavy traffic. In 1993, a 3-way ship collision at the mouth of Tampa Bay caused 300,000 gallons of oil to be released. Service personnel should be prepared in case there is another spill.

Strategies:

- Service supports the County Spill Response Plans.
- Service coordinates with partners to respond to spills.

Objective 8: Eradicate raccoons and rats from refuge islands within 2 years of the date of this CCP and remove predatory fish crows on a continual basis.

Discussion: Colonies of birds have been devastated by raccoon predation, in particular, nesting birds on Tarpon Key. Predation by fish crows has increased recently and rats have become a serious issue on Egmont Key NWR. Predator control on the refuge islands is critical to protect wildlife.

Strategies:

- Hire one biological technician to live trap raccoons and rats.
- Use Service personnel and/or contractors as needed.
- Continue to monitor refuges for reinfestations and remove predators as needed.

Objective 9: Reduce the occurrences of refuge violations on an on-going basis.

Discussion: The southern end and an eastern portion of Egmont Key NWR are closed to all public use year-round to protect the birds, and a vessel exclusion zone has been established around the seagrass beds on the east side of the island to protect them from propeller damage. Small areas of the public beach can be closed seasonally to protect certain bird populations or buried turtle eggs. Pinellas and Passage Key NWRs are closed to the public year-round to protect wildlife and critical habitat. Illegal access to closed areas or human disturbance even outside of the closed areas can cause birds to abandon their nests or flush from their nests allowing predators to move in. Bird nests on the ground are often hard to detect as the nest and eggs visually blend into their surroundings. Access to closed areas could inadvertently destroy these eggs and buried turtle eggs by trampling.

Strategies:

- Increase Service law enforcement presence by hiring one full-time law enforcement officer.
- Improve, maintain, and increase the number of signs designating closed areas, and those prohibiting dogs on Egmont Key NWR.
- Install barriers to prevent entry to closed areas.
- In coordination with FPS, determine the public use capacity of Egmont Key NWR and manage visitation, overcrowding, and commercial tours within 5 years of reaching staffing goals.
- Explore the possibility of extending the Service's law enforcement jurisdiction around the islands beyond mean high tide through an agreement with the state or port authority, a submerged land lease, changing the acquisition boundary of the refuges, or other means.
- Improve awareness of the role of the Service, the purposes of the refuges, and the reason for closed areas through educational opportunities.

Objective 10: Continue routine removal of improperly disposed monofilament fishing line and other waste from refuge islands and beaches.

Discussion: Fishing line and other trash entangle birds, manatees, fish, turtles, and other wildlife, and causes death to the animal entangled.

Strategies:

- Continue to work with partners to remove improperly disposed material.
- Educate and improve public awareness of the hazards caused by improper disposal of material to help reduce the amount.
- Rescue entangled, oiled, and injured animals when possible.

Objective 11: Establish a fire management program on Egmont Key to reduce hazardous fuel loads and to protect wildlife and island facilities from catastrophic wildfire events.

Discussion: Large amounts of vegetative biomass from exotic species control efforts and tree die-offs from tropical storm events cover most of the island of Egmont Key NWR. A prescribed fire would drastically reduce the threat of a catastrophic wildfire event and would improve nesting and foraging habitat for most refuge species including gopher tortoise and beach-nesting birds.

Strategies:

- Service completes a fire management plan within 1 year of date of this CCP.
- Service fire management office conducts prescribed burns as needed to reduce hazardous fuel loads and to improve habitat.
- Service and partners educate and improve public awareness of the benefits of controlled burning and the hazards of increasing fuel loads.
- Service maintains fire-breaks around island facilities and cultural resources.

Goal 2 – Provide Habitat and Protection for Threatened and Endangered Species and State-Listed Species.

Discussion: Another purpose of the refuge is to provide habitat and protection for threatened and endangered species and species of special concern, which include federal, state, and internationally listed species.

Objective 1: Protect and conserve sea turtle nesting habitat on Egmont Key and Passage Key NWR beaches.

Discussion: The Atlantic loggerhead sea turtle is a threatened species located in the Tampa Bay area. Threats to adult loggerheads include being trapped in fishing nets and being injured by boat propellers. Commercial, residential, and recreational development has decreased the amount of coastal habitat available for nesting sea turtles. Female sea turtles nest on Egmont NWR beaches. Egmont Key NWR is an Index Beach Site for the Atlantic loggerhead sea turtle. Erosion of the refuge *beaches and barriers to nesting areas, such as fallen palm trees, are reducing sea turtle habitat* on the refuge. Additional threats to sea turtles include nest predation by raccoons or poaching by humans.

Strategies:

- Develop and implement a long-term beach renourishment plan for Egmont Key and Passage Key NWRs. (See Goal 1, Objectives 2 and 4.)
- Control predators such as raccoons (see Goal 1, Objective 8), and continue to post sea turtle nests on the refuge to prevent disturbance by informing visitors that the nest is there.
- Hire one full-time Service law enforcement officer to enforce refuge regulations and prevent poaching of sea turtle eggs.
- Remove barriers to nesting by removing fallen palm trees as needed.
- Hire one biological technician to direct and lead monitoring efforts with partners.
- Continue Index Nesting Beach Surveys.
- Continue to support the Atlantic Loggerhead Sea Turtle Recovery Plan.
- Initiate sea turtle research to support sea turtle recovery.

Objective 2: Protect and conserve designated critical habitat for piping plovers on Egmont Key NWR beaches.

Discussion: Piping plovers are a threatened species that are found in Florida during the non-breeding season (fall, winter, and spring). Commercial, residential, and recreational development has decreased the amount of coastal habitat available for piping plovers. Egmont Key NWR has been designated as a critical habitat for piping plovers to feed and roost. However, erosion of the refuge beaches is reducing the piping plover critical habitat, and public beach use may be interfering with the foraging and roosting of these birds. Illegal access to closed areas disturbs wintering birds.

Strategies:

- Develop and implement a long-term beach renourishment plan for Egmont Key and Passage Key NWRs. (See Goal 1, Objectives 2 and 4.)
- Control predators such as raccoons (see Goal 1, Objective 8).
- Hire one full-time Service law enforcement officer to enforce refuge regulations.
- Service directs and leads monthly surveys and coordinates additional surveys with partners.
- Service participates in the International Piping Plover Survey that occurs every 5 years.

Objective 3: Protect and conserve manatee sea grass feeding habitat on east side of Egmont Key NWR.

Discussion: The West Indian manatee is an endangered species found primarily along the coast of Florida. The largest problems facing the manatee are caused by man. Speeding boats run over many manatees that are submerged just below the surface which either kills them or maims them. A vessel exclusion zone has been established around the sea grass beds on the east side of Egmont Key NWR to protect seagrass and manatees that feed on the vegetation.

Strategies:

- Service continues to cooperate with the state and other partners to enforce the vessel exclusion zone around the sea grass beds on the east side of Egmont Key NWR.
- Expand the vessel exclusion zone out from the shore, and clarify the boundary by creating a straight border.

Objective 4: Protect and conserve the Egmont Key NWR gopher tortoise population, increase their burrowing and foraging habitat from 50 acres to 100 acres or more, and maintain the habitat within the 15-year life of this CCP.

Discussion: The FWC has listed the gopher tortoise as a threatened species for the following reasons: (1) It has a significant vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation; (2) it may already meet certain criteria for designation as a threatened species; and (3) it may occupy such an unusually vital or essential ecological niche that should it decline significantly in numbers or distribution other species would be adversely affected to a significant degree. The Egmont Key NWR gopher tortoises are unique in having demonstrated adaptive behavior different from the mainland gopher tortoises by living three to four in a burrow instead of just one to a burrow. Poaching and collection of refuge gopher tortoises by humans is unlawful and threatens the species.

Strategies:

- Use mechanical, chemical, and/or manual means as needed, followed by prescribed fire to remove exotic and invasive vegetation from areas designated as gopher tortoise habitat.
- Hire one full-time Service law enforcement officer to enforce refuge regulations.
- Service initiates regular monitoring and research on the Egmont Key NWR gopher tortoises.

Objective 5: Protect and conserve state-listed vegetation on refuge lands.

Discussion: State-listed plants are known to grow on the refuges. Populations and locations of listed plants need to be identified and protected.

Strategies:

- Service with university and non-governmental organization partners survey the refuge lands to identify and map the location of each species.
- Use mechanical, chemical, and/or manual means as needed, followed by prescribed fire (Egmont Key NWR) to remove exotic and invasive vegetation from areas where state-listed plants are growing.
- Hire one full-time Service law enforcement officer to enforce refuge regulations.

Goal 3 – Provide quality wildlife-dependent recreation at Egmont Key NWR, and impart understanding of importance of the Service role in conservation and management of wildlife and their habitat.

Discussion: Over 25 commercial operators transport 70,000 visitors to Egmont Key NWR annually. One of the purposes of Egmont Key NWR is to provide wildlife-dependent recreation and environmental education for the public. Tampa Bay Refuges staff has not promoted wildlife-dependent recreation at the refuge due to lack of resources. The Service's priority public uses are hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation. Hunting is not an appropriate use for the refuge.

Objective 1: Increase environmental education and interpretation opportunities for the public within the 15-year life of this CCP.

Strategies:

- Service, with partners, plan and open Egmont Key Guard House/Visitor Center and provide wildlife and cultural education exhibits and opportunities.
- Hire one full-time public use specialist.
- Establish an on-site and off-site environmental education program and provide regular public education events.
- Improve and increase the number of interpretive signs and kiosks.
- Update and distribute the Egmont Key/Tampa Bay Refuges brochure.
- Service provides occasional interpretive tours.
- Require tour operators to operate under Service special use permit. Tour operators would be required by the permit to provide refuge interpretation.
- Construct an ADA-compliant commercial dock near the new Visitor Center to safely disembark passengers and to improve management of public use.

Objective 2: Improve opportunities for wildlife photography and observation on Egmont Key NWR *within the 15-year life of this CCP.*

Strategies:

- Service provides access to a photography blind on Egmont Key NWR for wildlife photography and viewing.
- Service constructs a wildlife observation tower.
- Service provides opportunities for closed-circuit television viewing of wildlife (e.g., nesting birds in closed areas) at the Egmont Key NWR Guard House/Visitor Center.

Goal 4 – Protect and interpret cultural and historical resources for the benefit of future generations.

Discussion: Egmont Key has a long history of occupation. The late 19th to early 20th century Fort Dade located on Egmont Key and the mid-19th century Egmont Key Lighthouse were listed on the National Register of Historic Places in 1978. The Tampa Bay Refuges staff has not provided cultural resource educational opportunities on a regular basis due to lack of resources.

Objective 1: Increase awareness and opportunities for cultural resources interpretation.

Strategies:

- Service and FPS establish a visitor center at the Egmont Key NWR guard house which includes cultural resources exhibits.
- Remove vegetation on and around the historical structures on a regular basis.
- Improve historical interpretive signs within in 2 years of meeting staffing goals.
- Service, with partners, provides occasional interpretive tours for the public.

Goal 5 – Properly manage the refuges to meet refuge goals and objectives continuously.

Objective 1: Improve coordination and cooperation between the Service and the FPS for more efficient and effective management of Egmont Key NWR.

Discussion: Egmont Key NWR is managed by the Service and the FPS under a cooperative agreement. Generally, the state is responsible for public recreation and interpretation of natural and cultural resources located predominantly on the north end of the island. The Service is primarily responsible for the management of all wildlife and habitat on the refuge.

Strategies:

- Continue the Egmont Key NWR cooperative management agreement with FPS.
- Ensure the State Unit Management Plan and the CCP are consistent.
- Service and FPS conduct monthly teleconference calls and quarterly meetings to facilitate better communication, coordination, and cooperation.

Objective 2: Improve and enhance partnership opportunities and relationships.

Discussion: The Service has numerous partners that assist in meeting the goals and objectives of the Tampa Bay Refuges. The federal, state, and local governments, non-governmental organizations, universities, and local groups are all partners of the Service.

Strategies:

- Promote and support increasing “Friends” membership to 150+ members within 5 years of the date of this CCP.
- “Friends” Group shares office/storage space with Service once new office is leased.
- Hold an annual partnership meeting.

Objective 3: Incorporate all vacated non-refuge land on Egmont Key under the Service as it becomes available.

Discussion: For consistent management of wildlife and habitat on Egmont Key, consolidate the property under the Service ownership. One property owner, instead of three on the island, would be more efficient for management.

Strategies:

- Service facilitates the transfer of the USCG property (approximately 55 acres) to Service ownership.
- Within 1 year of the date of this CCP, establish Service’s interest in the Tampa Bay Pilot Compound property, to include acquisition of the 5-acre tract leased from Hillsborough County, in the event that occupancy changes within 1 year of the date of this CCP.

Goal 6 – Provide adequate staff and resources to meet refuge goals and objectives.

Discussion: Currently, there is 1 full-time position assigned to the Tampa Bay Refuges. To meet the proposed objectives, additional staff would need to be hired. A boat, vehicles, and heavy equipment would need to be purchased to allow the staff to access the refuges' lands and to complete its tasks. Facilities would need to be procured or constructed to accommodate the refuges' staff and equipment, and to accommodate the proposed visitor services needs.

Objective 1: Within 10 years of the date of this CCP, hire staff, purchase equipment, and construct facilities to support and accommodate the proposed visitor services objectives and biological objectives.

Strategies:

- Hire one full-time law enforcement officer to enforce refuge regulations for the protection of wildlife and habitat, and ensure the safety of visitors on a daily basis.
- Hire one full-time biological technician to support the proposed additional surveying and predator control.
- Hire one full-time public use specialist to provide the proposed environmental education and interpretation opportunities.
- Hire one part-time administrative office assistant to support the increased staff at the refuge.
- Purchase boats, vehicles, and heavy equipment needed for the refuge staff to meet the proposed objectives.
- Install a Service dock on Egmont Key NWR.
- Construct a visitor center and restrooms at the guard house building, and install a water treatment plant to accommodate these facilities.
- Pursue housing and office space at the Pilots' Compound on Egmont Key, and provide office space and storage space on the mainland to accommodate larger staff and new equipment.
- Construct a commercial dock near the new visitor center for transferring equipment on and off the island. The dock would also be used by commercial operators ferrying the public to and from the island.

V. Plan Implementation

INTRODUCTION

Refuge lands are managed as defined under the Improvement Act. Congress has distinguished a clear legislative mission of wildlife conservation for all national wildlife refuges. National wildlife refuges, unlike other public lands, are dedicated to the conservation of the Nation's fish and wildlife resources and wildlife-dependent recreational uses. Priority projects emphasize the protection and enhancement of fish and wildlife species first and foremost, but considerable emphasis is placed on balancing the needs and demands for wildlife-dependent recreation and environmental education.

To accomplish the purpose, vision, goals, and objectives contained in this CCP for the Tampa Bay Refuges, this section identifies projects, funding and personnel needs, volunteer and partnership opportunities, step-down management plans, a monitoring and adaptive management plan, and plan review and revision.

PROPOSED PROJECTS

Listed below are the proposed project summaries and their associated costs for fish and wildlife population management, habitat management, resource protection, visitor services, and refuge administration over the next 15 years. This proposed project list reflects the priority needs identified by the public, planning team, and refuge staff based upon available information. These projects were generated for the purpose of achieving the refuge's objectives and strategies. The primary linkages of these projects to those planning elements are identified in each summary.

FISH AND WILDLIFE POPULATION MANAGEMENT

Eradicate or Control Exotic and Invasive Predators

(First-year cost: \$130,000; Recurring cost: \$5,000)

Egmont Key NWR hosts some of the largest and most important bird nesting colonies in Florida. Egmont Key NWR is also a key loggerhead sea turtle index site since it is the only index beach on the entire Gulf Coast monitored by both state and federal wildlife agencies. Nest predation by invasive predators is a major concern for Egmont Key and Pinellas NWRs. The black rat was unintentionally introduced to Egmont Key NWR in 2006 and will likely have a severe impact on nesting success of all refuge wildlife. The islands of Pinellas NWR have already suffered a nearly total collapse in bird nest success largely due to raccoon predation. This project would allow the refuge to coordinate and contract with the U.S. Department of Agriculture, Wildlife Services, to implement current mammalian predator control techniques to accomplish total eradication of nest predators from refuge islands. (Linkages: Objectives 1.8)

Science-based Inventorying and Monitoring of Plant and Animal Populations

(First-year cost: \$45,000; Recurring cost: \$45,000)

Science-based inventorying and monitoring of plant and animal populations are critical to ensuring the biological integrity of the refuges. The information collected is used to make sound decisions concerning habitat management, predator control, location of closed areas, and to focus law enforcement efforts. Comprehensive inventories are needed for beach-nesting birds, colonial waterbirds, gopher tortoises, box turtles, diamondback terrapins, and state-listed plants found within the Tampa Bay Refuges. Daily

monitoring of sea turtle nesting activity is needed during the summer nesting season. Data collected will contribute to state, regional, and national databases and provide long-term contributions to national objectives for endangered and imperiled species including loggerhead turtles and piping plovers, shorebirds, wading birds, and neotropical migratory birds. This project will address comprehensive monitoring and data management with the addition of a biological technician.
(Linkages: Objectives 1.1, 1.5, 1.6, 1.7, 1.8, 1.10, 2.1, 2.2, 2.3, 2.4, 2.5, 6.1)

HABITAT MANAGEMENT

Eradicate or Control Exotic and Invasive Plants

(First-year cost: \$100,000; Recurring costs: \$15,000)

Exotic and invasive plant species are some of the greatest threats to habitat loss on Egmont Key and Pinellas NWRs. Large stands of exotic plants (Australian pine and Brazilian pepper) cover nearly 40 percent of Egmont Key NWR. Other invasive native plants like strangler fig and coin vine spread rapidly and benefit some wildlife as a food source and provide dune stabilization. Collectively, these nuisance plants displace lush forbs and grasses and significantly reduce nesting and foraging habitat for birds and reptiles. The proven method to eliminate each of these nuisance species requires costly herbicide applications, and remains difficult to accomplish with present staffing levels. Cooperation with partners, the use of volunteer labor, and grants have slowed the infestation of exotics on Egmont Key NWR to approximately 100 acres. Prescribed burning and mechanical treatments are needed to maximize attempts to control invasive plants and restore preferred habitat. This project will utilize contract labor to eradicate current acres infested by exotic plants. It will also secure adequate reserves of herbicide to control re-sprouts and new growth.

(Linkages: Objectives 1.5, 1.6, 2.4, 2.5, 3.2, 4.1)

Fire Management Program on Egmont Key NWR

(First-year cost: \$70,000; Recurring cost: \$15,000)

Fire is a natural part of the central Florida ecosystem and wildfires are an ever-present threat to plants, wildlife, and facilities on Egmont Key NWR. Prescribed fire can be used to minimize wildfire impacts by reducing accumulated fuel loads and to restore beneficial native vegetations like grasses and forbs from monoculture invasive plant stands. Implementation of prescribed fire on the refuge is reliant on fire crews and fire expertise from other refuges located several hours away in north Florida. Implementation of a prescribed fire program on Egmont Key NWR will require additional, in-house operational support, including fire training and personal protective equipment for refuge staff, and on-site fire equipment. This project will also enhance our partnerships with state and local partners willing to respond to refuge wildfires.

(Linkages: Objectives 1.5, 1.6, 1.8, 1.11, 2.4, 2.5, 3.2, 4.1, 5.1)

Erosion Monitoring and Beach Restoration

(First-year cost: \$5,000; Recurring cost: \$5,000)

The largest external threat to the Tampa Bay Refuges is erosion. Over 260 acres (50 percent) of Egmont Key NWR have been lost to erosion in the past 130 years. Passage Key NWR has eroded to a 0.5-acre sandbar only visible during low tides. In order to ensure continued habitat for beach-nesting birds and sea turtles, an active beach renourishment program needs to be implemented. Suitable sand dredged from nearby marinas and/or channels could be placed on the refuges instead of being dumped offshore. Two past beach renourishment projects have successfully restored beach habitat for nesting birds and sea turtles and have also protected cultural resources on Egmont Key NWR. Sand placements typically only lasts about 5 years before being eroded again by high tides

and severe tropical storms including hurricanes. This project consists of continuing to work with the USACE to divert sand from dredged projects to the refuges, and to use GIS mapping to monitor refuge acreages.

(Linkages: Objective 1.2, 1.4)

Mangrove Restoration for Pinellas NWR

(First-year cost: \$5,000; Recurring cost: \$5,000)

Several mangrove islands of Pinellas NWR have lost acres to erosion from storm events over the years. These islands once provided habitat for thousands of brown pelicans, double-crested cormorants, herons, egrets, and roseate spoonbills which nested annually. Habitat restoration projects coordinated by local partners (Tampa Bay Watch) have successfully limited further erosion by stabilizing sections of shoreline with the installation of oyster shell bars and saltmarsh grass plantings. This project will continue restoration efforts with Tampa Bay Watch and support new projects with other partners.

(Linkage: Objective 1.3)

Habitat Maintenance for Beach Nesters

(First-year cost: \$5,000; Recurring cost: \$5,000)

The majority of birds nesting on Egmont Key and Passage Key NWRs prefer open, sandy beaches for nesting. Currently, dense sea oats and other low herbaceous vegetation have invaded the open beach habitat, thus making the habitat unsuitable for beach-nesting birds. This vegetation must be removed or thinned manually (hand-pulling, raking), mechanically (plowed), or by conducting controlled burns. This project will support mechanical removal of encroaching vegetation.

(Linkages: Objectives 1.2, 1.4, 1.5, 1.6, 1.7, 1.10, 1.11, 2.1, 2.2).

RESOURCE PROTECTION

Protect Refuge Resources and Visitors

(First-year cost: \$70,000; Recurring cost: \$70,000)

More than 165,000 visitors recreationally use the Tampa Bay Refuges annually. Closed area trespass, illegal harvest of plants and animals, vandalism, littering, bird and turtle nest disturbance, and other illegal activities have increased due to lack of regular law enforcement patrols. In the past, one complex full-time officer would conduct weekend law enforcement during summer months. Currently, one collateral-duty officer is solely responsible for enforcement activities, but ever-increasing public use and other assigned duties limit the officer's ability to adequately address threats to refuge visitors and wildlife. Furthermore, the refuge system is gradually moving away from collateral-duty officers in favor of full-time officers. The addition of a full-time law enforcement officer would dramatically improve visitor safety and resource protection.

(Linkages: Objectives 1.7, 1.8, 1.9, 2.1, 2.2, 2.3, 2.4, 2.5, 5.2, 6.1)

Cultural Resource Protection and Interpretation

(First-year cost: \$30,000; Recurring cost: \$5,000)

The 100-year old remnants of Fort Dade and 150-year old lighthouse located on Egmont Key were listed on the National Register of Historic Places in 1978. Cultural resources need to be protected from vandalism and need to be maintained from encroachment by native and exotic plants.

Acquisition of the land off-refuge where these cultural resources are located would aid in the care, management, and interpretation of these exhibits. Through this project, access to resources will be

maintained and interpretive signs and regular tours of these resources will be established with the assistance of partners.

(Linkages: Objectives: 1.5, 3.1, 4.1, 5.1, 5.2, 5.3)

Land Acquisition

(First-year cost: \$6,000,000; Recurring cost: \$0)

A minor expansion plan will be completed for Egmont Key NWR. Two parcels are outside the current acquisition boundary. A 55-acre parcel at the north end of the island is officially owned by the U.S. Coast Guard, which discontinued operations on the island in 1995. The other parcel possibly available in the future is a 5-acre tract on the east side of the island and is currently occupied by the Tampa Bay Pilots Association (TBPA) under a 99-year lease with Hillsborough County. The TBPA is always actively looking for a more cost-effective site to base its operations. Acquisition of these two parcels of land would improve management of Egmont Key by streamlining coordination, facilities, and primary missions of the island. Land acquisition costs are estimates to purchase non-federal lands. Additional habitat for wildlife and important cultural resources would be acquired and managed by the Service instead of several different entities (FPS, USCG, TBPA).

(Linkages: Objectives 1.2, 1.5, 1.6, 2.1, 2.2, 2.4, 2.5, 3.1, 3.2, 4.1, 5.3, 6)

Minimize Impacts of Trash, Marine Debris, and Oil Spills

(First-year cost: \$20,000; Recurring cost: \$5,000)

A substantial amount of litter, monofilament, and marine debris is regularly deposited onto refuge beaches and vegetation (mangroves) and can harm wildlife and injure visitors. This project would work with the partners to use signs, brochures, and other tools to educate the public about the harmful effects of marine debris and monofilament. This project would provide support for monthly refuge clean-up events with partners and the refuges' friends group. Refuge staff would support the Hillsborough County Oil Spill Response Plan and coordinate with partners to respond to oil spills.

(Linkages: Objectives 1.7, 1.10)

VISITOR SERVICES

Visitor Center and Environmental Education

(First-year cost: \$565,000; Recurring cost: \$100,000)

Approximately 165,000 visitors come to Egmont Key NWR annually. Currently, the Egmont Key Guard House building on Egmont Key NWR has been restored to function as a visitor center and island museum. Interactive exhibits need to be developed to highlight the natural and cultural resources of the island and the Tampa Bay Refuges. Environmental education and Interpretive programs (guided nature hikes and tours), can be conducted within and from the center. This project would include exhibit development/installation, and would purchase environmental education supplies and equipment for on- and off-site programs. This project also includes the addition of a park ranger to coordinate all aspects of visitor services including environmental education, outreach, recreation, visitor facilities, partnerships, visitor center operations, media, and the volunteer program.

(Linkages: Objectives 3.1, 3.2, 4.1, 6.1)

Improve Wildlife-dependent Recreation

(First-year cost: \$75,000; Recurring cost: \$5,000)

The Tampa Bay Refuges provide a diversity of wildlife observation and recreational opportunities. Fishing is permitted in waters around refuge islands. Abundant underwater wildlife can be viewed when swimming, snorkeling, and diving in the sea grass beds along the east side of Egmont Key NWR and near the submerged gun battery along the southeast side. These refuges are utilized year-round by migrating, wintering, feeding, and nesting birds. There are plenty of opportunities to view wildlife up-close on Egmont Key NWR. The public can watch beach-nesting birds outside of sanctuary areas, or resident gopher tortoises and box turtles as they wander throughout the island. This project involves providing interpretive kiosks which show the location of the areas accessible to the public and the permitted/prohibited activities. This project will also establish photo blinds to increase opportunities for wildlife photography and observation. A closed-circuit television in the visitor center could provide live video feed of birds nesting high in trees and closed areas. (Linkages: Objectives 3.1, 3.2, 4.1, 6.1)

REFUGE ADMINISTRATION

Construct New Refuge Dock

(First-year cost: \$150,000; Recurring cost: \$2,000)

There is a clear need for refuge docking facilities at Egmont Key NWR. Currently, refuge vessels are afforded limited docking space to the privately owned Pilot's dock. Privately owned pilot vessels receive priority access to the one available boat slip and mooring overnight puts refuge vessels at risk of damage or loss due to laterally impacting wave action during rough weather. This project will construct a 6-foot wide boardwalk in a "T" shaped dock 180 feet from the refuge shore. Two 13,000-pound boat lifts will be attached to each end of the dock. (Linkage: Objective 6.1)

Construct New Public Restroom Facility by Egmont Key Guard House

(First-year cost: \$950,000; Recurring cost: \$25,000)

Over 165,000 visitors come to the island of Egmont Key annually. The newly reconstructed Egmont Key Guard House will soon become the refuge visitor center with wildlife and cultural exhibits but the facility is in desperate need of an adjacent public restroom facility. This project will construct a self-contained restroom building that does not use freshwater and includes an extensive drain field or composting system. The facility will be able to handle high daily use. (Linkage: Objectives 3.1, 6.1)

Construct New Shop/Bunk House Facility on Egmont Key NWR

(First-year cost: \$750,000; Recurring cost: \$15,000)

There is a glaring need for refuge-owned sleeping and equipment storage facilities on the remote island of Egmont Key. Currently, refuge staff and volunteers use a 500-square-foot historic cottage originally built in 1911. The cottage is located within the Tampa Bay Pilot Association's compound and is provided to refuge staff as per memorandum of understanding with the Pilots. Refuge vehicles (ATV, mule, carts), signs, and equipment are stored within a small tool shed or under an open-air vehicle shelter which offers poor protection from corrosion caused by salt air. This project would construct a facility capable of housing a dozen personnel overnight and include a full bathroom and kitchen. The facility will also provide a minimum of 1,500 square feet of enclosed storage for vehicles, supplies, and heavy equipment. The facility will be equipped with a reverse osmosis system to provide potable water. (Linkage: Objective 6.1)

Construct New Commercial Docking Facility by Egmont Key Guard House

(First-year cost: \$500,000; Recurring cost: \$15,000)

Over 25 commercial operators transport 70,000 refuge visitors to the island annually. A large commercial dock adjacent to the refuge visitor center (Guard House) is needed to safely disembark passengers and to improve management of public use.

(Linkage: Objective 3.1, 6.1)

Meet/Fulfill Heavy Equipment Needs

(First-year cost: \$75,000; Recurring cost: \$10,000)

There is a strong need for a piece of heavy equipment on Egmont Key NWR. A small- to medium-sized 4-wheel drive tractor with a set of attachments (bucket, backhoe, root rake, and bushhog) or a 4-wheel drive backhoe loader is needed. Refuge staff could maintain established fire breaks, clear and level island trails used by visitors and staff, remove beach debris (palm trunks) impeding nesting sea turtles, maintain tern/skimmer beach nesting sites, and remove newly sprouting exotic plants. A tractor could also be used to support future construction projects. (Linkage: Objective 6.1)

Replace All-Terrain Utility Vehicle

(First-year cost: \$12,000; Recurring cost: \$1,000)

This project calls for the replacement of the 2006 Kawasaki Mule 4-wheel drive vehicle. This all-terrain vehicle is the primary mode of transportation to carry refuge staff, volunteers, equipment, and large refuge signs around the beaches and rough trails of the island. It is used for law enforcement, injured wildlife rescues, exotic species control, and wildfire suppression. All vehicles on the island need replacement after 3 years of service due to the extensive use and harsh environmental conditions (salt corrosion).

(Linkage: Objective 6.1)

Replace 25-Foot Work Boat

(First-year cost: \$125,000; Recurring cost: \$10,000)

This project calls for the replacement of the 1986 Boston Whaler vessel with twin 4-stroke outboard motors. This boat is the primary vessel used to transport staff, volunteers, and supplies to Egmont Key and Passage Key NWRs. This boat provides the only reliable passage to these island refuges regardless of wind or wave conditions. A replacement vessel with twin outboard motors capable of safely transporting a dozen passengers or a ton of cargo and able to load beach vehicles (ATV, Kawasaki Mule, electric carts) is needed. (Linkage: Objectives 6.1)

Replace 23-Foot Law Enforcement Boat

(First-year cost: \$100,000; Recurring cost: \$ 10,000)

This project calls for the replacement of the 2000 Seacraft vessel with twin outboard motors. This boat is the primary vessel used by law enforcement officers to conduct patrol activities around Egmont Key and Passage Key NWRs. This boat is outfitted with blue lights/sirens and boat bumper to conduct vessel stops. A replacement vessel with twin outboard motors and a covered wheel house is needed to provide law enforcement coverage during the frequent poor weather situations occurring in Tampa Bay.

(Linkage: Objective 6.1)

Administrative Support

(First-year cost: \$78,000; Recurring cost: \$ 78,000)

If additional staff including a full-time refuge officer, biological technician, and park ranger were added to the current staff (assistant manager) living and working in Tampa Bay, additional administrative office space and support would be needed. A part-time permanent administrative office assistant would be needed assist the complex office assistant (located 100 miles driving distance from the complex headquarters office) with the additional administrative workload. This project would also provide \$60,000 for GSA- leased office space and computer needs. (Linkages: Objective 6.1)

Table 14 summarizes the proposed projects and associated costs and staffing needs.

FUNDING AND PERSONNEL

The Tampa Bay Refuges are satellite stations of Chassahowitzka NWR Complex, with the headquarters office located in Crystal River, Citrus County, Florida. All five refuges in the complex share a budget and partially share staff. The Tampa Bay Refuges are staffed by a refuge operations specialist/law enforcement, GS-485-9/11 (assistant refuge manager) with collateral law enforcement authority who handles daily activities. Complex staff provides assistance on large projects, biological surveys, and law enforcement activities. However, since Tampa Bay and Crystal River are 100 miles driving distance apart, it is not feasible to send staff to assist on a daily basis. The addition of a full-time law enforcement officer, public use specialist, biological technician, and part-time office assistant will be required for the refuges to achieve the goals and objectives outlined in this CCP. The estimated cost for a full staff would be \$280,000 per year based on the 2008 General Schedule salary table including estimates for benefits and overtime pay.

PARTNERSHIP/VOLUNTEERS OPPORTUNITIES

A key element of this CCP is to establish partnerships with local volunteers groups, adjacent landowners, private organizations, and state and federal natural resource agencies. Many partnerships currently exist at the Tampa Bay Refuges, since a variety of partners help further the purposes, vision, goals, and objectives of the refuges through wildlife and habitat management activities, outreach, environmental education, other visitor services, and cultural resource protection. The Service will continue to work with existing partners and thrive to add new partners that will benefit the refuges.

Table 14. Summary of proposed projects and costs (in 2008 dollars)

| Projects Proposed to Implement Management Plan | Initial Project Cost (\$) | Annual Recurring Costs (\$) * | Staffing FTEs (3.5) |
|--|----------------------------------|--------------------------------------|----------------------------|
| Eradicate or Control Exotic and Invasive Predators | \$130,000 | \$5,000 | -- |
| Science-based Inventory and Monitoring of Plant and Animal Populations | \$45,000 | \$45,000 | Biological Technician |
| Eradicate or Control Exotic and Invasive Plants | \$100,000 | \$15,000 | -- |
| Fire Management Program on Egmont Key NWR | \$70,000 | \$15,000 | -- |
| Erosion Monitoring and Beach Restoration | \$5,000 | \$5,000 | -- |
| Mangrove Restoration for Pinellas NWR | \$5,000 | \$5,000 | -- |
| Habitat Maintenance for Beach Nesters | \$5,000 | \$5,000 | -- |
| Protect Refuge Resources and Visitors | \$70,000 | \$70,000 | Refuge Officer |
| Cultural Resource Protection and Interpretation | \$30,000 | \$5,000 | -- |
| Land Acquisition (non-federal lands) | \$6,000,000 | -- | -- |
| Minimize Impacts of Trash, Marine Debris, and Oil Spills | \$20,000 | \$5,000 | -- |
| Visitor Center and Environmental Education | \$565,000 | \$100,000 | Park Ranger |
| Improve Wildlife-dependent Recreation | \$75,000 | \$5,000 | -- |
| Construct New Refuge Dock | \$150,000 | \$2,000 | -- |
| Construct New Public Restroom Facility by Egmont Key Guard House | \$950,000 | \$25,000 | -- |
| Construct New Shop/ Bunk House Facility on Egmont Key NWR | \$750,000 | \$15,000 | -- |

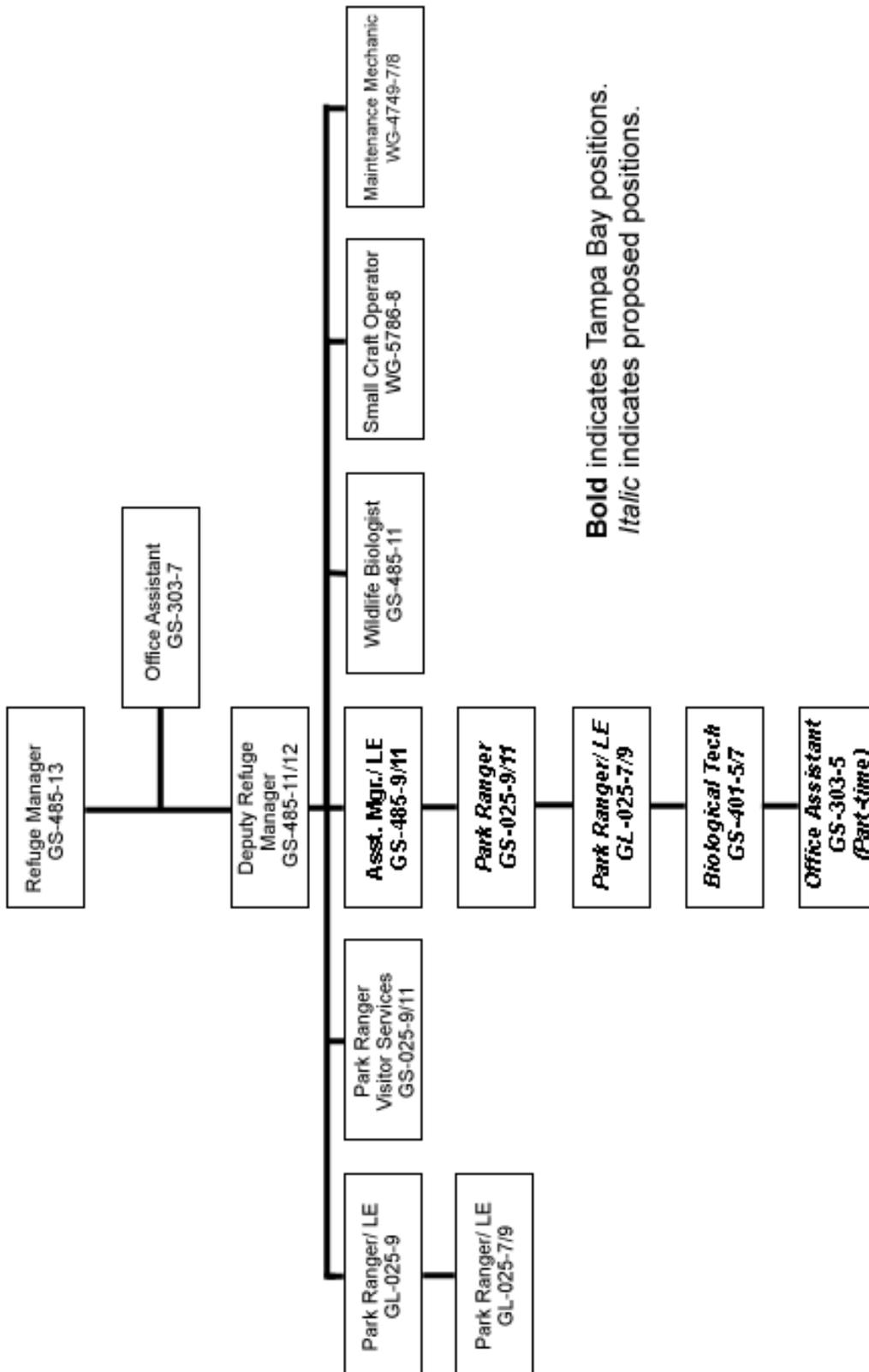
| Projects Proposed to Implement Management Plan | Initial Project Cost (\$) | Annual Recurring Costs (\$) * | Staffing FTEs (3.5) |
|---|----------------------------------|--------------------------------------|----------------------------|
| Construct New Commercial Docking Facility by Egmont Key Guard House | \$500,000 | \$15,000 | -- |
| Meet/Fulfill Heavy Equipment Needs | \$75,000 | \$10,000 | -- |
| Replace All-Terrain Utility Vehicle | \$12,000 | \$1,000 | -- |
| Replace 25-Foot Work Boat | \$125,000 | \$10,000 | -- |
| Replace 23-Foot Law Enforcement Boat | \$100,000 | \$10,000 | -- |
| Administrative Support | \$78,000 | \$78,000 | (PT) Office Assistant |
| Grand Totals: | \$9,860,000 | \$446,000 | 3.5 |
| Grand Total Without Land Acquisition: | \$3,835,000 | \$416,000 | |

Table 15. Approximate annual costs of proposed staff positions in 2008 dollars

| Title | Responsibility | RONS Project Number | Grade | Annual Cost |
|---------------------------|--|----------------------------|--------------|--------------------|
| Refuge Officer | Resource Protection | 99006 | GS-7/9 | \$70,000 |
| Biological Technician | Wildlife Monitoring and Exotic Species Control | 09003 | GS-5/7 | \$45,000 |
| Park Ranger | Visitor Services | 09002 | GS-9/11 | \$65,000 |
| Office Assistant (PTE) | Administration | 09004 | GS-5 | \$18,000 |
| Total yearly cost: | | | | \$198,000 |

Note: These figures have been incorporated into the project descriptions and their associated costs in Table 14.

Figure 18. Proposed organization structure for the management of the Tampa Bay Refuges—current and proposed positions



Bold indicates Tampa Bay positions.
Italic indicates proposed positions.

STEP DOWN MANAGEMENT PLANS

A CCP is a strategic plan that guides the direction of the refuge. A step-down management plan provides more details and specific guidance on certain refuge program areas or activities, such as habitat, prescribed fire, and visitor services management. As implementation strategies in the CCP, step-down plans are also developed in accordance with the National Environmental Policy Act. Each of these plans will further address the priority issues raised during the comprehensive conservation planning process, the recommendations of the CCP review teams, and comments made by the public and other interested parties.

The refuge proposes to initiate, update, revise, and/or implement 12 step-down plans within the 15-year time frame of this CCP. A list of these plans and their associated completion dates is presented in Table 16. The following section describes the proposed step-down plans.

Law Enforcement Plan (Update), plan completed 2006: This plan provides a ready reference to Service, regional, and local law enforcement resources regarding refuge policies, procedures, and programs concerning refuge law enforcement. It describes the objectives of the law enforcement function on all refuges in the complex. It addresses the type of jurisdiction, active memoranda of understanding, and authorities of refuge officers both on and off the refuge. This plan discusses the procedures for addressing crimes on refuge lands, and includes patrols, traffic control, plain clothes operations, surveillance, and investigations. This plan includes procedures for documentation of both serious and routine incidents, warnings, and violation notices, and outlines procedures for custodial arrests, execution of warrants, intrusion alarm responses, searches and rescues, medical emergencies, and crowd control. This plan was approved in 2006 and will be reviewed every 5 years.

Fire Management Plan (New Plan), completion 2009: This plan will describe the use of prescribed fire on Egmont Key, and also serve as a contingency plan in the case of wildfire activity on or near refuge property. The plan will implement the policies, objectives, and standards for fire management presented in the Fire Management Handbook (621 FW 1-5), Department Manual (620 DM), and Service Manuals (095 FW 3, 232 FW6, 241 FW 3, and 241 FW 7). It will provide guidance for achieving the resource management objectives defined in refuge resource management plans and the comprehensive conservation plan. Guidance will be provided to staff for carrying-out fire management operations, including prescribed burning for habitat improvement and fuel reduction, as well as wildfire suppression activities.

Wildlife Inventorying and Monitoring Plan (New), completion 2010: This plan describes inventorying and monitoring techniques and methodologies for surveys of priority species or species groups. Several migratory bird and reptile species are monitored for nest success and population trends. Plant communities will also be addressed. The plan establishes timetables for inventorying and monitoring. Inventory data is essential to guide in management of wildlife habitat on refuges.

Predator Control Plan (New Plan), completion 2011: This plan will include a description of refuge predator issues, control methods, and an explanation of the necessity to control mammalian and avian predators in order to protect priority refuge species.

Exotic/Invasive Plant Control Plan (New Plan), completion 2010: This plan will establish the strategy to eradicate or control exotic and invasive plants to maintenance levels. It will include monitoring protocols and control techniques including herbicide applications, mechanical treatments, and the use of prescribed fire.

Oil Spill Response Plan (Update), plan completed 2007: This plan sets forth a strategy for protection of refuge shoreline and marine environments within and adjacent to refuge boundaries. This plan outlines refuge responsibilities and rolls in responding to oil spills.

Refuge Sign Plan (New Plan), completion 2012: This plan will describe refuge strategies for informing visitors via signs, kiosks, and buoys. It will incorporate Service sign policy guidelines. This plan will contain a photo, the message, GPS location, and condition of all refuge signs currently installed. The plan will specify signage needed to improve communication of information and regulations to the public.

Visitor Services Management Plan (New Plan), completion 2012: This plan will describe wildlife-dependent recreation, environmental education, and interpretive programs associated with the Tampa Bay Refuges. It will address specific issues or items, such as refuge access, facility operations, site plans, and handicapped accessibility. This plan will guide the Visitor Services' program on the refuges. The plan will also address wildlife and habitat needs, trail development, wildlife-dependent recreation priorities, and interpretation of cultural resources.

Commercial Use Monitoring Plan (New Plan), completion 2013: Access to Egmont Key NWR is by personal boat or commercial tour boats. This plan will address commercial uses and operations on Egmont Key NWR.

Cultural Resource Protection Plan (New Plan), completion 2013: This plan will address management and protection of cultural resources on Egmont Key NWR including inventory, interpretation, and restoration. This plan will contain current and historic photos of resources, GPS location, and history/current condition of all island cultural resources.

Habitat Management Plan (New Plan), completion 2011: This plan will guide all habitat management activities on the Tampa Bay Refuges, including habitat management and restoration, shoreline restoration, and exotic and invasive plant control. The plan will identify the wildlife habitat needs and outline the appropriate application of management tools, such as prescribed fire, herbicide and pesticide treatments, and mechanical or hand removal of vegetation. Wildlife and habitat monitoring will be incorporated into the plan. It will include parameters for using adaptive management principles to fine-tune management and to improve results for targeted, priority wildlife species, species groups, and habitat.

Hurricane/Disaster Action Plan (Update), plan completed 2008: This plan outlines general procedures to be followed before, during, and after hurricane events or other disasters. It outlines staff responsibilities for preparations of facilities, equipment, vehicles, information systems, and files. This plan contains key contact information and GPS locations of refuge facilities and staff residences. The plan is updated annually.

Table 16. Step-down management plans related to the goals and objectives of CCP

| Step-down Plan | Completion Date |
|---|------------------------|
| Law Enforcement Plan (2006) | 2012 |
| Fire Management Plan (draft 2008) | 2009 |
| Wildlife Inventorying and Monitoring Plan (1990) | 2010 |
| Predator Control Plan (draft 2002) | 2011 |
| Exotic/Invasive Plant Control Plan (draft 2007) | 2010 |
| Oil Spill Response Plan (2007) | 2013 |
| Refuge Sign Plan (new) | 2012 |
| Visitor Services Management Plan (new) | 2012 |
| Commercial Use Management Plan (new) | 2013 |
| Cultural Resource Protection Plan (new) | 2013 |
| Habitat Management Plan (new) | 2011 |
| Hurricane/Disaster Action Plan (2006) | Annually |

MONITORING AND ADAPTIVE MANAGEMENT

Adaptive management is a flexible approach to long-term management of biotic resources that is directed over time by the results of ongoing monitoring activities and other information. More specifically, adaptive management is a process by which projects are implemented within a framework of scientifically driven experiments to test the predictions and assumptions outlined within a plan.

To apply adaptive management, specific surveying, inventorying, and monitoring protocols will be adopted for the refuges. The habitat management strategies will be systematically evaluated to determine management effects on wildlife populations. This information will be used to refine approaches and determine how effectively the objectives are being accomplished. Evaluations will include ecosystem team and other appropriate partner participation. If monitoring and evaluation indicate undesirable effects for target and non-target species and/or communities, then alterations to the management projects will be made. Subsequently, this CCP will be revised. Specific monitoring and evaluation activities will be described in the step-down management plans.

PLAN REVIEW AND REVISION

This CCP will be reviewed annually as the refuges' annual work plans and budgets are developed. It will also be reviewed to determine the need for revision. A revision will occur if and when conditions change or significant information becomes available, such as a change in ecological conditions or a major refuge expansion. This CCP will be augmented by detailed step-down management plans to address the completion of specific strategies in support of the refuges' goals and objectives. Revisions to this CCP and the step-down management plans will be subject to NEPA compliance.

