Eradication
Of
Non-native Rats
From
Egmont Key National Wildlife Refuge

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This Draft Environmental Assessment (EA) evaluates impacts from non-native rats on Egmont Key National Wildlife Refuge, describes control alternatives and proposes actions to eradicate their population. By removing rats from the island of Egmont Key, we will reduce adverse impacts to habitats, resident wildlife, nesting migratory birds, threatened/ endangered species, cultural resources, and public visitors. Non-native rats pose a very large threat to the native natural resources, long-term resource management programs of the Refuge, and visitor health and safety. The Final EA document will be prepared in response to comments and concerns received during the public review of the Draft EA.

Comments and Availability
The Draft Eradication of Non-native Rats from Egmont Key National Wildlife Refuge Environmental Assessment is available for public viewing at the following locations:

- Refuge Headquarters Office
- 1502 SE Kings Bay Drive
- Crystal River, Florida 34429

- Tampa Bay Refuges Office
- U.S. Fish and Wildlife Service
- 9500 Koger Blvd. N., Suite 102
- St. Petersburg, Florida 33702

The EA may also be viewed and downloaded at www.tampabayrefuges.org

All comments, questions, or requests for printed/ electronic copies of the EA should be directed to Richard Meyers of U. S. Fish and Wildlife Service at (727) 570-5417 or by email at Richard_Meyers@fws.gov.

As the nation’s principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to assure that their development is in the best interests of all. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.
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1 BACKGROUND

1.1 Introduction

The U.S. Fish and Wildlife Service (USFWS) prepared this Environmental Assessment for Egmont Key National Wildlife Refuge (NWR) in compliance with the National Environmental Policy Act (NEPA).

The Environmental Assessment (EA) is to evaluate impacts from black rats (Rattus rattus) to the island of Egmont Key, to describe reasonable control alternatives, and to propose actions to eliminate their population. The predicted biological impacts of implementing each alternative are analyzed in this environmental assessment. This analysis assists the USFWS in determining if the alternatives represent no significant impacts, thus requiring the preparation of a Finding of No Significant Impact (FONSI), or if the alternatives represent significant impacts, thus requiring more detailed analysis through an Environmental Impact Statement (EIS) and a Record of Decision (RD). Following public review and comment, the USFWS will select an alternative to be fully developed for this refuge.

Egmont Key is located at the mouth of Tampa Bay, along the Gulf Coast of Florida in Hillsborough County. In 1974, a 392 acre wildlife refuge was established to protect the Key’s significant natural, historical, and cultural resources from the impending threats of development. A cooperative management agreement between the USFWS and Florida’s Department of Environmental Protection, Division of Recreation and Parks established Egmont Key State Park in 1989. The Florida Park Service (FPS) manages daily public use activities on the island and provides regular assistance to USFWS on biological activities.

Egmont Key NWR provides nesting, feeding, and loafing habitat for more than 110 species of migratory and resident birds. Thousands of gulls and terns, hundreds of pelicans and black Skimmers (Rhychos niger), and a handful of American oystercatchers (Haematopus palliates), nest annually. Egmont Key provides valuable wildlife habitat in the very populated Tampa Bay area. The island is listed as critical habitat for the endangered piping plover (Charadrius melodus) and provides habitat and protection for the endangered West Indian manatee (Trichechus manatus latirostris). The key has an average of 30 endangered Atlantic loggerhead sea turtles (Caretta caretta caretta) nests annually, and unusually large populations of gopher tortoises (Gopherus polyphemus) and Florida box turtles (Terrapene carolina bauri).

Thousands of non-native species have been introduced either accidentally or intentionally into natural communities worldwide. Many die out, some persist and become pests. Animals that establish breeding populations after being introduced by humans are termed exotic. These species jeopardize the populations of native plants and animals (especially rare species) and disrupt complex native ecology, thus degrading native habitats (Howald et al. 2007).

The black rat (Rattus rattus) also known as roof rat or fruit rat, are notorious for rapidly colonizing islands throughout the world. Due to their commensal association with humans, rats are inadvertently introduced by humans visiting islands or disperse from one island to another by rafting on debris. The colonization of islands by rats frequently results in the reduction or extinction of native plants and animals.
1.2 Purpose of the Proposed Action

40 CFR 1502.13: The purpose of this Environmental Assessment is to evaluate the short- and long-term environmental consequences of eradicating non-native black rats from the environmentally sensitive offshore island of Egmont Key in Tampa Bay, Florida. The primary goal of this study is to enhance and ultimately restore the habitat of native species, primarily birds and reptiles which inhabit the approximately 280 acre island.

The National Environmental Policy Act requires an analysis of potential impacts from the proposed activity on the affected environment. This environmental assessment reviews these potential impacts, the actions that would be taken to prevent or mitigate any and all environmental damage from the proposed project to eliminate rats, and the environmental consequences of the No Action alternative.

1.3 Need for the Proposed Action

Invasive rodents are likely responsible for the greatest number of extinctions and ecosystem changes on islands (Howald et al. 2007). Rats are generally omnivorous, foraging opportunistically on virtually any kind of plant or animal. Consequently they can rapidly reduce populations of native plants and animals on islands, thus adversely altering the habitat for wildlife. Because rats feed on young vegetative growth and frequently gnaw the stems of plants to wear down their incisor teeth and keep them short, the ecological succession of plants may be adversely affected, especially on small, dry islands with sparse vegetation. Although rats typically prey on the smaller species of animals which are generally slower, more readily available and easier to capture, the eggs or neonate offspring of beach nesting species are especially vulnerable to predation.

Rats were first discovered on Egmont Key during the summer of 2006. Their arrival coincided with a major beach re-nourishment project at the north end of the island. A large dredging vessel was anchored adjacent to the island for several weeks. Rats could have easily escaped from the vessel if it was infested. An introduction through swimming or rafting across the shipping channel is possible, but not probable. Rats have been implicated in the decline in many populations of island-nesting birds (Gochfeld et al. 1994). Previous work on offshore islands in the US Virgin Islands (USVI) demonstrated a significant decline in bird species diversity with increasing rat abundance (Campbell 1991). Historical breeding colonies of seabirds have diminished or disappeared (Dewey and Nellis 1980), presumably due to rat predation which most adversely affects the smaller species. In 1998, the entire colony (c. 250 pairs) of Roseate Terns (Sterna dougallii) nesting on Congo Cay, USVI, deserted the island soon after egg-laying due to rat predation (Pierce 2004). Bird species that abandoned previously occupied islands are likely to re-occupy them once islands are rat free. In 1983, Dog Island, USVI was one of three islands where rats were eliminated through a combination of trapping and poisoning (Boulon and Nellis 1985). Prior to rat eradication, the only seabirds nesting on Dog Island were laughing gulls (Larus atricilla). Subsequent to eradication, the laughing gulls are thriving, a large colony of ground-nesting sandwich terns (Sterna sandvicensis) are using the island for nesting every summer (Pierce 2004).
The rat eradication program for the Antiguan Racer Conservation Project has had a profound effect on the nesting seabird populations of the offshore islands of Antigua. Since 1995, a total of eleven offshore islands have been cleared of rats, and islands where there had been very little or no seabird activities in recent times are, since June 2001, thriving with bird life (Pierce 2001).

The Audubon Society of Florida proposed the eradication of rats from Egmont Key in order to enhance the habitat of the islands, to prevent catastrophic predation on the native wildlife, beach nesting birds, and to restore natural ecological functions. A single, rapid population elimination effort is necessary to ensure successful eradication of the rats, lest a few survivors reestablish a breeding population. Similar rat eradication projects were successfully conducted by U. S. Department of Agriculture, Wildlife Service (WS) on Caribbean islands including a project completed in 2006 on Buck Island National Wildlife Refuge on the island of St. Thomas, U.S. Virgin Islands (Witmer et al. 2007).

1.4 Decision that Must be Made

The island of Egmont Key is cooperatively managed by the USFWS and the FPS. The USFWS will make the decision whether to implement a rat eradication program, and if the proposed action will require preparation of a Finding of No Significant Impact or that an Environmental Impact Statement will be needed.

1.5 Issues and Concerns

Rats are highly omnivorous and opportunistic feeders. Their foraging activities can impact ground nesting birds, sea turtle nests and hatchlings and many small trees and shrubs. Black rats are known to be excellent climbers and are known to eat invertebrates, lizard and bird eggs and nestlings. Rats feed on the eggs and chicks of seabirds, game species, and other native wildlife. Rats may have direct impacts on federally listed species. Egmont Key is designated critical habitat for the threatened piping plover. The island annually hosts large colonies of beach nesting birds including brown pelicans (*Pelecanus occidentalis*), royal terns (*Sterna maxima*), sandwich terns (*Sterna sandvicensis*), black skimmers, and laughing gulls.

In the Virgin Islands, rat predation on the eggs and hatchlings of the endangered hawksbill sea turtle (*Eretmochelys imbricata*) as well harassment of female turtles attempting to nest has been documented by the National Park Service (NPS) on Buck Island, St. Croix (Witmer et al. 2007). Atlantic loggerhead sea turtles nesting at Egmont Key are vulnerable to predation and harassment by rats. Least tern (*Sterna antillarum*) eggs and hatchlings can also be affected by rat predation, and a small colony of nesting least terns abandoned nesting at Egmont Key after a week in May 2008 for unknown reasons. Rat disturbance could have caused abandonment. Rats were likely responsible for 100% egg mortality and colony abandonment for two separate roseate tern (*Sterna dougallii*) colonies on Little St. James Island (Dewey and Nellis 1980) and Congo Cay (Witmer et al. 2007).
Plant species may also be at risk at Egmont Key since rats use plants to obtain moisture on islands with no permanent freshwater. Because rats consume new vegetation growth as it appears, and small islands have dry and sparse vegetation comprising relatively few species, plant growth and succession on small islands is inhibited by the presence of rats.

Concerns by the public are likely to focus on potential adverse effects on non-target plant and animal species, which are addressed in this EA. There is no foreseeable negative impact on any endangered species or other non-target organisms. The nesting seabirds are exclusively fish-eaters. Reptiles, wading birds, and waterfowl are not expected to consume poisoned bait. The few raptors observed on the island including peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaetus*), broad-winged hawk (*Buteo platypterus*), red-shouldered hawk (*Buteo lineatus*) forage primarily on birds or fish caught on the wing. Rapid removal and burial of poisoned rats should minimize any secondary exposure to raptors.

As this study is unlikely to have an effect on the marine environment, it will not impact any of the marine turtles or cetaceans in these waters. The consultation with pertinent organizations and implementation of a review period for the public are intended to provide critical assessment of the EA.
2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Alternative 1: No Action

No rat eradication would be done. The impacts of non-native rats would continue including damage to native vegetation and predation on native wildlife, beach nesting bird colonies, and endangered and threatened species. The non-native rats would continue to be an unnatural part of the islands’ environmentally sensitive ecosystems. All nesting birds and reptiles populations on the island could drastically decrease due to lack of nesting success.

2.2 Alternative 2: The Proposed Action – Rat Eradication

The preferred alternative is rat eradication by poisoning. The USFWS would work with State and Federal partners to develop a strategy to eradicate rats. Because the USFWS and FPS have limited personnel, resources, and expertise for a rat eradication program, the U.S. Department of Agriculture’s (WS) Wildlife Services will be contracted to implement the rat eradication. The WS has successfully conducted island-wide rat eradication using a combination of trapping and rodenticide on several offshore islands in the U.S. Virgin Islands. Rodents have been eradicated from at least 284 islands worldwide. Of known eradication attempts where the result has been documented, 90% have been successful (Howald et al. 2007).

Ideally, baiting would begin with the onset of the dry season during Florida’s short winter when food is most limited for rats. The project should start roughly in January or February of 2009. Work within Egmont Key’s bird sanctuary would be to be completed by April 1st when brown pelicans would arrive to the island to start nesting. Eradication work could continue in areas outside the bird sanctuary past April if needed. Prior to the start of baiting, trap census will be conducted to establish a baseline population. Snap-traps will be secured to the side of a tree or on a wooden stake about 10-20 inches above the ground and baited with a mixture of oats and peanut butter.

Baits will be placed in bait stations. Approximately 700 bait stations will be placed in trees or on wooden stakes above the ground and each station affixed to that location with either cable ties, wire, or stakes. After placement, baits will be checked and replaced as needed. To assure that all rats have been eliminated, baits are maintained for weeks after all consumption has virtually stopped (Witmer, et al. 1998).

Once rats are eradicated, periodic monitoring will be used to determine the success of the eradication and whether reinvasion has occurred. The successful eradication of rats on the island would stimulate the recovery of native vegetation, thus enhancing the habitat for wildlife. Furthermore, the absence of predation by rats would increase survivorship of nesting birds and reptiles.
3  AFFECTED ENVIRONMENT

3.1  Physical Environment

3.1.1  Geology, Topography, and Soils

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 6000 to 8000 years ago and ending between 3000 and 5000 years ago), the area was flooded and became Tampa Bay (Doyle, 1985). Prior to this flooding the sea level was 328 feet lower than present and land extended 160 kilometers farther west.

Geology - 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 1000-1500 feet of this carbonate platform are most important in terms of ground water 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, 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 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 66 feet of unconsolidated sediments in parts of Tampa Bay (Southwest Florida Water Management District, 2002).

**Topography** - 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 (USFWS 2008).

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 (USFWS 2008).

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 feet 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 is nearly two miles long of relatively uniform width, and is approximately 2250 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).

**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).

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 are comprised of post-Pleistocene undifferentiated sand and shells. The entire Egmont 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 Hillsborough 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 key, where greater tidal, wind, and current forces are exerted (USFWS 2008).

### 3.1.2 Groundwater and Surface Water

**Groundwater** - Ground water 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 Floridian 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 Floridian 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 betrailered up to the park manager’s residence on a weekly basis. In most years, the water table at Egmont Key ranges from three to four 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 tide 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).

More specifically, tides in Tampa Bay are a mixture of lunar (semidiurnal) and solar (diurnal) gravitational effects. 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 by Egmont Key. 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).

The rat eradication procedures are restricted to land; there will be no impact on the surrounding marine systems of the island.

### 3.2 Biological Environment

#### 3.2.1 Vegetation

Egmont Key has a long history of human habitation, 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). Pepper and pine occur throughout the interior of the Key, interspersed with cabbage palms, sea grapes (*Coccoloba uvifera*), red cedar (*Juniperus silicicola*), wax myrtle (*Myrica cerifera*), and strangler fig (*Ficus aurea*).

Egmont Key contains five distinct natural communities (plus ruderal and developed areas):

- **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.
3.2.2 Wildlife

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”). 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 2007, 550 pairs of black skimmers have nested on Egmont Key, the greatest number to date, due to beach re-nourishment 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. Adult and recently fledged royal and sandwich terns regularly rest and feed on the island.

About 240 pairs of piping plovers reside in the Tampa Bay area. The island is listed as critical habitat for endangered piping plovers; however, they are only viewed infrequently on Egmont Key usually in the fall or early winter. Least tern populations have been declining and they have been nesting only sporadically on Egmont Key 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 annually. Less than 30 pairs of snowy plovers are nesting 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 from 2004 to 2008 (USFWS 2008).

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”. 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. Currently, there are no native mammal species on Egmont Key. Atlantic loggerhead sea turtles nest on the island; and large populations of box turtles are resident on the island. In addition, gopher tortoises are abundant and conspicuous on Egmont Key. Egmont Key has the highest-density populations of gopher tortoises in the state (USFWS 2008).

The distribution and abundance of invertebrate species on Egmont Key has not been well studied. Fire ants (solenopsis richteri) and crabs (Coenobita clypeatus, Geocarcinus ruricola) are the most obvious invertebrate species known to exist on the island.
3.2.3 Endangered / Threatened Species

The federal Endangered Species Act of 1973 requires that federal agencies protect all listed species and habitats. Comprehensive 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 Fish and Wildlife Conservation Commission (FWCC), 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):

- six plant species - spring ladies’ tresses (*Spiranthes vernalis*), bay-cedar (*Suriana maritima*), beach creeper (*Ernodia littoralis*), hairy beach sunflower (*Helianthus debilis ssp. vestitus*), pineland poinsettia (*Poinsettia pinetorum*), and shell mound prickly-peach cactus (*Opuntia stricta*);
- one fish - common snook (*Centropomus undecimalis*);
- three reptiles - Atlantic loggerhead turtle, Atlantic green turtle (*Chelonia mydas*), and gopher tortoise;
- seven birds - brown pelican, snowy egret (*Egretta thula*), reddish egret (*Egretta rufescens*), 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 as threatened (T) or endangered (E): spring ladies’ tresses (*Spiranthes vernalis*)-T, beach creeper (*Ernodia littoralis*)-T, inkberry (*Scaevola plumieri*)-T, Everglades poinsettia (*Poinsettia pinetorum*)-E, prickly pear cactus (*Opuntia stricta*)-T, and brake fern (*Pteris vittata*)-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).

Appendix A consists of two tables of 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. A complete listing of the plants found on Egmont Key is given in the Tampa Bay Refuges Comprehensive Conservation Plan, “Review Draft”, USFWS October 2008.
3.3 Cultural Resources

Egmont Key NWR is one of the most culturally rich refuges in the entire refuge system. In fact, the entire island was entered into the National Register of Historic Places in December of 1978.

The strategic location of Egmont Key has contributed to its rich nautical and military history (Appendix C). In the mid-1700s a British surveyor named the island in honor of John Perceval, second Earl of Egmont, who at that time was serving as First Lord of the Admiralty. Military use of the island dates back to the Second Spanish Period (1783-1821) and continued through the Seminole, Civil, and Spanish-American wars as well as World Wars I and II.

In 1846, Congress authorized the construction of the Egmont Key lighthouse at the north end of the island. It was completed in May 1848 and was partially destroyed by two hurricanes in September of that year. A second lighthouse designed to "withstand any storm" was completed in 1858, and still lights the way one hundred and fifty years later (Florida Division of Recreation and Parks, February 1998).

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 guardhouse, 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. Fort Dade was deactivated in 1923, although the military still utilized the island for coastal submarine watch and aerial exercises in World War II (Florida Division of Recreation and Parks, February 1998). In 1939 the U.S. Coast Guard (USCG) was transferred authority to maintain the lighthouse and the island. The USCG discontinued operations on Egmont Key in 1995, and allows Egmont Key State Park to maintain and operate the lighthouse through cooperative agreement.

Since the abandonment of Fort Dade in 1923, wildfires from arson and lightning have swept the island on several occasions consuming all remaining combustible historic structures on the island except the lighthouse, gun batteries, and guardhouse. Today, island visitors can walk the red brick roads to view the charred building foundations, or take pictures atop a cement gun battery. In the future, the public will get information and view wildlife and cultural resource exhibits in the newly rebuilt guardhouse which is planned to serve as the Island Visitor Center.

Rats can cause considerable property damage to refuge and state park facilities. Rats gnaw to keep their incisor teeth sharp and worn down, as these teeth grow over 5 inches a year. These rodents sometimes start fires when they damage the insulation of electrical wiring. They may also use flammable materials like oily rags and matches for building nests, which may cause fires from spontaneous combustion. Extensive damage is sometimes done when rats burrow under buildings. Foundations and lower floors of buildings have been weakened and some have collapsed when rats burrowed under them. The major environmental impact to the historic structures is growth of vegetation and undermining of historic structures by burrowing, vegetation grazing, and fecal and urine contamination by non-native rats. By removing rats from these sites, there would be safer, cleaner, healthier and more stable structures for interpretation and enjoyment (NPS 2002).
4 EXOTIC RAT CONTROL ALTERNATIVES

This section describes the primary mechanical and chemical methodologies for exotic rat control. This section describes methods for an extensive and rapid rat population reduction effort.

4.1 Mechanical Live Trap and Euthanization

Since black rats were introduced to Egmont Key, they must be eradicated from the island to prevent devastation to nesting bird colonies and federal and state facilities. This section describes various methodologies to capture and euthanize rats. Extensive live traps are placed along designated trap lines known as transects. They are baited with fish flavors. Measures are taken to reduce nontarget captures of birds, reptiles, etc. Numerous kill traps are available and many are species-specific, greatly reducing capture of non-target species. Captured animals generally do not eat the bait once in the trap due to increased stress levels. When water is added to the trap, it is usually spilled by the captured animal, which becomes very animated for extended periods before becoming exhausted. When technicians arrive, the animal endures some trauma when being prepared for euthanization (NPS 2002). The field personnel would bury euthanized rats immediately.

Sodium pentabarbatol is an excellent central nervous system agent. Once properly injected with a small amount (average 2 cc / adult) in the heart, the animal falls into a deep sleep within 3-4 minutes and is dead within 10 minutes. The drawbacks include stress on the animal, increased field time, and high drug costs (Pierce 2004).

A “squeeze box” can be used to hold an animal for purposes of administering an injection. Because wild, aggressive omnivores cannot be safely placed into a “squeeze box” without first muzzling them, the animal must receive the injection while inside the live trap. This requires opening the cage door and quickly inserting a large cushion and pressing the animal (particularly its sternum) into the cage floor. When properly positioned, the heart is readily exposed for the lethal injection (Pierce 2004).

Another injecting alternative involves use of a “jab stick,” which consists of a syringe mounted to the end of a small pole. Jab sticks are principally used to apply intramuscular injections and would be impractical for an intracardiac injection. Other problems are the increased stress their use causes the animal, problems injecting the desired location, and insufficient dosage. In addition, the animal often moves when the injection is taking place, which can produce unnecessary injury (Pierce 2004).

Other means of destroying animals captured in live traps include drowning, clubbing, shooting, gassing and suffocation. Drowning is considered inhumane because of the suffering caused before expiration, and presents the problem of trap degradation. Clubbing is also considered inhumane and may allow maimed animals to escape. Gas poisoning is problematic and inhumane because of the time requirement, which may require up to 20 minutes, depending on the effectiveness of the apparatus. Suffocation is also inhumane, time intensive, and requires additional handling. Shooting remains the most humane, expedient, and cost effective treatment to dispatch a live-trapped animal. However, problems exist with shooting a small animal and containing the projectile (NPS 2002).
4.2 Kill Traps

Numerous kill traps are available and many are species-specific, greatly reducing capture of nontarget species. Snap traps contained inside protective boxes have some applicability inside buildings after the population is reduced. The advantages include target species selectivity, immediate and humane death, and lower labor costs. Some drawbacks include limits on trap placement, nontarget bycatch, maiming/escape potential, and evasion by trap-shy individuals.

Both live and kill traps can be easily modified to reduce incidental by-catch. Because rats are relatively small, their traps would also be small. Capture of non-target species is unlikely.

4.3 Chemical / Poison – The Preferred Alternative

Several rodenticides are available for management of commensial rodents. Most rodenticides are registered for use in or within 150 feet of man-made structures. The use of rodenticides on the island would be authorized through section 24c of the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA).

While several chemicals were considered for use, diphacinone was selected due to the extensive data to support registration, its excellent record in other control efforts, and low hazards to non-target species compared to more acute chemicals (Witmer and Eismann 2007). The numerous existing toxicants would not be described in this document, in part because data are insufficient to support FIFRA registration. Thus, it is unrealistic to consider use of any other rodenticide for this project.

Several chemicals were considered for use, but diphacinone (Ramik Mini Bars, EPA Reg. No. 61282-26 – Appendix B) was selected due to the considerable existing data to support registration, its excellent record in other similar control projects, and low hazards to non-target species compared to more acute toxicants (Conry 1994). Diphacinone has been used extensively and effectively for rodent control since the 1960’s and for several years in other island situations. Diphacinone is an anticoagulant that depresses the synthesis of prothrombin, an essential clotting factor. In 1999, Buck Island Reef National Monument in St. Croix, U.S. Virgin Islands, was granted a section 24c under FIFRA, in cooperation with the Territorial Government of the U.S. Virgin Islands, to administer diphacinone. Using methodology developed by the WS, rats were eliminated from Buck Island, St. Croix (Witmer et al. 2007)

Secondary toxicity would require a predator to eat several poisoned prey before reaching the threshold level to produce hemorrhaging. All the species of reptiles inhabiting Egmont Key are primarily insectivorous or herbivores and are at a low risk of exposure to these rodenticides; the use of elevated bait stations would exclude most individuals from exposure. The pelagic and roosting seabirds are considered to be at a low risk of primary poisoning because their foraging strategy is almost exclusively on fish offshore. They are almost exclusively carnivorous, preferring live marine prey. Brown Pelicans are not scavengers and will not eat dead and poisoned rodents. The use of bait stations would exclude most of the land birds that are either granivorous or omnivorous from primary exposure risks (Witmer et al. 2007).
Some birds of prey, such as hawks, falcons, eagles, and scavengers may be at risk of secondary exposure through predation/scavenging of live or dead mice and rats containing rodenticide residues. This risk would be greatly reduced because field personnel would routinely recover dead rats and mice and bury them in the ground during all control operations. Birds of prey eat only living animals, while poisoned rodents would die in their burrows or palm tree nests, and thus be out-of-sight for any potential scavenging of rodents killed by poison. Therefore, it would be an extremely remote possibility that any birds of prey would ever locate and consume enough poisoned rodents to produce hemorrhaging (Witmer and Eisemann 2007).

The rodenticide bait must be available over an adequate area and for an adequate period of time so that all rats will be exposed to a lethal dose. An eradication operation that is 99% successful is a 100% failure since one pregnant rat can re-populate the entire island (Witmer pers. comm. 2008).

Long-term post-eradication monitoring is essential to determine that a successful eradication has been achieved, but also to give early warning should a re-invasion occur. Some practitioners believe that 2 years of relatively intensive monitoring with no invasive rodents detected should occur before a “probably successful eradication” can be declared (Howald et al. 2007).

4.4 Biological Control (Bio-control)

Biological controls are inappropriate in this situation. Bio-control is the use of species-specific control agents, typically pathogens or arthropods from the host’s range, to provide effective control of a target pest.
5 ENVIRONMENTAL CONSEQUENCES

5.1 Alternative 1: No Action

5.1.1 Physical Environment

The physical environment, including geology, topography, soils, groundwater, and surface water resources, would be minimally affected under this alternative. Rates of erosion may be increased as rats tunnel in softer soils and graze upon the native vegetation, thus removing ground cover. Surface temperatures may also increase as vegetation is removed.

5.1.2 Biological Environment

Native vegetation would be adversely impacted under this alternative as rats feed on plants. Such impacts would be most acute during the dry season, when bark and leaves are consumed for their moisture content. The loss of vegetation would decrease ground cover, thus increasing rates of erosion and increase surface temperatures. Preferred plant species could be subject to feeding rats and would be vulnerable to over consumption and could disappear from Egmont Key. This would dramatically alter community composition and succession. Furthermore, the loss of vegetation to rat predation would reduce the quantity and quality of microhabitats available for native wildlife. State listed plant species would also be vulnerable to rat destruction.

Native wildlife would be adversely impacted by this alternative because significant numbers of native fauna, including numerous invertebrate, reptile, and bird species are preyed upon by rats. Rat depredation could cause a total failure in nest success in colonial nesting bird colonies. Repeated years of poor nesting success would likely trigger nest site abandonment for most or all nesting bird species at Egmont Key. Small, slow invertebrates and reptiles are particularly susceptible to extinction from rat depredation either directly or indirectly since small species like box turtles would be out competed for invertebrate food resources. Each species performs a vital role in the food webs of these islands, which would be disrupted if one component or more is removed.

The USFWS is duty-bound by the Endangered Species Act and other federal mandates to actively remove or destroy species that are known to prey upon listed species of plants and animals. The federally listed piping plover and eggs/hatchlings of Atlantic loggerhead sea turtles are especially vulnerable to predation by rats.

5.1.3 Cultural Resources

Rats have already impacted cultural resources on the island by occupying and traveling through historic structures like the lighthouse and gun batteries. Rats are adversely impacting structures by chewing holes in cement, wood, and wires, and by depositing large amounts of excrement. Rat damage could reverse costly preservation and restoration efforts.
5.2 Alternative 2: The Proposed Action – Rat Eradication

5.2.1 Physical Environment

The physical environment, including geology, topography, soils, groundwater, and surface water resources, would be minimally affected under this alternative. Normal rates of erosion may be restored as rats cease to tunnel in softer soils and graze upon the native vegetation. Surface temperatures may also decrease as vegetation regenerates.

5.2.2 Biological Environment

Native vegetation would flourish under this alternative because rats would no longer consume vegetation. The populations of plant species would increase, thus reducing the risk of local extinctions. Community composition and succession would revert back to its original state prior to the introduction of rats.

Native wildlife would benefit significantly under this alternative as invertebrates, reptiles, and birds are no longer subjected to predation by rats. Populations would increase in proportion to the increasing quantity and quality of microhabitats. The removal of rats from the ecosystem would restore the natural food webs. Many persons involved with successful invasive rodent eradications on islands are pleasantly surprised with how rapidly the island’s floral and faunal resources recover after the rats are gone (Witmer et al. 2007).

We believe that this alternative would not adversely impact any federal or state listed species. Resident terrestrial species migratory bird species would increase due to increased survivorship of offspring. Nests and hatchling of Atlantic loggerhead sea turtles would no longer be threatened by predation from rats.

The baits used to kill rats would not produce secondary toxicity, and the trapping methods used would not entrap any endangered or threatened species. There have been no reported cases of secondary poisoning for raptors. There are no listed species on the island expected to eat baits or dead rats. Diphacinone has no apparent effect on crabs or reptiles (Campbell 1991). Non-target species like gopher tortoises or box turtles would not be able to access bait since bars can be affixed inside bait boxes, and elevated bait boxes require rats to climb. Access holes into bait boxes exclude all species larger than a rat. Additionally, preliminary studies conducted by WS researchers have shown that Gopher tortoises have little to no interest in eating placebo versions of bait bars. Diphacinone bait bars are hard and brown, and are likely unappealing to herbivore species like tortoises which diet on succulent grasses, herbs, or brightly colored fruits.

5.2.3 Cultural Resources

Cultural Resources are not likely to be adversely impacted under this alternative. The eradication of rats would prevent further structural damage to historic building and improve aesthetics by eliminating the sources of excrement currently defacing cultural resources. This alternative will require consultation with Florida’s State Historic Preservation Officer (SHPO) and native Tribes as required by Section 106 of the National Historic Preservation Act 1966.
This section describes the alternatives that were analyzed in this environmental assessment for eradication of exotic rats from Egmont Key. The alternatives include: (1) no action, and (2) the proposed action – rat eradication.

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Alternative 1: No Action</th>
<th>Alternative 2: The Proposed Action – Rat Eradication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Environment</strong></td>
<td>Slight negative impacts: increased rates of erosion and increased surface temperatures due to rat tunneling and removal of ground cover through predation on native vegetation.</td>
<td>Slight positive impacts: restoration of normal erosion rates and surface temperatures as rats no longer tunnel through ground or remove native vegetation.</td>
</tr>
<tr>
<td><strong>Biological Environment: Vegetation</strong></td>
<td>Negative impacts: rat predation on plants, especially during dry season, would decrease populations, decrease ground cover, alter plant community composition and succession, reduce quantity and quality of microhabitats for wildlife, and increase risk of local extinctions. State listed plant species would be vulnerable to island rat destruction.</td>
<td>Positive impacts: absence of rat predation would restore plant populations, ground cover, natural plant community composition and succession, quality and quantity of microhabitats for wildlife, and reduce risk of local extinctions. Stated listed plant species would benefit the most.</td>
</tr>
<tr>
<td><strong>Biological Environment: Wildlife</strong></td>
<td>Negative impacts: rat predation on native wildlife, especially small species and offspring of larger species, would decrease populations, disrupt food webs, and increase risk of local extinctions. Species that are federally and state listed endangered, threatened, or species of concern would have adverse affects especially on wintering piping plovers and loggerhead sea turtle eggs and young.</td>
<td>Positive impacts: absence of rat predation on native wildlife would increase populations, restore natural food webs, and reduce risk of local extinctions. Species that are federally and state listed endangered, threatened, or species of concern would benefit including piping plovers and loggerhead sea turtles. USFWS would uphold federal mandates including ESA.</td>
</tr>
<tr>
<td><strong>Cultural Resources</strong></td>
<td>Negative impacts: rats would impact historic structures by damaging cement, wood, and wires. Rats deface cultural resources with excrement and reverse costly restoration efforts.</td>
<td>Positive impacts: rat eradication would prevent further structural damage to cultural resources and improve aesthetics.</td>
</tr>
</tbody>
</table>
5.4 Compliance with Environmental Laws and Regulations

The proposed action for the eradication of exotic rats from Egmont Key is consistent with the following environmental laws and regulations.

**Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)(7 U.S.C. 136 *et seq.*)** – The rodenticide proposed for use diphacinone (mini-bars) is a general use product registered by the Environmental Protection Agency for use in and around man-made structures. In order to use this product on Egmont Key, the WS has obtained a special Section (c) registration for the product through an Environmental Protection Agency (EPA) permit. This permit is consistent with the FIFRA. The Refuge has also obtained pesticide use approval through the Southeast Regional Integrated Pest Management Program (IPM) and the Washington IPM Office.

**Endangered Species Act of 1973 (ESA) (7 U.S.C. 136, as amended)** – The island of Egmont Key provides habitat for many bird and reptile species including federal and state listed species.. In order to comply with the ESA of 1973, USFWS must protect endangered and threatened species and their habitats (PL 93-205).

**Migratory Bird Treaty Act of 1918 (40 Stat 755)** – This act provides clear authority for the proposed action, which would potentially benefit migratory species of birds including seabirds, waterbirds, raptors, and songbirds.

**Animal Damage Control Act of 1931** – This act provides authority to remove injurious animals for the protection of birds and other wildlife.

**Coastal Zone Management Act (16 U.S.C. 1 {1916} *et seq.*)** – “Preserve, protect, develop and where possible restore or enhance the resources of the nation’s coastal zones” supports the removal of non-native pests that damage the coastal zone and wildlife therein. With release of Draft EA, DFW will initiate formal consultation with the Department of Planning and Natural Resources in conformance with the Coastal Zone Management Act.

**National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4332, as amended).** Title I of NEPA requires that government agencies plan and carry out their activities… “so as to protect and enhance the quality of the environment. Such activities shall include those directed to controlling pollution and enhancing the environment.” With release of Draft EA, DFW will initiate the NEPA process.

**Comprehensive Conservation Plan – Tampa Bay Refuges, 2008** – non-native rats are identified as threat to native flora and fauna and must be controlled.
6 CONSULTATION AND COORDINATION

Personnel from the following agencies and organizations have been consulted or participated in the formulation of this Environmental Assessment:

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9. APPENDICES
### 9.1 APPENDIX A

**Protected Animal and Plant Species in the Tampa Bay Basin**

<table>
<thead>
<tr>
<th>Scientific Name*</th>
<th>Common Name</th>
<th>Federal Protection Status</th>
<th>State Protection Status</th>
<th>FNAI Global Rank</th>
<th>FNAI State Rank</th>
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<tr>
<td><strong>AMPHIBIANS AND REPTILES</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Alligator mississippiensis</td>
<td>American alligator</td>
<td>T(S/A)</td>
<td>SSC</td>
<td>G5</td>
<td>S4</td>
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<tr>
<td>Caretta caretta</td>
<td>Loggerhead turtle</td>
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<td>T</td>
<td>G3</td>
<td>S3</td>
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<td>Chelonia mydas</td>
<td>Green turtle</td>
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<td>E</td>
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<td>S1</td>
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<td>E</td>
<td>E</td>
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<td>S1</td>
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<td></td>
<td></td>
<td>SSC</td>
<td>G5</td>
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<tr>
<td>Egretta tricolor</td>
<td>Tricolored heron</td>
<td></td>
<td></td>
<td>SSC</td>
<td>G5</td>
</tr>
<tr>
<td>Eudocimus albus</td>
<td>White ibis</td>
<td></td>
<td></td>
<td>SSC</td>
<td>G5</td>
</tr>
<tr>
<td>Grus Canadensis pratensis</td>
<td>Florida sandhill crane</td>
<td>T</td>
<td></td>
<td>G5T2T3</td>
<td>S2 S3</td>
</tr>
<tr>
<td>Haematopus palliatus</td>
<td>American oystercatcher</td>
<td></td>
<td></td>
<td>SSC</td>
<td>G5</td>
</tr>
<tr>
<td>Haliaeetus leucocephalus**</td>
<td>Bald eagle</td>
<td>T</td>
<td></td>
<td>G4</td>
<td>S3</td>
</tr>
<tr>
<td>Mycteria americana</td>
<td>Wood stork</td>
<td>E</td>
<td>E</td>
<td>G4</td>
<td>S2</td>
</tr>
<tr>
<td>Pelecanus occidentalis</td>
<td>Brown pelican</td>
<td></td>
<td></td>
<td>SSC</td>
<td>G4</td>
</tr>
<tr>
<td>Rynchops niger</td>
<td>Black skimmer</td>
<td></td>
<td></td>
<td>SSC</td>
<td>G5</td>
</tr>
<tr>
<td>Sterna antillarum</td>
<td>Least tern</td>
<td>T</td>
<td></td>
<td>G4</td>
<td>S3</td>
</tr>
<tr>
<td><strong>MAMMALS</strong></td>
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<tr>
<td>Podomys floridanus</td>
<td>Florida mouse</td>
<td></td>
<td></td>
<td>SSC</td>
<td>G3</td>
</tr>
<tr>
<td>Sciurus niger shermani</td>
<td>Sherman’s fox squirrel</td>
<td></td>
<td></td>
<td>G5T2</td>
<td>S2</td>
</tr>
<tr>
<td>Trichechus manatus</td>
<td>West Indian manatee</td>
<td>E</td>
<td>E</td>
<td>G2</td>
<td>S2</td>
</tr>
<tr>
<td><strong>PLANTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asclepias curtissii</td>
<td>Curtiss’ milkweed</td>
<td>E</td>
<td>G3</td>
<td>S3</td>
<td></td>
</tr>
<tr>
<td>Bigelowia nutallii</td>
<td>Nuttall’s rayless goldenrod</td>
<td>E</td>
<td>G3g4</td>
<td>S1</td>
<td></td>
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<tr>
<td>Chrysopsis floridana</td>
<td>Florida golden aster</td>
<td>E</td>
<td>E</td>
<td>G1</td>
<td></td>
</tr>
<tr>
<td>Glandularia tampensis</td>
<td>Tampa vervain</td>
<td>E</td>
<td>G1</td>
<td>S1</td>
<td></td>
</tr>
<tr>
<td>Gossypium hirsutum</td>
<td>Wild cotton</td>
<td>E</td>
<td>G4G5</td>
<td>S3</td>
<td></td>
</tr>
<tr>
<td>Pteroglossaspis eristata</td>
<td>Giant orchid</td>
<td>T</td>
<td>G2</td>
<td>S2</td>
<td></td>
</tr>
</tbody>
</table>

* 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.*

**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:

- **E** = Endangered.
- **T** = Threatened.
- **T(S/A)** = Threatened due to similarity of appearance.
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:
E = Endangered.
T = Threatened.
S = Species of Special Concern.
N = Not currently listed, nor currently being considered for listing.

### Nonlisted Animal and Plant Species of Special Concern in the Tampa Bay Basin

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

* 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.

**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:**

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.


### 9.2 APPENDIX B. Sample Ramik Mini Bars Rodenticide Label

**SPECIMEN LABEL**

**Ramik® Mini Bars**

**ALL-WEATHER Rat and Mouse KILLER**

Mold & Moisture Resistant • Kills Norway Rats, Roof Rats and House Mice in Wet or Dry Areas

<table>
<thead>
<tr>
<th>ACTIVE INGREDIENT:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphacinone (2-Diphenylacety-1,3-Indandione)</td>
<td>0.005%</td>
</tr>
<tr>
<td>INERT INGREDIENTS:</td>
<td>99.995%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.000%</td>
</tr>
</tbody>
</table>

**EPA Reg. No. 61242-26**

**KEEP OUT OF REACH OF CHILDREN CAUTION**

**FIRST AID**

**Have label with you when obtaining treatment advice**

- Call a poison control center, doctor, or 1-800-698-5743 immediately for treatment advice.
- Have person sip a glass of water if able to swallow.
- Do not induce vomiting unless told to do so by the poison control center or doctor.

**Note to Physician:** If ingested, administer Vitamin K₃ intramuscularly or orally as indicated in bishydroxycoumarin overdose. Repeat as necessary based on monitoring of prothrombin times.

**PRECAUTIONARY STATEMENTS**

**HAZARD TO HUMANS AND DOMESTIC ANIMALS**

**CAUTION:** Keep away from humans, domestic animals and pets. If swallowed, this material may reduce the clotting ability of the blood and cause bleeding.

**ENVIRONMENTAL HAZARDS**

This product is toxic to mammals and birds. Do not apply this product directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark.

**DIRECTIONS FOR USE**

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

**READ THIS LABEL:** Read this entire label and follow all use directions and use precautions.

**IMPORTANT:** Do not expose children, pets, or other non-target animals to rodenticides. To help prevent accidents:

1. Store product not in use in a location out of reach of children and pets.
2. Apply bait in locations out of reach of children, pets, domestic animals and non-target wildlife, or in tamper-resistant bait stations. These stations must be resistant to destruction by dogs and by children under six years of age, and must be used in a manner that prevents such children from reaching into bait compartments and obtaining bait. If bait can be shaken from stations when they are lifted, units must be secured or otherwise immobilized. Even stronger bait stations are needed in areas open to hoofed livestock, raccoons, bears or other potentially destructive animals, or in areas prone to vandalism.
3. Dispose of product container, and unused, spoiled, and unconsumed bait as specified on this label.

**USE RESTRICTIONS:** For control of Norway rats, roof rats and house mice in and around homes, industrial and agricultural buildings, and similar man-made structures. This product is especially suited for use in wet or damp areas, including river banks, gullies, irrigation ditches, sewers, garbage dumps, and landfills.

Do not place bait in areas where there is a possibility of contaminating food or surfaces that come in direct contact with food. Do not apply bait directly to ground surface or in grass or other ground cover.

**SELECTION OF TREATMENT AREAS:** Determine areas where rats or mice will most likely find and consume the bait. Generally, these are along walls, by gnawed openings, in or beside burrows, in corners and concealed places, between floors and walls, or in locations where rodents or their signs have been seen. Protect bait from rain or snow. Remove as much alternative food as possible.

**APPLICATION DIRECTIONS:** Each RAMIK Mini BAR weighs approximately one ounce.

**RATS:** Apply 4 to 6 RAMIK Mini BARS (usually at intervals of 15 to 30 feet) per placement. Maintain an uninterrupted supply of fresh bait for at least 10 days or until signs of rat activity cease.

**MICE:** Place one 1-ounce RAMIK Mini BAR at each placement location. Space placements at 8- to 12-foot intervals. Two 1-ounce pieces may be needed at points of very high mouse activity. Maintain an uninterrupted supply of fresh bait for at least 15 days or until signs of mouse activity cease.

**RATS AND MICE:** Replace contaminated or spoiled bait immediately. Collect and dispose of all dead animals and leftover bait properly. To prevent reinestation, limit sources of rodent food, water, and harborage as much as possible. If reinestation does occur, repeat treatment. Where a continuous source of infestation is present, establish permanent bait stations and replenish as needed.

---

This specimen label is intended for use only as a guide in providing general information regarding the directions, warning and cautions associated with the use of this product. As with any rodenticide, always follow the label instructions on the package before using.

Ramik Mini Bars / Page 1 of 2
STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

STORAGE: Store only in original closed container in a cool, dry place inaccessible to children and pets. Store separately from fertilizer and away from products with strong odors which may contaminate the bait and reduce acceptability. Sweep up spillage carefully and collect for disposal.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Commercial Use: Dispose of empty container in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

Household Use Disposal – If empty: Do not re-use empty container. Place in trash or offer for recycling if available. If partly filled: Call your local solid waste agency for disposal instructions. Never place unused product down any indoor or outdoor drain.

CONDITIONS OF SALE AND LIMITATION OF WARRANTY AND LIABILITY

NOTICE: Read the entire Directions for Use and Conditions of Sale and Limitation of Warranty and Liability before buying or using this product. If the terms are not acceptable, return the product at once, unopened, and the purchase price will be refunded.

Manufacturer and Seller warrant that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated in the Directions for Use, subject to the inherent risks referred to above, when used in accordance with directions under normal use conditions. This warranty does not extend to the use of this product contrary to label instructions, or under abnormal conditions or under conditions not reasonably foreseeable to or beyond the control of Seller or Manufacturer, and Buyer and User assume the risk of any such use. MANUFACTURER AND SELLER MAKE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE NOR ANY OTHER EXPRESS OR IMPLIED WARRANTY EXCEPT AS STATED ABOVE.

IN NO EVENT SHALL MANUFACTURER OR SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE EXCLUSIVE LIABILITY OF MANUFACTURER AND SELLER FOR ANY AND ALL CLAIMS, LOSSES, INJURIES OR DAMAGES (INCLUDING CLAIMS BASED ON BREACH OF WARRANTY, CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT, SHALL BE THE RETURN OF THE PURCHASE PRICE OF THE PRODUCT OR, AT THE ELECTION OF MANUFACTURER OR SELLER, THE REPLACEMENT OF THE PRODUCT.

Manufacturer and Seller offer this product, and Buyer and User accept it, subject to the foregoing conditions of sale and limitations of warranty and of liability, which may not be modified except by written agreement signed by a duly authorized representative of Manufacturer.

For non-emergency (e.g., current product information) call: 1-800-621-8829

Manufactured By:
Hacco, Inc.
110 Hopkins Drive
Randolph, WI 53956 U.S.A.

Code (RR.NT) NUNI

Item No.: 116325
Net Contents: 400 x 1 oz. (25 lbs/11.24 kg)
UPC: 055242 08650 (9)
Format: UPC-A

Item No.: 116326
Net Contents: 640 x 1 oz. (40 lbs.)
UPC: 055242 08657 (2)
Format: UPC-A

Item No.: 116331
Net Contents: 4 lbs (1.82 kg) Pouch
UPC: 055242 08755 (1)
Format: UPC-A

Item No.: 116332
Net Contents: 64 x 1 oz. (4 lbs/1.82 kg)
UPC: 055242 08655 (4)
Format: UPC-A

Item No.: 116333
Net Contents: 8 x 1 oz.
UPC: 055242 18333 (0)
Format: UPC-A

Item No.: 116345
Net Contents: 9 lbs. (4.08 kg)
UPC: 055242 08660 (8)
Format: UPC-A

*RAMIK is a registered trademark of Hacco, Inc.

This specimen label is intended only as a guide in providing general information regarding the directions, warning and cautions associated with the use of this product. As with any irritant, always follow the label instructions on the package before using.
9.3 APPENDIX C. Map of Tampa Bay Refuges including Egmont Key.