United States Department of the Interior

FISH AND WILDLIFE SERVICE

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April 7, 2017

Superintendent Daniel Brown
Gulf Islands National Seashore
1801 Gulf Breeze Parkway
Gulf Breeze, Florida 32563

Attn: Jolene Williams

Service Log No: 04EF3000-2016-F-0236
Date Consultation Initiated: April 6, 2016
Project Title: Gulf Islands National Seashore Parking Lot Expansion
Location: Escambia County, Florida

Dear Mr. Brown:

This letter transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion based on our review of the proposed Gulf Islands National Seashore (GINS) parking lot expansion project and the effects to the endangered Perdido Key Beach Mouse (*Peromyscus polionotus trissyllepsis)* (PKBM). The effects of the action on PKBM and PKBM critical habitat have been evaluated per section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Our Biological Opinion is based on information provided in the GINS Biological Assessment, several site meetings, and many discussions. It is based on the best available scientific and commercial data pertinent to listed species and habitats directly or indirectly affected by the proposed action. The sources of these data, summarized or referenced in this Biological Opinion, include Service files, published and unpublished reports, the experience of Service biologists, and scientific literature. A complete administrative record is on file in the Panama City Field Office.

Concurrences

Gulf Islands National Seashore has determined that the project may affect, but is not likely adversely affect nesting sea turtles, piping plover, red knot or adversely modify their critical habitat based on the inclusion of conservation measures. The FWS concurs with the GINS' determination. These species are not likely to be adversely affected by the proposed project due to avoidance of sensitive habitat, avoidance of nests, and conservation measures developed and incorporated into the project. These species will not directly be discussed in our Biological Opinion. We believe the requirements under the Act have been met in regards to these species, and no further consultation is needed unless the project, as described, changes.

The enclosed Biological Opinion summarizes the project and its proposed impacts to the PKBM. Approximately 2.35 acres of suitable PKBM habitat is proposed for impact and 0.66 acre will be reverted back to suitable habitat from asphalt removal.

The Service appreciates your willingness to work together to conserve threatened and endangered species, and their habitats on which they depend. If you or your staff has any questions, please contact Kristi Yanchis of the Panama City Field Office at 850-769-0552, extension 252, or via email Kristi_yanchis@fws.gov.

Sincerely,

Dr. Catherine Phillips
Project Leader

Enclosures: Biological Opinion

Cc: (electronic copies only)
Tim Day, Escambia Co. Development Services, Pensacola, FL
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Gulf Islands National Seashore-Johnson Beach Area
Parking Lot Expansion Project
Biological Opinion
Gulf Islands National Seashore
Escambia County, Florida

USFWS Log No: 04EF3000-2016-F-0236

To

U.S. Department of Interior
National Park Service

Biological Opinion
March 7, 2017

Prepared by:
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, Florida

Catherine Phillips 19 Apr 17

Dr. Catherine Phillips, Project Leader Date

Executive Summary

We, the U.S. Fish and Wildlife Service (USFWS), have evaluated the impacts of the proposed Gulf Islands National Seashore/Johnson Beach Area (GINS) parking lot improvement project to be developed on the east end of Perdido Key in Escambia County, Florida. GINS encompasses 1,041 acres with high visitor use, primarily beach and Gulf of Mexico access. Coastal dune habitat can be found adjacent to the open beach. It is this habitat that supports the federally endangered Perdido Key beach mouse (*Peromyscus polionotus trissyllepsis*) (PKBM).

Gulf Islands National Seashore is one of three core population areas for PKBM. These core areas support the main population of PKBM and without them extinction would likely be near. GINS operates under a General Management Plan that supports management for PKBM and other protected species and their habitat. This parking lot expansion project aims to focus visitor use of the beaches to and through specific corridors to avoid critical and sensitive habitat. Currently the main parking lot holds 323 vehicles with additional roadside parking along both sides of the 1.2 mile paved park road. This road routinely gets covered in sand and requires regular maintenance to plow and remove. The focus of this expansion project is to remove the roadside parking, expand the main parking lot, and add three additional small parking lots along the park road. The entry way will also be expanded from a single entry and exit road to double entry/exit lanes. Removing and replacing dune walkovers, installing split rail fence and post and rope will direct pedestrian use from these parking areas to the open beach with limited disturbance to the habitat and species in the area. Habitat benefits from this project include; restoring the roadside habitat along the park road and the asphalt removal and restoration from converting the last mile of road to a narrower multi-use trail. The permanent impacts consist of approximately 2.35 acres of beach dune habitat that is suitable for PKBM, sea turtles, and shorebirds.

The Conservation Measures, Terms and Conditions, and project design will reduce the potential for injury, harm, and harassment from the proposed construction activities. The USFWS has determined that with the implementation of these measures, the actions will not jeopardize PKBM or adversely modify their habitat.

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CONSULTATION HISTORY

May 2015 – GINS, USFWS, and Florida Fish and Wildlife Conservation Commission (FWC) staff met onsite to discuss the project.

September 2015 – GINS solicits information and possible concerns from USFWS via email.

November 2015 – USFWS sent email to GINS outlining comments and concerns based on 5 proposed alternatives.

April 2016 – USFWS received the Biological Assessment and request for consultation.

June 2016 – Site meeting with GINS, FWC, and USFWS staff to discuss siting and conservation measures associated with this project.

June 2016 – Received Environmental Assessment and consultation request.

Table 2. Species and critical habitat evaluated for effects and where the USFWS has concurred with a "not likely to adversely affect" determination.

SPECIES OR CRITICAL HABITAT	PRESENT IN ACTION AREA	PRESENT IN ACTION AREA BUT "NOT LIKELY TO ADVERSELY AFFECT"
Loggerhead sea turtle (*Caretta caretta*)	Yes	Yes
Green sea turtle (*Chelonia mydas)*	Yes	Yes
Leatherback sea turtle (*Dermochelys coriacea*)	Yes	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Yes	Yes
Piping plover (*Charadrius melodus*)	Yes	Yes

These species and critical habitat will not be discussed further in this biological opinion.

Biological Opinion

A Biological Opinion (BO) is the document required under section 7 the Endangered Species Act (Act) that states the opinion of the U.S. Fish and Wildlife Service (USFWS) as to whether a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. This BO addresses the effects resulting from the proposed Gulf Islands National Seashore/Johnson Beach Area parking lot improvement project. We analyze the effects of this proposed action, interrelated and interdependent actions, and cumulative effects relative to the status of the Perdido Key beach mice (*Peromyscus polionotus trissyllepsis*) (PKBM).

"*Jeopardize the continued existence of*" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species (50 CFR §402.02).

"*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR §402.02).

Your request for formal consultation was received on April 6, 2016 via email. This BO is based on the best scientific and commercial data available, including information provided in the March 2016 biological assessment (BA), recent meetings/site visits, and general knowledge of the area. A complete administrative record for this consultation is on file in the USFWS Panama City, Florida, Ecological Services Field Office.

DESCRIPTION OF PROPOSED ACTION

The National Park Service (NPS) proposes to expand parking facilities and improve visitor access at Gulf Islands National Seashore (GINS) - Johnson Beach Unit (Figure 1). GINS-Johnson Beach Unit is a barrier island on Perdido Key within the Florida District of the Seashore. This unit contains approximately 1,041 acres. Development within this unit includes a ranger office/first aid facility, a concession facility, and a picnic area, five shelters, and two restrooms. The island is accessible by vehicle bridges and watercraft.

Figure 1. GINS-Johnson Beach Unit location map.

The proposed project consists of expanding the main visitor facility parking lot to include an additional 30 parking spots for approximately 350 spots. Also proposed are two boardwalks to the south at the main parking area. New construction for the expanded main visitor facility parking area would be approximately 12,915 square feet (about 0.3 acre). Figure 2 shows the limits of GINS-Johnson Beach Unit.

Figure 2. Action Area in Gulf Islands National Seashore-Johnson Beach Unit

Additional project features include two parking lots along Johnson Beach Road and one parking lot at the new end of the road. The current last half-mile portion of the road will be closed to public vehicles, and half the width of the asphalt will be removed, making this a bike/pedestrian path. The proposed project features can be seen in Figure 3.

Figure 3. Proposed project features.

The two new smaller parking lots would be constructed along the road corridor in areas that have been previously disturbed where sand clearing operations have been concentrated, and adjacent to existing boardwalk locations where impacts have already occurred. Each of these parking lots would accommodate approximately 30 parking spaces. New construction for each of the smaller lots would be 12,550 square feet (0.29 acre). The new parking lot at the new end of the road will include a single entrance and exit to allow cars to loop through the parking lot to travel back to the road. This lot would accommodate approximately 50 vehicles. New construction for this parking area would be 20,900 square feet (about 0.48 acre). The new turn around parking lot will have two dune walkovers that will be rebuilt in their current location to minimize habitat disturbance.

Figure 4 shows the proposed expanded entrance area, totaling approximately an acre. This portion includes adding an additional lane for entrance into the park.

Figure 4. Proposed expanded entrance area.

Furthermore, GINS proposes to improve a total of 6 dune walkovers in their current locations to minimize habitat disturbance, add 1 new walkover, remove un-improved walkovers and enforce use of improved walkovers. This will result in the removal of 5 of the existing 11 boardwalks or dune walkovers on Johnson Beach Road. The 6 newly elevated dune walkovers and 1 new walkover will result in 1168 linear feet of boardwalk. The total vehicle parking spots would be between 458 and467 available within GINS Johnson Beach area. The combined total area of new proposed construction for new parking lots would be approximately 58,915 square feet (1.35 acres). One-half mile of the existing paved Johnson Beach Road would be reduced in width to 10 feet to become a multi-use path. This is a reduction of 0.66 acre of asphalt surface, resulting in a net increase of asphalt surface of 1.7 acre for the project.

Additional conservation recommendations will be incorporated into the project.

- All construction activities would occur outside of shorebird nesting season.
- Split rail fencing will be used around all new parking lots to guide visitors to the dune walkovers.
- GINS staff will install “No Pets” signage on all dunes walkovers to prevent disturbance to beach mice, shorebirds, and sea turtles.
- Predator resistant trash receptacles will be installed at the parking lots in order to prevent attracting unwanted predators to sensitive habitat.
- Install and enforce “No Parking” signs along the roadside to prevent disturbance to beach mice, shorebirds, and sea turtles.
- Install speed humps and speed limit signs along Johnson Beach Road and prohibit non-emergency driving after 10:00 pm through nighttime hours to control visitor speed especially during critical times for beach mice and sea turtles.
- Improve posting/roping of nesting bird habitat to reduce disturbance from visitors.

The USFWS has described the action area to include all of GINS-Johnson Beach Unit for reason that will be explained and discussed in the “EFFECTS OF THE ACTION” section of this consultation.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The PKBM is a subspecies of the small old-field mouse that can reach lengths of up to 5.5 inches. It has a small body, haired tail, relatively large ears, and protuberant eyes. The PKBM has grayish fawn to wood brown fur on its back that extends to between its eyes. It has a white underbelly, cheeks, and tail. This species is a nocturnal herbivore. PKBM feed primarily on the seeds of sea oats (*Panicum repens*) and beach grass (*Panicum amarums*). When these seeds are scare, especially in the late winter or early spring, beach mice may consume invertebrates (Ehrhart, 1978) or fruiting bodies of sea rocket (*Cakile* sp.) and other plant species (USFWS, 1987).

PKBM occupy coastal dune habitat that is generally characterized as primary dunes (characterized by sea oats [*Uniola paniculata*] and other grasses); secondary dunes (similar to primary dunes but also frequently include such plants as woody goldenrod [*Chrysoma pauciflosculo])* and false rosemary (*Conradina canescens*); and interior or scrub dunes (often dominated by scrub oaks [*Quercus geminata* spp.], yaupon holly [*Ilex vomitoria*]) and Florida rosemary (*Ceratiola ericoides*). While primary and secondary dunes are often more fruitful for forage, scrub dunes are necessary for refugia and recolonization during and after tropical storm or hurricanes.

Based on our current knowledge of the life history, biology, and ecology of the species and the requirements of the habitat to sustain the essential life history functions of the species, we have determined that the PKBM critical habitat primary constituent elements (PCE) include (USFWS, 2006):

1. A contiguous mosaic of primary, secondary, and scrub vegetation and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites.

2. Primary and secondary dunes, generally dominated by sea oats, that, despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes, provide abundant food resources, burrow sites, and protection from predators.

3. Scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane induced storm surge.

4. Functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas.

5. A natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth and viability of all life stages.

Additional expanded information on the status and history of the species can be found on the Panama City Field Office's website www.fws.gov/panamacity under species information-beach mice.

Critical habitat has been designated on lands that have been determined to be essential to the conservation of the PKBM. An area is considered essential if it possesses one or more of the primary constituent elements and the following characteristics: (1) supports a core population of beach mice; (2) was occupied by PKBM at the time of listing; (3) is currently occupied by the beach mouse and is an area essential to the conservation of the species because it represents an existing population needed for conservation (50 FR 23872).

Five units were designated for the PKBM spaced throughout its historic range, depending on the relative fragmentation, size, and health of habitat, as well as availability of areas with beach mouse PCEs. The five units are: Gulf State Park Unit (PKBM-1), West Perdido Key Unit (PKBM-2), Perdido Key State Park (PKSP) Unit (PKBM-3), Gulf Beach Unit (PKBM-4), and Gulf Islands National Seashore Unit (PKBM-5) (Table 2 and Figure 5). The Action Area for this BO includes only the Gulf Islands National Seashore Unit (PKBM-5).

Table 2. Designated Critical Habitat for the Perdido Key Beach Mouse.

Critical Habitat Unit	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Gulf State Park Unit (PKBM-1)	0	115	0	115
2. West Perdido Key Unit (PKBM-2)	0	0	147	147
3. Perdido Key State Park Unit (PKBM-3)	0	238	0	238
4. Gulf Beach Unit (PKBM-4)	0	0	162	162
5. Gulf Islands National Seashore Unit (PKBM-5)	638	0	0	638
Total	638	353	309	1300

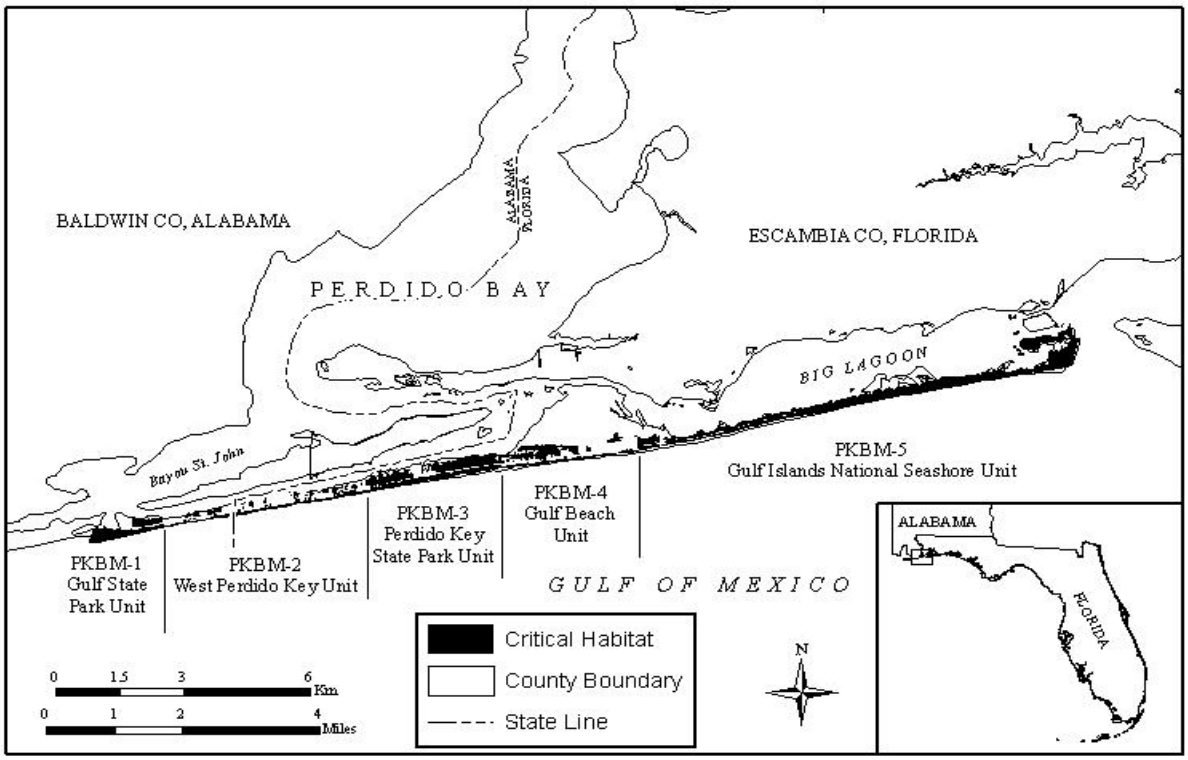

Figure 5. **Designated Critical Habitat Units for the Perdido Key Beach Mouse.**

The Gulf Islands National Seashore Unit (PKBM-5) consists of 638 acres in southern Escambia County, Florida, on the easternmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of Gulf Islands National Seashore–Perdido Key Area (also referred to as Johnson Beach Unit) from approximately 6.0 miles east of the Alabama–Florida State line to the eastern tip of Perdido Key at Pensacola Bay and the area from the MHWL north to the seaward extent of the maritime forest. This unit is managed by the NPS, and is referred to as GINS-Johnson Beach (Figure 6).

Beach mouse habitat in PKBM-5consists mainly of primary and secondary dune habitat, but provides the longest contiguous expanse of frontal dune habitat within the historic range of the PKBM. PBKM were known to inhabit this unit in 1979. No beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour, 1981; Holler et al., 1989). However the population was impacted by Hurricane Frederic (1979), and considered unoccupied at the time of listing. In 1986, PKBM were re-established at this Unit as part of FWC and USFWS recovery efforts. This reestablishment project was identified as the most urgent recovery need for the mouse (USFWS, 1987; Holler et al., 1989). The project is considered a success, and the population inhabiting this Unit is now considered a core population. In 2000 and 2001, PKBM captured from this site served as donors to re-establish beach mice at PKSP (PKBM-3).

PKBM-5, in its entirety, possesses all five PCEs and is essential to the conservation of the species. However, most of this unit consists of frontal dunes, making the population inhabiting this unit particularly threatened by storm events. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction,

damage to dunes, and/or a decrease in habitat quality. This unit was included in the initial critical habitat designation (50 FR 23872) as well as the 2006 revision (71 FR 60238). The majority of this unit was overwashed and inundated by storm surge several times during the 2004 and 2005 storm seasons. Park facilities were destroyed and most of the Park road was destroyed. Dune vegetation was washed away or covered with sand. Habitat recovery efforts continue and include natural and human facilitated dune restoration by GINS staff. Park structures were reconstructed landward of their former locations and in accordance with protected species guidelines.

Figure 6. Critical Habitat within GINS and the proposed removal and addition of dune walkovers.

Historic Range

Historically, PKBM occurred on Perdido Key in coastal dune habitat between Perdido Bay, Alabama and Pensacola Bay, Florida (50 FR 23872; Bowen 1968) (Figure 7). Historical information indicates that both Pensacola Pass and Perdido Pass were natural inlets. The existing navigation channel project at Pensacola Pass (east end of Perdido Key) was authorized in 1962 and the Perdido Pass navigation channel project was authorized in 1971 (U.S. Army Corps of Engineers 1976; Browder and Dean 1999). Currently, PKBM occupy a good portion of their historic range, even though much of it has been developed and fragmented.

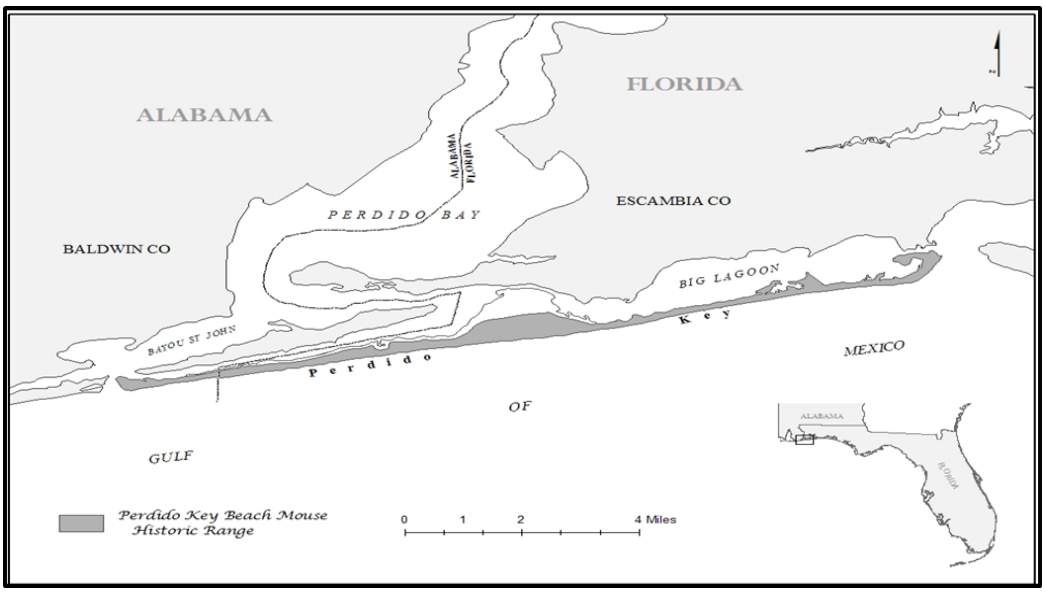

Figure 7. Historic range of the Perdido Key Beach Mouse.

Life history

Behavior

Peromyscus polionotus is the only member of the genus that digs an extensive burrow. Beach mice are semifossorial, using their complex burrows as a place to rest during the day and between nightly foraging bouts, escape from predators, have and care for young, and hold limited food caches. Burrows of *P. polionotus* generally consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are frequently placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 24 to 35 inches (60 cm to 90 cm), and the escape tunnel rises from the nest chamber to within 9.8 inches (2.5 cm) of the surface (Blair 1951). Nests of beach mice are constructed within a 4 to 6 cm diameter, spherical nest chamber. The nest comprises about one fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949). Beach mice select burrow sites based on a suite of biotic and abiotic features including dune slope, soil compaction, vegetative cover, and height above sea level (Lynn 2000; Sneckenberger 2001). Potential burrow sites are considered to be a possible limiting resource.

Like other beach mice, PKBM are nocturnal and forage for food throughout the dune system. Beach mice feed primarily upon seeds, fruits, and insects (Moyers 1996). Seeds and fruits consumed by PKBM are commonly produced by low-growing, prostrate plants, or become available as fallen seeds (Moyers 1996). Beach mice appear to forage on food items based on availability and have shown no preferences for particular seeds or fruits (Moyers 1996). Research suggests that the availability of food resources fluctuates seasonally in Gulf Coast coastal dune habitat. The frontal dunes appear to have more species of high quality foods, but these sources are primarily grasses and annuals that produce large quantities of small seeds in a short period. Foods available in the scrub consist of larger seeds and fruits that are produced throughout a greater length of time and linger in the landscape (Sneckenberger 2001). Nutritional analysis of foods available in each habitat revealed that seeds of plant species in both habitats provide a similar range of nutritional quality.

Reproduction and Demography

Subtropical beach mice can reproduce throughout the year; however their peak reproductive activity is generally during late winter and early spring. Sex ratios in beach mouse populations are generally 1:1 (Extine 1980; Rave and Holler 1992). Beach mice are generally monogamous (Smith 1966; Foltz 1981; Lynn 2000). While a majority of individuals appear to pair for life, paired males may sire extra litters with unpaired females. Beach mice are sexually mature at about 55 days of age; however, some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Kaufman and Kaufman 1987). Littering intervals may be as short as 26 days (Bowen 1968). Peak breeding season for beach mice is late winter and early spring, typically falling to lower levels during the hot summer months. However, pregnant and lactating beach mice have been observed in all seasons (Moyers et al. 1999).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama suggested that their average life span is about nine months (Swilling 2000). Other research indicates that 63% of Alabama beach mice lived (or remained in the trapping area) for four months or less, 37% lived five months or greater and 2% lived 12 to 20 months (Rave and Holler 1992). Less than half (44 %) of beach mice captured for the first time were recaptured the next season (Holler et al. 1997). Greater than 10% of mice were recaptured three seasons after first capture, and 4% to 8% were recaptured more than one year after initial capture. According to Kathy Russell (PKBM captive breeding program Studbook keeper) with Santa Fe College Teaching Zoo, PKBM held in captivity can live up to five years.

Habitat and Movement

Beach mice inhabit coastal dune ecosystems on the Atlantic and Gulf Coasts of Florida and the Gulf Coast of Alabama. The dune habitat is generally categorized as: primary dunes, secondary, and scrub. Contrary to the early belief that beach mice were restricted to (Howell 1909, 1921; Ivey 1949), or preferred the frontal dunes (Blair 1951; Pournelle and Barrington 1953; Bowen 1968), more recent research has shown that scrub habitat serves an invaluable role in the persistence of beach mouse populations (Swilling et al. 1998; Sneckenberger 2001). Beach mice occupy scrub dunes on a permanent basis and studies have found no detectable differences

between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling et al. 1998; Swilling 2000; Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary and scrub dune habitat is essential to beach mice at the individual level. Not only is scrub habitat necessary for food and burrow sites when resources are scarce in the frontal dunes, this higher elevation habitat provides refuge from storm surge during hurricanes. Trapping data suggests that beach mice persisting in the scrub following hurricanes recolonize the frontal dunes once vegetation and some dune structure have recovered (Swilling et al. 1998; Sneckenberger 2001).

Two main types of movement described for small mammals are within home-range activity and long-range dispersal. Such movements are influenced by a suite of factors, such as availability of mates, predation risk, and habitat quality. Movement and home range studies have been conducted for most beach mouse subspecies, but are limited to natural habitat (*e.g.* research has been conducted on public lands within contiguous beach mouse habitat, not within a development or in a fragmented landscape). Studies of the home range size of beach mice (using trapping and telemetry data) have been estimated at 1 to 5 acres (Novak 1997; Lynn 2000). Individual beach mice travel extensive distances (several hundreds to thousands of feet commonly, and up to a mile) during one night (Swilling et al. 1998; Lynn 2000; Moyers and Shea 2002). Beach mice have also been documented crossing two-lane roads within public lands (Gore and Schaefer 1993; USFWS 2004).

Significant seasonal differences in the movement of Alabama Beach Mouse (ABM) have been found, which may be a result of seasonal fluctuations in food availability, food quality, and nutritional needs (Sneckenberger 2001). Santa Rosa beach mice (SRBM) increased movements as habitat isolation increased suggesting that longer travel distances were needed to obtain necessary resources (Smith 2003). SRBM also preferred vegetative cover and connectivity, which is likely a behavioral response to increased predation risk in open areas. Thus, while beach mice are able to travel great distances, the travel pathways have vegetated cover and only a few large gaps or large open areas. Previous connectivity research suggests critical thresholds exist for species persistence in fragmented landscapes (With and Crist 1995). As connectivity decreases, species ability to move through and between habitats is reduced in a nonlinear fashion.

Population dynamics

Population size

Estimating animal abundance or population size is an important and challenging scientific issue in wildlife biology (Otis et al. 1978; Pollock et al. 1990). A number of different census methods are available to estimate wildlife populations, each with particular benefits and biases. Beach mouse surveys involve relatively standardized scientific methods, common to the study of small mammals. The basic census method for beach mice involves mark-recapture by live trapping. Mice are captured at night in live traps placed along lines or grids. Each captured animal is checked to determine if it has been captured for the first time (unmarked) or if it is a recapture

(marked). A five-night minimum trapping period has been standard practice since 1987 for Gulf Coast beach mice. Data from such surveys have been analyzed using various methods with differing degrees of accuracy and bias, as number of individuals captured, minimum number known alive, number captured per 100 trap nights, or a mathematically modeled statistical population estimate (e.g., closed population model; Otis et al. 1978). Additionally, tracking tubes have recently been used to estimate the distribution of beach mice within an area. This method involved baited PVC tubes checked month or every other month set in a line or grid throughout suitable habitat. This is the long-term monitoring program currently in place on all public lands supporting Gulf Coast beach mice.

Since its listing in 1985, PKBM population estimates have never numbered more than 400 to 500 individuals until 2003. Population estimates for trapping efforts yielding captures were generated using the closed population model available in program CAPTURE (Otis et al. 1978) and later program MARK (White and Burnham 1999). The 2003 population estimate (pre-Hurricane Ivan) was between 500 to 800 PKBM divided among two populations: GINS and PKSP (USFWS 2004b). Tracking and trapping surveys have been conducted on PKSP and small sections of GINS since the passage of Hurricane Ivan in 2004 to determine presence or absence of beach mice. In October 2005, a trapping effort of less than one-third of the habitat available on public lands yielded captures of less than 30 individuals. Tracking data from June 2006 indicated that about 25% and 32% of the available habitat was occupied at PKSP and GINS, respectively (FWC 2007). Tracking data from March 2007 indicated that less than 10% and approximately 28% of the available habitat was occupied at PKSP and GINS, respectively (FFWCC 2007). In 2008, the tracking efforts found no detections of beach mice in PKSP for approximately a year. It wasn't until May and July of 2009 that detections started to appear. These detections were few and sporadic. Towards the end of 2009 and the beginning of 2010, beach mouse detections started to increase at a fairly steady rate to present day. These mice were moving expanding from GINS to PKSP. Current data from 2013 and 2014 track tube monitoring suggests beach mouse detections ranging from 93% to 98% distributed evenly over PKSP (FWC 2013a, FWC 2013b, and FWC 2014). Tracking results for GINS from 2011-2012 indicate beach mice detections across the landscape, with the majority of tracking tubes having 100% detection over the two year span (FWC 2012). Tracking results for GINS from 2013-2014 indicate beach mice detections throughout the park at an average of 90% detection over the two year period (FWC 2014a and FWC 2014b). The most recent track tube data over the past year and a half indicate from January to June 2015 the detection rate at GINS was 89% throughout the park; 77% for July to December 2015; and back up to 96% detection for January to June 2016 (FWC 2015a, FWC 2015b, and FWC 2016a).

Trapping efforts are conducted less frequently with the track tube monitoring in place. The most recent trapping for the entire range of PKBM was conducted in May 2015 and the population was estimated to be approximately 3,473 (Gore and Pawlikowski, 2016 unpublished). These numbers were calculated using only data from the three core public lands to correlate to past trapping efforts which only included these lands. Also, a more conservative method to identify a buffer around each grid location was used; an average nightly distance moved was used to calculate the effective trapping area. For GINS, this value was 30 meters. Thus PKBM moved an average of 30 meters a night within those grids. This method provides a more realistic population number based on site specific movement patterns instead of a standard buffer

distance. Using this method during the May 2015 trapping project, GINS estimated PKBM population was 1,978.

Few PKBM were trapped on private lands, indicating that mice are using some of the areas between the core public lands. More work is needed to understand how much of these private lands are used and what the use is (i.e., established home ranges or corridors only).

Population variability

Population density of beach mice typically reaches peak numbers in the late autumn into spring (Rave and Holler 1992; Holler et al. 1997). Peak breeding period occurs in late winter and early spring, apparently coinciding with the increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and Holler 1992; Holler et al. 1997). Food supplementation studies showed that *P. polionotus* mouse populations increased when foods were abundant; thus, populations of *P. polionotus* and beach mice appear to be food-limited (Smith 1971; Galindo-Leal and Krebs 1998).

Beach mouse populations fluctuate on a seasonal and annual basis. Attempts to explain population dynamics have revealed an incomplete understanding of the species and its population cycles. It is clear that beach mice, like all rodents, are known for high reproductive rates and experience extreme highs and lows in population numbers. Tropical storms and drought may be associated with depressed beach mouse populations, perhaps resulting from elimination of habitat and food supply reduction. These fluctuations in beach mice populations can be a result of altered reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951; Bowen 1968; Smith 1971; Hill 1989; Rave and Holler 1992; Swilling et al. 1998).

Population stability

Population viability analysis (PVA) is essentially a demographic modeling exercise to predict the likelihood a population will continue to exist over time (Groom and Pascual 1997). The true value in using this analytical approach is not to determine the probability of a species' extinction, but to clarify factors that have the most influence on a species' persistence. From 1996 to 1999, the USFWS' Panama City Florida Field Office funded Auburn University to develop PVAs for two PKBM and two ABM subpopulations (Holler et al. 1999; Oli et al. 2001). The subpopulations modeled consisted of two subpopulations of PKBM, one at GINS-Perdido Key Area and one at Gulf State Park - Florida Point.

The Oli et al. (2001) analyses indicated that all four subpopulations were at risk of extinction, with habitat fragmentation as the most influential factor. The GINS-Perdido Key Area has the highest risk for extinction; the PKBM had a 100% chance of reaching one individual (becoming functionally extinct) within 21 (mode) or 45 (median) years. At Gulf State Park - Florida Point, the PKBM had a low risk of becoming functionally extinct (1.3%) within 13 to 20 years. However, following Hurricane Opal in 1995 and subsequent predation pressure, the PKBM population at Florida Point was believed to be extirpated in 1998. This localized extirpation clearly demonstrates that while PVAs are useful in determining factors significant to species survival, they have limited use in predicting the time to species extinction. More detailed

information on beach mouse PVAs can be found on our website in the document entitled Status of the Species.

Species which are protected across their ranges have lower probabilities of extinction (Soulé and Wilcox 1980). Beach mouse populations naturally persist through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increase and dispersal occurs from adjacent populated areas. From a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As human development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline is no longer possible and any hurricane can impact the entire range of each subspecies, the probability of beach mice persisting would be enhanced by the presence of contiguous tracts of suitable habitat occupied by multiple independent populations (Danielson 2005). The history of the PKBM illustrates the need for multiple populations (Gulf State Park (GSP) was the source for the populations at PKSP and GINS, then was extirpated, and only recently was repopulated with captive-bred mice) (Holler et al. 1989; USFWS 2006a). While maintaining multiple populations of beach mouse subspecies provides protection from total loss (extinction), especially when migration and relocations are possible (Oli et al. 2001), conservation of each subspecies necessitates protection of genetic variability throughout their ranges (Ehrlich 1988). Preservation of natural populations is therefore crucial, as the loss of a population of beach mice can result in a permanent loss of genetic diversity (Wooten and Holler 1999). This loss of genetic variability cannot be regained through translocations or other efforts.

Status and distribution

Status

The PKBM was listed as an endangered species primarily because of fragmentation, adverse alteration, and loss of habitat due to coastal development. This subspecies is assigned a high recovery priority because the degree of threat to its persistence is high, it is a subspecies with a high level of taxonomic distinctness, and its potential for recovery is great if threats can be eliminated or minimized. Recovery of the PKBM often conflicts with certain economic objectives, a factor which further elevates its priority ranking.

Data collected in 1983 to 1984 lead to the listing of PKBM. At that time beach mice were recovering from the effects of Hurricane Frederick in 1979. Following Hurricane Frederick estimated population numbers based on trapping were 13 PKBM found at one location (GSP). Just prior to listing, the decline continued and only one PKBM was captured during a trapping survey at GSP. The effects of Hurricane Frederic (1979) coupled with increased habitat fragmentation due to human development led to the extirpation of all but one population of PKBM.

Since listing, all populations of PKBM have been extirpated at least once. Through translocation efforts, at least one population has remained viable to present day.

Coastal development contributes to habitat loss and fragmentation pressures imposed on all beach mice subspecies. Beachfront development along the Gulf Coast of Florida began in the 1950s and continues to this day. Coastal development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). The threat of development-related habitat loss continues to increase throughout the remaining habitat on private lands that connect the protected habitat on public lands. However, Escambia County has an active Habitat Conservation Plan and Incidental Take Permit for Perdido Key to regulate this development so growth on private lands occurs in a manner compatible with PKBM recovery. Associated with this regulatory planning mechanism is a PKBM Conservation Fund that was developed to identify and fund conservation activities for PKBM. Unfortunately, there are additional contributing threats to PKBM which include low population numbers at times, habitat loss from other causes (including hurricanes), predation (fox, coyotes, and cats), potential competition by animals associated with human development (house mice), and regulatory weaknesses regarding coastal development. These factors probably caused the extinction of the Pallid beach mouse (Humphrey 1992).

Isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by feral and domestic cats), diseases, and potential competition with house mice, are intensified in small, isolated populations, which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated or fragmented populations may experience severe declines or extirpation (Caughley and Gunn 1996). Contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

The status of current PKBM populations is thought to be higher than in the past according to track tube monitoring data and interspersed trapping surveys. Recent PKBM trapping in May 2015 included each of the three core areas (GSP, PKSP, and GINS) plus several private parcels. The private parcels were not included in the population estimate since the long-term trapping grids did not include these areas. However, it is worth identifying where mice are on private lands to account for use of those lands. The total Perdido Key-wide PKBM population is estimated to be 3,473. This is broken down by park; GSP estimated population of PKBM was 276, PKSP estimated population was 1,219, and GINS estimated population was 1,978. While these population numbers are the highest they have been since the time of listing in 1985, the threats to PKBM still remain. Federal, State, and local efforts are attempting to reduce those threats through various recovery actions.

The PKBM population numbers are at a suspected all time high (since monitoring began) largely due to the absence of recent hurricanes. The recent slump in development within the PKBM range has lessened the continual pressure from development and habitat loss. However, this pressure is currently rising, but is being managed in a more compatible and planned fashion under the Escambia Co. HCP. Additionally, current feral and outdoor cats appear to be minimized from past and current predator control efforts. However, all of these threats still remain relevant.

Distribution

Since the late 1970s, PKBM have existed as isolated populations along its historic range (16.9 miles). Less than 30 individuals at GSP were once the only known existing population of PKBM (Holler et al. 1989). Beach mice from this site were used to re-establish PKBM at GINS between 1986 and 1988 (Holler et al. 1989). However, the population at GSP was considered extirpated by 1999 (Moyers et al. 1999). In 2000, ten PKBM (5 pairs) were relocated from GINS to PKSP. In February of 2001, this relocation was supplemented with an additional 32 PKBM (16 pairs). The PKBM were released on both the north and south sides of SR 292 in suitable habitat. Two years of quarterly trapping surveys indicated that the relocations of PKBM to PKSP were successful, and this translocation was considered an established population in 2003 (USFWS 2004). PKBM were also trapped on private land between GINS and PKSP in 2004, increasing documentation of occurrences (Lynn 2004). The Perdido Key-wide population estimate of PKBM just prior to Hurricane Ivan in 2004 was between 500 and 800 individuals. The 2004 hurricane season was highly destructive to Perdido Key and PKBM habitat and 2005 trapping indicated PKBM were only found in approximately 30% of their then available habitat (trapping less than 30 mice). It wasn't until 2008 that PKBM began to show signs of natural recolonization by mice from GINS moving to PKSP. Also in 2008, 48 captive bred PKBM were released onto GSP. After 3 months of monitoring, 8 captive bred mice were recaptured, of which 3 were lactating females and several new wild-born offspring were captured. In May 2012, a 3-day trapping effort continued to find PKBM throughout GSP, including north of Highway 182 (a 4-plus lane highway) (Jeff Gore, FWC, pers. comm. 2012). The most recent track tube surveys indicate PKBM are remaining throughout GSP. The past translocations and releases appear to have been a success and as of 2012, PKBM have occupied all three public lands for the first time since being listed as endangered.

Long term track tube monitoring established in 2008 by FWC in some areas of Perdido Key has allowed us to track distribution and occurrence of beach mice throughout the area. Table 3 shows the percentage of PKBM occurrences in track tubes within the core habitat units.

Table 3. Percentage of PKBM occurrences in track tubes within the three public lands.

YEAR	GSP	PKSP	GINS
2009	NA	2.9%	48%
2010	48%	55%	84%
2011	88%	96%	94%
2012	NA	99%	95%
2013	93%	97%	94%
2014	92%	94%	87%
2015	99%	91%	83%
2016 (half year)	98%	94%	87%

From 2010 to 2016, the track tube detection occurrences have continued to increase and stabilize in each of the three public lands (FWC 2010a, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b, FWC 2014a, FWC 2014b, FWC 2015a, FWC 2015b, FWC 2016a).

According to 2009-2016 track tube data, PKBM have continued to expand their population within the core critical habitat units and within the interspersed private lands that support enough

suitable habitat. Based on the track tube data as well as the Perdido Key-wide trapping efforts during the spring of 2015, PKBM are estimated to occupy suitable habitat on public and private lands north and south of SR 292. Based on 2013 aerials, the PKBM was considered to occur on 56% (1,711 of 3,050 acres) of Perdido Key (Table 4).

Table 4. Areas and acreages of Perdido Key and PKBM habitat in Florida and Alabama.

Area	Total in AL & FL		Total in Florida		Total in Alabama	
	Acres	Percent	Acres	Percent	Acres	Percent
Perdido Key total	3,050	100%	2,714	89%	336	11%
PKBM habitat	1,711	100%	1,518	89%	192	11%
Private lands total	1,539	51%	1,379	45%	160	5%
PKBM habitat	303	23%	270	24%	33	3%
Public lands total	1,512	50%	1,337	44%	175	6%
GINS			937			
PKSP			325			
GSP					162	
FDOT			32			
ALDOT					13	
COUNTY			43			
PKBM habitat within Public lands	1134	66%	1006	59%	128	7%
GINS			753			
PKSP			248			
GSP					128	
COUNTY			5			

Data calculated by U.S. Fish and Wildlife Service Panama City, Florida using a Habitat Characterization Tool developed with Ecognition software using 2013 State of DOQQ aerial photography.

When suitable beach mouse habitat is available and located near an existing population, data suggests beach mice will readily re-establish unoccupied habitat if the known threats are minimized. However, the current amount of available suitable habitat has been reduced and habitat fragmentation has increased due to development since the time of listing in 1985. Therefore, PKBM will always require monitoring to ensure development doesn't create an impassible point that would prevent distribution throughout Perdido Key, especially to and from the three core public land units.

Recovery Criteria

The approved Recovery Plan for Alabama, Perdido Key, and Choctawhatchee Beach Mice was published in 1987 (USFWS 1987). The primary recovery objectives identified in the Recovery Plan are:

1) stabilization of populations by preventing further habitat deterioration, and
2) reestablishment of populations in areas where they were extirpated. For each of the subspecies to be considered for re-classification to threatened, there must be a minimum of at least three distinct self-sustaining populations in designated critical habitat with at least 50% of the critical habitat being protected and occupied by beach mice.

Specific recovery actions or "tasks" can be found in the Recovery Plan on our website: https://www.fws.gov/panamacity/beachmicepkbm. This recovery plan is not up-to-date for PKBM with regard to many sections; however the basic premise is still valid. An updated five-year status review of the PKBM is available (USFWS 2014). This document reflects the more current status of PKBM and can be found on our website as well.

Analysis of the species/critical habitat likely to be affected

Perdido Key is a barrier island and part of a complex and dynamic coastal system that is continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport, and depletion, and fluctuations in sea level. The location and shape of barrier island beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, scrub dunes, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island. The Perdido Key coastal dune ecosystem supports several federally listed species, including PKBM, four species of sea turtles, piping plover, and red knot; in addition to a host of other State protected shorebirds.

The quality of the dune habitat (primary, secondary, and scrub) is an important factor in maintaining and facilitating beach mouse recovery. Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation and extinction, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources. Habitat manipulation is especially useful in improving habitat suitability to increase local populations of a species. For beach mice, improving habitat can enhance the abundance and diversity of food resources, increase the chances of meeting a mate, and reduce competition for food and burrow sites.

Long-term trapping data has shown that beach mouse densities are cyclic and fluctuate by magnitudes on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951; Bowen 1968; Smith 1971; Hill 1989; Rave and Holler 1992; Swilling et al. 1998; Swilling 2000; Sneckenberger 2001).

The presence of vegetative cover reduces perceived predation risk of foraging beach mice, and allows for normal movements, activity, and foraging patterns. Foraging in sites with vegetative cover is greater and more efficient than in sites without cover (Bird 2002). Beach mice have also been found to select habitat for increased percent cover of vegetation, and decreased distance between vegetated patches (Smith 2003). Wilkinson et al. (2010) noted that SRBM preferred to cross narrow open sand gaps (less than 8.38 m (27.49 ft.) wide) to relatively large patches of vegetation ($\geq$11.75 m^2) (126.43 ft^2) during new moon phases when the predation risk is presumed to be low. A preliminary test of predictive models for the SRBM found that barrier island occupancy may be constrained more by predation risk, hurricane damage, and human impacts than by strict dependence on a particular preferred habitat (Wilkinson et al. 2009).

Beach mice use burrows to avoid predators, protect young, store food, and serve as refugia between foraging bouts and during periods of rest. Beach mice have been shown to select burrow sites based on a suite of abiotic and biotic factors. A limitation in one or more factors may result in a shortage of suitable sites and the availability of potential burrow sites in each habitat may vary seasonally. Beach mice tend to construct burrows in areas with greater plant cover, less soil compaction, steep slopes, and higher elevations above sea level (Lynn 2000; Sneckenberger 2001). These factors are likely important in minimizing energy costs of burrow construction and maintenance while maximizing the benefits of burrow use by making a safe and physiologically efficient refuge. Similar to food resources, this fluctuation in availability of burrow sites suggests that a combination of primary, secondary and scrub dune habitat is essential to beach mice at the individual level.

Activities conducted within the Action Area (defined as GINS only for this project) have the potential to impact PKBM within the entire geographic range occupied by the subspecies. It is important to consider ways to provide essential connectivity within and among the 3 public lands that contain the core population of PKBM and to provide habitat for natural movements within all suitable habitat on public and private lands. Activities should limit behavioral alterations of natural PKBM movements and functions and should contribute to the long-term persistence of PKBM within the Action Area and range-wide.

Since the listing of PKBM in 1985, the relative importance of the frontal dune and scrub dune habitat has been reconsidered. While the frontal dunes were thought to represent optimal habitat, the scrub dunes are now considered to serve an equally important role in the persistence of beach mice. The role of the scrub dunes becomes particularly important during and after storm events when inland habitat is the only refugia from storm surge.

Habitat loss and degradation, loss of genetic variation, predation, artificial lighting, and hurricanes are threats to beach mouse populations. Enhancing and maintaining habitat connectivity and protecting multiple populations work to moderate the effects of these threats and these management actions are essential to the long-term persistence of PKBM. Incorporation of a natural light regime within the three public lands and private developments throughout the species range would limit effects from artificial lighting and address the requirements for PCE 5. PKBM populations have been on the decline since before listing and have struggled for several years to recover from the tropical storms and hurricanes of 2004 and 2005. Currently, it is thought the population is doing well, but populations fluctuations throughout the year make long-term monitoring essential to discern trends from these fluctuations. Through the existing Perdido Key HCP/ITP, population estimates are required every 5 years to identify long term trends in the population over the life of the 30-year ITP. This long-term monitoring will inform PKBM range-wide recovery, including at GINS.

Threats

Habitat loss and fragmentation

Habitat loss and fragmentation associated with residential and commercial real estate development is the primary threat contributing to the endangered status of beach mice (Holler 1992; Humphrey 1992). The historic range of PKBM included 16.9 miles of coastal dune habitat

on Perdido Key. Currently, an estimated 9 miles, or 1,711 acres, of PKBM habitat with moderate to heavy fragmentation remains. Coastal development has fragmented all the subspecies into disjunct populations, making it difficult to maintain connectivity to and among the three public lands and the coastal scrub refugia on private lands. Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by domestic cats), diseases, and the potential competition with house mice, are intensified in small, isolated populations which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation.

Habitat degradation due to recreational human use is also a factor. This is largely seen when people traverse through the primary and secondary dune habitat to access the beach. These trails get used over and over and a wear path devoid of vegetation begins to appear. This further exacerbates erosion as there is no vegetation to keep the sand in place. It also allows a pathway for water to flow during storm events, further reaching into the secondary dune habitat.

The conservation and protection of multiple large, contiguous tracts of habitat, including frontal, secondary, and scrub dunes, is key to the persistence of beach mice. At present, large parcels exist mainly on public lands; however, Escambia County has actively pursued purchasing and protecting approximately 25 acres of coastal dune habitat since enacting their HCP/ITP. They also have the potential to protect another 20 acres in the near future. Protection, management, and conservation of beach mice and coastal dune habitat on public areas have been complicated by increased recreational use by humans as public lands are rapidly becoming the only natural areas left on the coast. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local extirpations and complete extinctions due to storms and other stochastic events (Shaffer and Stein 2000; Oli et al. 2001; Danielson 2005). Protecting multiple populations increases the chance of at least one population within the range of a subspecies surviving episodic storm events and persisting while vegetation and dune structure recover.

Habitat connectivity is especially important where mice occupy fragmented areas lacking one or more habitat types. For instance, when food or burrow sites are scarce in the frontal dunes (*e.g.*, seasonally or after hurricanes), beach mouse access to connected tracts (*e.g.*, scrub or other frontal dune habitats) with these resources is important in maintaining local beach mouse populations and distributions. Trapping data suggest that beach mice occupying the higher elevation scrub dunes and open interior scrub following hurricanes recolonize the frontal dunes once vegetation and some dune structure have recovered (Swilling et al. 1998; Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract or a functional pathway to frontal dune habitat does not exist, beach mice may not be able to obtain the resources necessary to expand the local population and reach the densities necessary to persist through the harsh summer season or the next storm. Functional pathways may allow for natural behavior, such as dispersal and exploratory movements, as well as gene flow, to maintain genetic variability of the population within fragmented or isolated areas (USFWS 2009c).

The effects of barriers or loss of habitat connectivity on PKBM are dependent on their location, duration and magnitude. These effects are both relative and cumulative. Meyers (1983) contended that high density developments which eliminate large sections of contiguous habitat can be expected to be more of a barrier to beach mouse movement than a fully developed single-family subdivision, which in turn would impede beach mouse movement more than single-family homes on large lots. The cumulative effects of barriers are what finally extinguish populations in most cases (Noss and Csuti 1997).

How such development activities will affect the PKBM over the long term is not known and will likely depend on interactions between future developments and stochastic events (*e.g.*, hurricanes). The importance of the fragmentation process in the habitat requirements of the PKBM is not totally understood. However, fragmentation can affect the biological integrity of the PKBM through isolation and possible local extirpation. It is believed that fragmentation contributed to the loss of PKBM at Florida Point (GSP) and the pallid beach mouse (Humphrey 1992; Lynn 2000).

Hurricanes and Tropical Storm Events

Hurricanes are known to affect beach mouse population densities in various habitats. Mechanisms for effects include direct mortality of individuals, relocation/dispersal, and subsequent effects of habitat alterations (that impact such factors as forage abundance/production and substrate elevation). Habitat impacts can be widespread and encompass the range of the entire subspecies as indicative of past storms in the Escambia County area.

Hurricanes can severely affect beach mice and their habitat in the following ways:

1) Tidal surge and wave action overwashed habitat leaving a flat sand surface denuded of vegetation.
2) Sand deposition completely or partially covered vegetation.
3) Blowouts occurred between the Gulf and bay/lagoon leaving a patchy landscape of bare sand, dune, and scrub habitat.
4) The frontal portion of the primary dune habitat was sheared but landward areas were relatively unaffected;
5) Vegetation was killed by salt spray and/or prolonged inundation;, and
6) Islands were breached entirely and channels from the Gulf to bay/lagoon were created.

Future active storm seasons will likely affect Perdido Key and PKBM in the same manner if a direct or near landfall event occurs.

Until frontal dune topography and vegetation can redevelop or be restored, scrub habitat maintains beach mice populations and provides the majority of food resources and potential burrow sites (Lynn 2000; Sneckenberger 2001). Pries et al. (2009) found that frontal dune habitat occupancy by the SRBM went from 100% prior to Hurricane Ivan in 2004 to 60% after the storm. Occupancy of scrub habitat remained relatively constant at around 75%. Approximately 68% of the frontal dune area occupied by beach mice was lost, compared to a loss of only 15% of the scrub dunes. Scrub area may provide more stable habitat for beach mice

than frontal dunes. Scrub dunes can serve as refugia if mice can move from the frontal dunes to scrub dunes during hurricanes (Swilling et al. 1998), and are a source for recolonization of frontal dunes following hurricanes.

While storms temporarily reduce population densities (often severely), this disturbance regime maintains open habitat and retards plant succession, yielding a habitat more suitable for beach mice than one lacking disturbance. The low-nutrient soil of the coastal dune ecosystem often receives a pulse of nutrients from the deposition of vegetative debris along the coastline (Lomascolo and Aide 2001). Therefore, as the primary and secondary dunes recover, beach mice recolonize this habitat readily as food plants develop to take advantage of the newly available nutrients. Recovery times vary depending upon factors such as hurricane characteristics (*e.g.* severity, amount of associated rain, directional movement of the storm eye, storm speed), successional stage of habitat prior to hurricane, elevation, and restorative actions post hurricane. Depending on these factors, recovery of habitat may take from one year to over 40 years.

The impact of hurricanes on plant communities temporarily affects food availability, and hence can limit population densities in impacted habitats soon after storms. Observations indicate that Hurricane Opal (a Category 3 storm in November 1995) caused a decrease in one population of ABM by 30% (Swilling et al. 1998). However, population densities in scrub habitat typically increased following hurricanes (Swilling 2000; Sneckenberger 2001). Five months post-storm, "densities (individuals/km) were up to 7.5 times greater in scrub areas than in frontal dune grids" (Sneckenberger 2001). Impacts of the storm may have been apparent as long as 17 months after the storm when scrub densities remained triple those of frontal dunes (Sneckenberger 2001). Similar results were found for Chotawhatchee Beach Mouse (CBM) at Grayton Beach State Park. When frontal and primary dunes sustained extensive damage during Hurricane Opal in 1995, beach mice were captured behind what remained of primary dune habitat (Moyers et al. 1999). By 1998, however, primary dunes and the immediate habitat inland appeared to support higher numbers of beach mice.

In addition to the overall change in post Hurricane Opal distribution of ABM, the average percent of newly marked beach mice individuals increased from 14% for the three trapping periods before the storm to an average of 26.7% for the same interval post hurricane (Swilling et al. 1998). The average for the three trapping periods immediately following was even higher, at 42.7% of the individuals captured. This increased presence of new individuals reflected increased reproduction (Swilling et al. 1998). A statistical analysis of the data indicated that the number of females exhibiting signs of reproduction was higher than normal (18.9 % higher). Similar results were also found at Topsail Hill Preserve State Park. Four to five months following Hurricane Opal, all female CBM captured were pregnant or lactating (Moyers et al. 1999). Trapping six months after the hurricane, 52% of captured CBM were new unmarked beach mice.

Although hurricanes can significantly alter PKBM habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes may function to break up population subgroups and force population mixing (Holler et al. 1999). The resultant breeding

between members of formerly isolated subgroups increases genetic heterogeneity and could decrease the probability of genetic drift and bottlenecks.

Genetic viability

Selander et al. (1971) conducted an electrophoretic study on 30 populations of *P. polionotus*, including populations of beach mouse subspecies. Based on 30 allozyme loci, they estimated that the level of allozyme variation found in beach mouse populations was at least 40% lower than the level of variation in nearby inland populations. This work indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population. Lower levels of heterozygosity has been linked to less efficient feeding, fewer demonstrations of social dominance and exploratory behavior, and smaller body size (Smith et al. 1975; Garten 1976, Teska et al. 1990). Research focused on inbreeding depression in old-field mice (including one beach mouse subspecies), determined that the effects of inbreeding negatively influenced factors such as litter size, number of litters, and juvenile survivorship (Lacy et al. 1995).

In 1995, the USFWS contracted with Auburn University to conduct genetic analysis of post-re-establishment gene structure in PKBM (Wooten and Holler 1999). Results of the work for PKBM determined the following: (1) founder effect (from Gulf State Park to GINS) did impact the GINS population and loss of rare alleles and allele frequency shifts were noted; (2) a low to moderate level of overall genetic divergence was observed; (3) data suggest that some effects of genetic drift were mediated by continued transfer of individuals; (4) levels of heterozygosity were unexpectedly high given recent history; (5) average level of relatedness among individuals is high which may portend future inbreeding related problems and no substantial evidence of existing close inbreeding was observed in the data; and 6) the overall level of microsatellite variation retained in the GINS population was higher than anticipated.

A more recent genetic investigation with the University of Florida and FWC has looked at the genetic structure across the entire range of PKBM (Austin 2012; Austin et al. 2015). This work has advanced our understanding of existing variability, the impact of captive breeding on genetic variation, and has provided important insight into the dispersal capabilities of PKBM island-wide. This recent work was focused on the level of genetic drift associated with the reintroduction of captive bred PKBM at GSP in 2010. The growth and connectivity of the PKBM population over a two year period was documented at each of the three public lands. In 2010, the three park populations were significantly genetically different than 2012. This level of differentiation can be easily explained by the known history of bottlenecks, reintroductions from an inbred captive colony, and natural re-colonization of PKSP by a few GINS founders in 2009. Genetic levels were highest in GINS, which is consistent with the relatively long history of PKBM occupation of that park.

Recommendations to manage the genetic variability within PKBM include: (1) preserving the natural population to the maximum extent possible since the loss of the GSP population resulted in the permanent loss of alleles; (2) using whichever population of PKBM (GSP, PKSP, or GINS) has the most amount of genetic variation at the current time as donors for re-establishment of other populations when needed; (3) transfers between donor and re-established populations in re-establishment plans; and (4) maintain genetic similarities between the wild

populations and captive population to the maximum extent possible. In addition, future translocations and re-introductions should be accomplished in pairs.

Beachfront Lighting

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. Foraging activities and other natural behaviors of beach mice are influenced by many factors. Artificial lighting alters behavior patterns causing beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird et al. 2004). The effects from lighting should be reduced by avoiding lighting in all PKBM habitat.

The PCFO supports the practices associated with the International Dark-Sky Association (www.darksky.org) which stresses limiting outdoor lighting to those areas truly needed. Therefore, dark skies are recommended for projects proposed on Perdido Key. However, if lighting is deemed essential, wildlife-friendly lighting (FWC and USFWS approved) should be utilized. These are light sources that emit long wavelength light, highly directed light or that do not emit significant light in the spectral range of 550 to 620nm. These long-wavelength light sources include low pressure sodium vapor lamps 8000 lumens or less, bug lamps 480 lumens or less, amber and red LEDs (light emitting diodes), true red neon, and some color-filtered compact fluorescent lamps that are housed in a full cut off or fully shielded fixture. Fixtures should be mounted as low in elevation (height) for the needed purpose. The USFWS continues to work with public and private land owners concerning light pollution on Perdido Key. While wildlife-friendly lighting is considered to meet nocturnal wildlife specifications, beach mice have been shown to avoid illuminated habitat. Therefore, as our understanding of artificial lighting on PKBM continues, so should the parameters for wildlife friendly lighting within the coastal dune habitat.

Predation

Beach mice have a number of natural predators including coachwhip (*Masticophis flagellum*) and corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), and Eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared (*Asio flammeus*) and great-horned owls (*Bubo virginianus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*) skunk (*Mephitis mephitis*), weasel (*Mustela frenata*), and raccoon (*Procyon lotor*) (Blair 1951; Bowen 1968; Holler 1992; Novak 1997; Moyers et al. 1999; Van Zant and Wooten 2003). Predation in beach mouse populations that have sufficient recruitment and habitat availability is natural and less of a concern. However, predation pressure from natural and non-native predators on populations already stressed from a variety of threats may result in the extirpation of small, local populations of beach mice.

Free-roaming and feral cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968; Linzey 1978) and are considered to be the main cause of the loss of at least one population of beach mice (Holliman 1983). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers et al. 1999). The PVA for the ABM indicated that if

each population had as few as one cat which ate one mouse a day, rapid extinction occurred in over 99% of all iterations (Traylor-Holzer 2005).

In response to increasing depredation of sea turtle nests by coyote, fox, and raccoon, a multi-agency cooperative effort was initiated in northwest Florida in 1996. Ten Federal and State agencies have provided funding and/or in-kind services to implement a control program on coastal public lands across northwest Florida. The program is ongoing, and a permanent USDA position was established in northwest Florida to conduct the control work (Northwest Florida Partnership 2000; Daniel et al. 2002). USDA continues to capture feral cats in beach mouse habitat on Perdido Key. In 2013, the FWC was awarded a grant from the National Fish and Wildlife Foundation to increase predator control efforts in northwest Florida to conserve beach-nesting birds. Beach mice and sea turtles benefit from this increase effort as well. There are now three dedicated USDA positions in the area.

Climate Change

The varying and dynamic elements of climate science are inherently long term, complex and interrelated. Although continually improving, the science at present is not exact enough to precisely predict when and where climate impacts will occur. Although we may anticipate the direction of change it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

According to the Intergovernmental Panel on Climate Change Report (IPCC 2014), warming of the earth's climate is "unequivocal," as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. The IPCC Report (2014) describes changes in natural ecosystems with potential wide-spread effects on many organisms, including marine mammals and migratory birds. Scientific evidence indicates a rapid and abrupt climate change, rather than the gradual changes that have been currently forecasted (IPCC Report 2014), posing a significant challenge for fish, wildlife, and plant conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the USFWS will incorporate potential climate change effects as part of their long-range planning activities (USFWS 2009 a, b).

Climate change at the global level drives changes in weather at the regional level, although weather is also strongly affected by season and by local effects (e.g., elevation, topography, latitude, proximity to the ocean). Temperatures are predicted to rise from 2^{o}C to 5^{o}C for North America by the end of this century (IPCC 2014). Other processes to be affected by this projected warming include rainfall (amount, seasonal timing, and distribution), storms (frequency and intensity), and sea level. The 2014 IPCC report found a 90% probability of 7 to 23 inches of sea level rise by 2100. The exact magnitude, direction, and distribution of these changes at the regional level are not well understood or easy to predict. Seasonal change and local geography make prediction of the effects of climate change at any location variable. Current models project a wide range of regional changes.

Florida is one of the area's most vulnerable to the consequences of climate change. Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management (Pearlstine 2008). Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The USFWS will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (USFWS 2006b).

Increased sea levels, resulting from global warming, have accelerated shore line erosion rates in the Gulf of Mexico (Twilley et al. 2001). According to the Third National Climate Assessment, release May 2014, sea level rise and increasing storm surge events are occurring and are impacting coastal species and ecosystems (Melillo et al. 2014; Wolf 2014). As the coastal shore line of Perdido Key erodes gradually or rapidly during storm events, the frontal dune habitat of PKBM can be significantly degraded and reduced. A diminished frontal dune enables a hurricane storm surge to inundate secondary dunes and swales, killing vegetation and any burrowed mice. Perdido Key has relatively few high elevation dunes to provide refugia for PKBM during (and in the aftermath of) storms. The ability of PKBM to re-populate Perdido Key after a destructive hurricane is predicated on the successful re-establishment of dune vegetation. If late-succession dune species that occupy the higher elevation scrub dunes and provide refuge for beach mice during hurricanes (Pries et al. 2009) are damaged during an intense hurricane, it is unlikely they will have time to re-establish themselves between narrowing hurricane cycles (Feagin et al. 2005).

ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including suitable habitat and designated critical habitat), and the ecosystem within the Action Area. The Action Area of this project is GINS. The environmental baseline is a "snapshot" of a species' health at a specified point in time. It does not include the effects of the action under review in the consultation.

Status of the species within the Action Area

The Action Area for this project is GINS Johnson Beach Unit, which is also critical habitat unit PKBM-5. It consists of 753 acres of suitable and critical habitat. GINS equates to roughly 44% of the existing PKBM habitat still remaining. The habitat within GINS consists primarily of primary dune with portions of secondary and scrub dunes in the northern portion of the park. GINS supports a core population of PKBM and is essential to promoting PKBM expansion westward to private lands and PKSP and GSP. The scrub dunes and higher elevation areas on the eastern tip were thought to provide refugia from Hurricane Ivan for PKBM and allowed them to slowly recolonize GINS overtime. As one of three protected populations, the Action Area is essential to the recovery of the species. Actions that prevent or temporarily impede movement and alter behavior can impact the likelihood of PKBM persistence. The Action Area is particularly vulnerable to damage from hurricanes and tropical storms and will continue to see affects from sea level rise.

Factors affecting species environment within the Action Area

Coastal development and human use

The greatest factor threatening the status of PKBM within the Action Area is human use and associated development within GINS. This includes direct impacts such as parking lots, buildings, and walkways; as well as indirect impacts such as excessive presence of people, improper trash management, nighttime park use, trampling dune habitat, and artificial lighting. These actions result in habitat loss and fragmentation, excessive ambient artificial light, encroachment of non-native vegetation, free-roaming cats, and high numbers of natural predators. In the case of the PKBM, fragmentation began with the first active human use of the island when Fort McRee was constructed in 1831 and greatly increased as Perdido Key emerged as a beach resort development in the 1970's and 1980's (Work et al. 1991). This loss and fragmentation of habitat increases the obstacles faced by the PKBM when natural events, such as hurricanes and predation, occur. One of the most rapid and obvious effects of fragmentation is elimination of the species that occurred only in the portions of the landscape destroyed by development (Noss and Csuti 1977). Many species, like the PKBM, are especially susceptible to extinction from habitat loss because of their limited distributions. The prime example of the loss of a similar species is the extinction of the pallid beach mouse in Florida (Humphrey 1992). This threat of human use is why GINS is so valuable to PKBM; it is only one of three areas within the species range that contains large, relatively contiguous protected lands. Thus, every bit of development within GINS has the potential to take and fragment habitat.

Isolation of habitats by imposing barriers to species movement is an effect of fragmentation. A barrier to PKBM movement depends upon a number of factors, such as location and size, and can include roads, parking lots, residential developments, highly lit areas, and holding ponds. Following Hurricane Ivan in 2004, PKBM were largely extirpated from Perdido Key with only a few individuals found in isolated areas within GINS. Between 2008 and 2010, PKBM built up densities and continued to grow within GINS and expand their population westward outside of GINS to PKSP. This event was the first natural recolonization of a park without the need for a translocation. The viability of populations may depend on enough movement of individuals among habitat patches to balance extirpation from other habitat patches. If essential habitat requisites are eliminated or habitat connectivity is severed, PKBM populations may be at increased risk. Therefore, PKBM requires habitat connectivity that allows the species to move between habitat patches containing vital resources (*e.g.* food, cover, burrowing habitat, and higher elevation refugia).

Development of Perdido Key with residential homes, large condominiums, and commercial retail has undoubtedly reduced the amount of historic natural habitat available to the PKBM and this trend will likely continue. The increased local and visitor usage of GINS continues to increase during peak summer months when PKBM face natural struggles due to the harsh conditions. GINS routinely experiences the indirect effects from development pressures, such as increased human presence throughout the park, attraction of potential competitors (house mice) through inadequate refuse management, artificial lighting that disrupts normal nocturnal PKBM behavior, and attraction of non-native predators such as the domestic/feral cat.

Artificial lighting

Although the negative effects of artificial lighting are well documented for sea turtles (Witherington and Martin 2003), its potential effects within beach mouse habitat have not been extensively studied. Natural illumination of the dune systems due to moon phases is known to have a direct effect on beach mouse activity (Blair 1951; Wolfe and Summerlin 1989; Wilkinson et al. 2010). Bird et al. (2004) found that beach mouse foraging behavior was altered as a result of artificial light by reducing use of foraging patches and/or reducing seed harvest. They also suggested that artificial lights may cause habitat fragmentation due to altered movement patterns of mice. This alteration in behavioral patterns causes beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird et al. 2004). There are some poorly located lights within GINS that are being retrofitted with Natural Resources Damage Assessment (NRDA) monies from the Deepwater Horizon oil spill. These lights should consider all coastal species needs when being replaced.

Tropical Storms, Hurricanes, and Hurricane Recovery Actions

Post-Hurricanes Ivan/Dennis/Katrina (Category 3 storms) habitat assessments combined with subsequent trapping and tracking tube efforts at GINS indicated that PKBM distribution and numbers were severely reduced as a result of the storms. Range-wide, an estimated 80-100% of PKBM habitat was impacted by storm surge, high winds, sand erosion, and salt spray. In 2005, the anticipated rate of PKBM recovery after these storms was unknown and believed to be largely dependent on the response of storm-impacted habitats and their connectivity to remaining habitat patches, pre-storm PKBM distribution, post-storm development or reconstruction efforts, post-storm dune restoration actions, and the frequency, extent and/or intensity of future storm events. No major storms have impacted the area since 2005. By 2010, tracking tube data suggested that PKBM distribution was recovering, likely the result of the improving condition of storm-impacted habitat and connectivity facilitated by a Gulf-side vegetated berm constructed between GINS and PKSP. By this estimate, it takes 5 years before coastal dune habitat and PKBM populations begin to show signs of recovering from a devastating storm event.

Large tropical storms and hurricanes will continue to impact PKBM habitat within the Action Area and throughout its range in the future. To anticipate the habitat effects of future tropical storms and hurricanes, the USFWS used a digital terrain model (bathtub method) and 2010 LIDAR (Light Detection and Ranging) elevation data to predict inundated/uninundated habitat resulting from storm surge of 9 feet above sea level (Figure 8). This is a very simplistic model that raises the sea level from 0 feet to 9 feet and depicts what is remaining as uninundated (area in yellow). The objective of this exercise is to illustrate how little high elevation habitat could remain when this area is influenced by storm surge associated with hurricanes and tropical storms. Some minimum amount of dune habitat that is suitable for PKBM is necessary to allow beach mice to find refugia during these events and to persist over the long-term (Pergams et al. 2000).

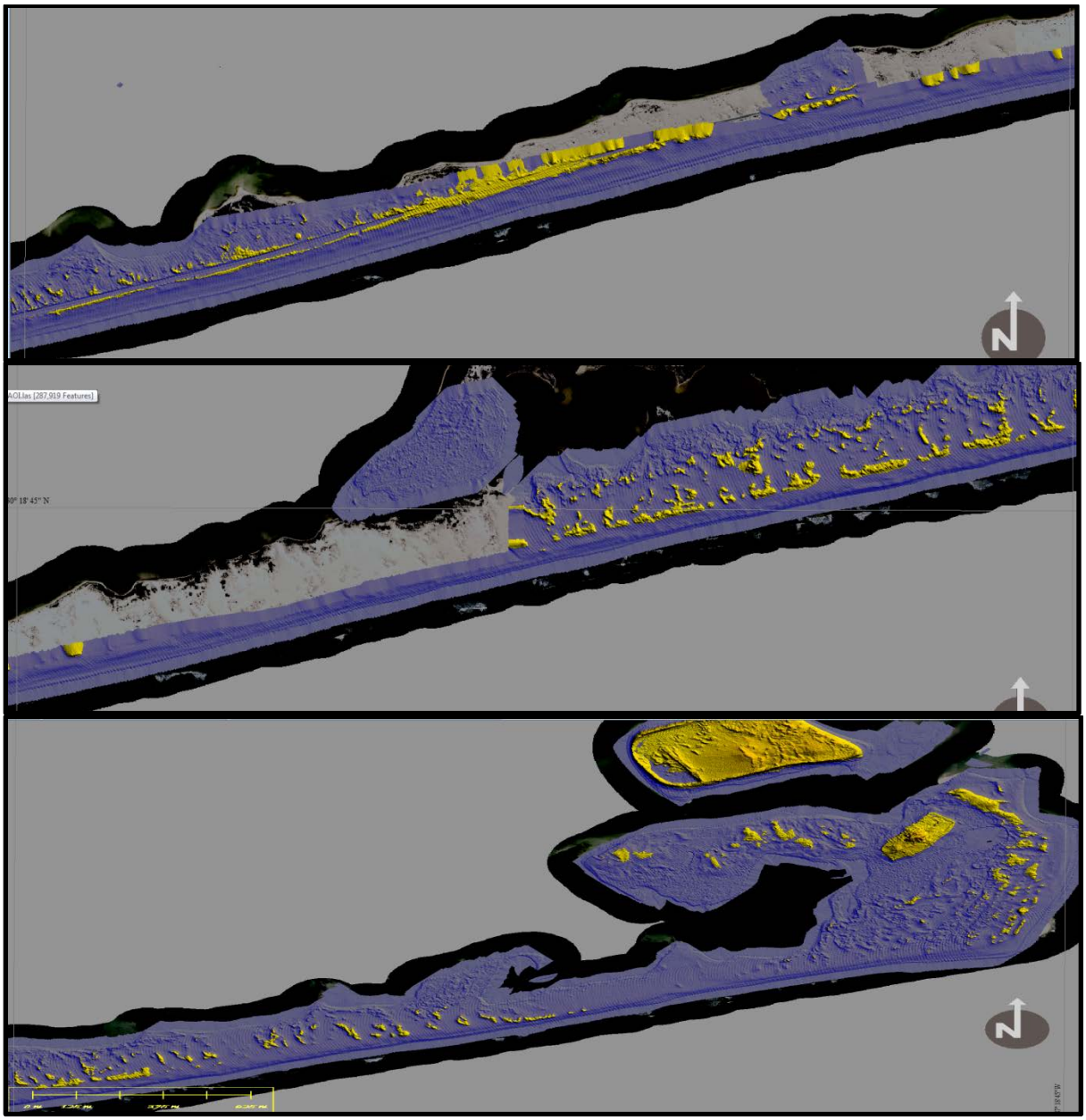

Figure 8. Effects of 9 foot storm surge on PKBM habitat within the western, central and eastern portions of GINS-Johnson Beach Unit. Areas above 9 ft. sea level are indicated in yellow are uninundated storm refugia.

The FEMA funded Escambia County to construct an emergency berm to provide storm protection along the Gulf of Mexico beachfront. The berm was completed in 2005 and was planted in 2006. This effort has expedited natural dune restoration which enhances beach mouse habitat range-wide. This berm was not constructed within the Action Area however; this vegetated berm likely provided essential connectivity between GINS and PKSP, enhancing the repopulation of PKSP. This berm has functioned more naturally overtime as sand has shifted and new plants have recruited, thus becoming essential to promote geneflow within the overall population.

Escambia County conducted a beach nourishment project for Perdido Key in 2005/2006. The project covered approximately 4 miles of beachfront along county and private lands, not including state and Federal lands. This included 2.4 miles between the Alabama state line and PKSP and 1.8 miles between PKSP and GINS. The beach nourishment project is likely to enhance PKBM habitat by providing additional dune habitat (creation) seaward of the existing primary dune habitat. This will provide a buffer to the coastal dune habitat and development structures from future storm events.

In 2016, Escambia County was awarded a grant from NRDA to conducted dune restoration water-ward of the current existing primary dunes. This effort is currently in the design phase and obtaining access. Construction for this beneficial restoration project is likely to begin in fall 2017. This effort includes dune restoration and plating on private lands and PKSP and will provide the essential connectivity needed between the Critical Habitat Units.

Non-Native Species

Any activities that modify coastal dune habitats (*e.g.*, construction, land grading and development) can create avenues for non-native species, such as cogon grass (*Imperata cylindrica*), torpedograss (*Panicum repens*), and fire ants (*Solenopsis invicta*) to invade PKBM habitat and impact local PKBM populations. Past activities have led to non-native species being brought into native habitat within the Action Area and throughout Perdido Key. Cogon grass and torpedograss can replace native plants which are important in maintaining the structure and continuity of PKBM habitat, and provide food resources. Fire ants have been known to attack beach mice in live traps and may have impacts on nesting females and their pups (USFWS 2009c). There is an ongoing predator management program within the Action Area that removes problem animals, specifically coyotes. Efforts to calculate impacts to PKBM from coyotes within the Action area and range-wide have recently begun. This should allow us to get a better understanding of these impacts and how to alleviate them. Other non-native species, such as the house mouse, domestic cat, and, also may place additional predation or competition pressures on PKBM populations (see Threats to Perdido Key beach mice, Predation). During 2010, during the release of captive-bred PKBM in GSP, red foxes denning under Highway 182 were associated with the loss of 35 mice within a span of a few days. There is potential for similar incidents throughout the Action Area if ignored.

Deepwater Horizon Oil Spill

The Deepwater Horizon Oil Spill (Oil Spill) that resulted from the April 20, 2010 explosion on the Deepwater Horizon oil platform off the coast of Louisiana had the potential to significantly impact the coastal ecosystem of the Gulf Coast. The damages have been assessed and are currently being mitigated in various phases through various avenues. Portions of the coastal dune environment were harmed on Perdido Key and within the Action Area. The majority of coastal dune and PKBM habitat impacts resulted from response efforts in the form of dune destruction and trampling. These impacts were eventually reduced through coordination with the USFWS, NPS, land managers, and Escambia County. There has also been some oil deposited or uncovered in GINS and other areas during periodic summer storms, most notably tropical storm Alex in 2010. The low tropical activity during the hurricane season of 2010 enabled the damaged well to be capped, and cleanup efforts continued 2013 on a sporadic basis. Impacts to

PKBM were minimized through a continuing emergency consultation with the U.S. Coast Guard and now fall under non-emergency (standard) consultation.

Other Factors

Increases in sea level, temperature, precipitation and storms are expected with global climate change, as described above (see Threats to Perdido Key beach mice, Climate Change). Although the implications for changes to the Florida Gulf Coast are far from clear, the possible effects of global warming/sea level rise may have significant impacts on PKBM habitat and populations. It is reasonable to assume that beach mouse habitat, particularly the frontal dunes, could be adversely impacted by shoreline inundation and erosion, as well as the effects of flooding and salt spray on interior dune vegetation, associated with predicted increases in sea level and/or storm activity along the Gulf coast.

Looking at the NOAA Sea level rise and coastal impacts map (https://coast.noaa.gov/slr/); a 3-foot rise in sea level could sever connectivity to the high dunes and fort structure within the Action Area. The impacts from sea level rise on Perdido Key are predicted to be felt more from lagoon and bay waters rising than from the gulf waters. This side of barrier islands is typically where the larger dunes have formed overtime. While the larger dunes may remain, the connectivity to them may not. This will make it difficult for PKBM to recolonize the Action Area and other habitat if these larger dune feature essentially become islands.

EFFECTS OF THE ACTION

This section is an analysis of the effects of the project on the species and critical habitat. This section addresses the future direct and indirect effects of the project, including the effects of any interrelated and interdependent activities. Our determination of total effects to the species and critical habitat in the "Conclusion" section is the sum of the effects evident in the baseline plus effects of the action and cumulative effects. The proposed action is likely to result in adverse effects to the PKBM and its habitat. In addition to effects realized by these species at the project site, we also evaluated effects to designated critical habitat.

Factors to be considered

The PKBM is found throughout its historic range in areas of suitable habitat and where other threats have at times been managed, controlled or ameliorated. Our recent estimates indicate that approximately 1,711 acres of PKBM habitat exists in Florida (1,518 acres) and Alabama (192 acres). The Action Area consists of 753 acres (44%) of the total PKBM habitat acreage. While various population estimates have been attempted for beach mouse populations in select areas, these are only estimates for the given time period; fluctuating PKBM populations, seasonal movement, recent storm events, food supply, and other factors can affect population estimates in PKBM. Since impacts cannot be assessed accurately in fluctuating populations on the sole basis of number of PKBM affected, a corresponding measure is the amount of PKBM habitat lost due to a project, and subsequently the PKBM that depend on that habitat. Because of this population fluctuation, the exact number of PKBM will not be precisely determined during the project analysis. However, since the impact to PKBM will be determined by loss of habitat, the direct impact to habitat will be provided.

The proposed work would result in site preparation, construction of three new parking lots with access areas, expansion of the main parking lot, expansion of the entrance road, nine new dune walkovers, and removal of a portion of the existing asphalt (Figures 3 and 4). Specifically, the main visitor parking lot will be expanded to include additional 25-30 parking spots for a total of 348 – 353. In addition, two new smaller lots consisting of approximately 30 spots would be constructed along the road corridor on the north side. The new 50 spot (approximately) parking lot will be at the end of the relocated end of the drivable road, forcing vehicles to turn into the parking lot to turn around. The existing drivable road and turn around loop beyond the last proposed parking lot will be converted to a non-vehicular walking path with a linear portion of the asphalt removed.

The total new parking spots for the Perdido Key area of GINS will be 458-467 parking spots. This is reduced from the current estimate of 508 parking spots. The amount of PKBM habitat proposed for impact for this project is approximately 2.35 acres. These impacts include 0.3 acre for the main parking lot expansion, 0.58 for both smaller parking lots, and 0.47 acre for the larger turn around lot. Additionally, the expanded entrance area will impact approximately 1 acre of coastal scrub habitat by adding the additional driving lane and station. This brings the overall total impact to 2.35 acres.

The intent of this project is to remove roadside parking to create a safer more focused area for vehicular and pedestrian traffic, reduce pedestrian trampling of dunes and vegetation, reduce roadside maintenance, and decrease wait times to enter the park. Slight benefits to coastal species could occur from some portions of the project; such as focusing the pedestrian traffic to desired areas instead of haphazard walking through dunes, thus reducing the impacts to coastal dune habitat and PKBM and; raising and reducing the dune walkovers to allow for natural habitat development underneath. Additionally, focusing pedestrian traffic to areas away from shorebird nesting areas should reduce human induced disturbance. GINS has proposed to remove half the existing (linear) asphalt to maintain a non-drivable multi-use path, install five fewer dune crossovers and, eliminate and enforce roadside parking that totals 4.97 acres of reclaimed habitat. Specific conservation design features that GINS has proposed for this project to help facilitate benefits to listed species include:

- Install “No Pets” signage on all dune crossovers to prevent disturbance of shorebird and sea turtle nesting and to reduce beach mouse predation.
- Install wildlife-friendly trash receptacles at parking lots to prevent attracting raccoons, opossums, feral cats, laughing gulls, and crows which can depredate beach mice, shorebirds, and sea turtles.
- Install “No Parking” signs along the roadside and enforcing violations.
- Install speed humps and speed limit signs along Johnson Beach Road and prohibiting non-emergency driving after 10:00pm.
- Improve posting/roping of nesting bird habitat and other sensitive habitat to reduce disturbance from visitors.
- Install multi-species educational signage at access points to inform visitors. Active education of visitors as they enter the park during peak use times.

- Conducting construction activities outside of shorebird nesting and peak PKBM reproduction season

GINS staff has stated in their Biological Assessment and other correspondence that during site specific planning, specific consideration will be given toward high quality habitat preservation, restoration, corridors, and habitat refugia above 9 feet mean sea level. On-site discussion were had that mentioned avoiding the large dunes on the east side of the main parking lot and locating the expansion on the north side in a more disturbed area. These preserved and/or restored areas will provide substantial acreages of permanently protected beach mouse habitat managed to maintain habitat connectivity in north-south and east-west corridors throughout the known range. These corridors will influence the overall movement of PKBM, including immigration and emigration pathways, thus affecting PCE 4 (functional, unobstructed pathways) throughout the Action Area. Indirect impacts could occur from human disturbance (including trampling habitat, being in the park at night, improper trash management, improper use of beach equipment, etc.), artificial lighting into beach mouse habitat, and barriers to movement. Conservation measures will be implemented as part of the project to minimize these indirect effects by improving the value of the habitat on site for PKBM through predator removal, current restoration, provision of easements, post-storm restoration, allowance of monitoring, and exclusion of barriers that might prohibit wildlife movement. No lighting is proposed for this project and GINS staff has agreed to address other lighting issues in future projects. Proposed conservation measures will improve the value of the remaining habitat throughout the Action Area.

Proximity of the action: The development activities will occur in habitat occupied and used by PKBM and designated as critical habitat. This includes PKBM-5, which is the critical habitat unit that contains all of GINS-Johnson Beach Unit. Beach mice spend their entire life cycle within the coastal dune system with peak reproduction periods occurring during late winter and early spring.

Distribution: The development activities are expected to occur within the higher density human use portion of the 638 acres of habitat within PKBM-5. This Action Area does include primary, secondary, and scrub dune habitat within GINS-Johnson Beach on Perdido Key, Escambia County, Florida.

Timing: The project will occur outside of shorebird nesting season (which is February 15 through August 31) or whenever nesting is determined complete as well as the overlapping peak PKBM reproductive season. Beach mice reproduce year round with a peak in the late winter and early spring. Activities impacting habitat and individuals during peak breeding season could have a greater immediate impact on the mice than other times of year, but the long-term effect on beach mice populations would be the same; carrying capacity and habitat connectivity would be diminished on a permanent basis to an undetermined extent taking into account those impacts not offset by the habitat enhancement designed to improve the suitability of the remaining habitat.

Nature of the effect: Implementation of the project will result in the permanent loss of approximately 2.35 acres of PKBM habitat and designated critical habitat, representing 0.31% of the total habitat within the Action Area. This loss has the potential to affect: (1) reducing the total carrying capacity of PKBM habitat within the Action Area, (2) decreasing the connectivity

between habitat features within PKBM-5 that support a core population of PKBM, and (3) reducing potential refugia within the Action Area for nearby PKBM during major storm events. Conservation measures are included as part of the project design to minimize temporary and permanent effects; these include micro-siting of structures to avoid key dune features and high elevation habitat and to ensure connectivity of habitat around structures.

Duration: Initial impacts to PKBM would occur during site demolition, preparation, and construction that will last 6 months. Permanent impacts of the action would occur from a loss of approximately 2.35 acres of habitat, although 0.66 ac will be restored. Close coordination and the incorporation of conservation measures for all coastal species should help increase use of habitat throughout the Action Area following the construction phase. Any long term effects from this project will be addressed and ameliorated as they arise.

Disturbance frequency: This will be a onetime disturbance for construction activities.

Disturbance intensity and severity: The proposed action would permanently impact approximately 2.35 acres. This accounts for 0.31% of the habitat in the Action Area. The intensity and severity should be minimal. As the habitat along the walking trail reverts back to useable habitat, the effects to PKBM will be further minimized.

Analyses for effects of the action

The potential direct loss of individual beach mice may not be detrimental to the genetic diversity of the remaining population because population numbers appear to have rebounded from past hurricanes. From a genetic perspective, beach mice are able to recover from population size reductions if sufficient habitat is available (Wooten 1994). When population numbers are low, beach mice are more vulnerable to stochastic events, such as hurricanes. Site design and proper management of habitat to protect connectivity necessary for movement and expansion is beneficial to PKBM and is an essential function of PKBM habitat within the Action Area. In addition, enough habitat must be available to support PKBM by providing food, burrow sites, and vegetative cover necessary for the conservation of the species. Preserving higher elevation habitat within the Action Area is essential for populations to rebound following hurricanes; this is why micro-siting of development features is so important.

Coastal habitat in the Action Area consist of the Gulf beachfront including the wet and dry unvegetated beach, developing foredunes, interdunal swales, and primary, secondary, and some scrub dunes. Of these habitats, the primary, secondary, and scrub dunes, would be inhabited by PKBM and the other habitats may be used by PKBM on a daily or seasonal basis for foraging and movements. Primary dunes and scrub dunes are considered to be habitats of high importance to the beach mouse (Sneckenberger 2001; USFWS 2006a). Higher elevation habitats provide necessary refugia for PKBM to survive flood events. Maintaining connectivity to these areas is likewise essential to the long-term survival and recovery of beach mice. Figure 8 in the Tropical Storms, Hurricanes, and Hurricane Recovery Actions section above shows the location of elevated habitats (uninundated) relative to the project as determined using LIDAR data and a bathtub model to predict storm surge.

Approximately 750 acres of PKBM habitat remaining within the Action Area will be protected, restored, and managed to ensure that habitat connectivity and refugia are retained within this critical habitat unit. Additionally, the proposed conservation measures should be sufficient to maintain the PCEs throughout this critical habitat unit. Available data have shown that the inland scrub habitat serves as a refuge during storms and is often the only habitat available years after storm events. Connectivity to the onsite scrub habitat and other critical habitat units to the west should be maintained to provide utilization of all needed areas and maintain genetic diversity throughout the entire PKBM population.

Analyses of activities associated with this project that may destroy or adversely modify critical habitat include (but are not limited to), is provided below:

(1) Actions that would significantly alter dune structure, soil compaction levels, and substrate characteristics. Such activities could include, but are not limited to, excessive foot traffic, the use of construction, utility, or off-road vehicles in beach mouse habitat, and sand contamination from gravel, clay, or construction debris. These activities, even if temporary, could alter burrow construction, reduce the availability of potential burrow sites, and degrade or destroy beach mouse habitat. *Analysis: The overall GINS-Johnson Beach parking expansion project impacts will permanently destroy approximately 2.35 acres of critical and suitable habitat. Heavy machinery or dumpsters for debris could crush burrows and individual PKBM. Reducing the 0.66 acre of asphalt to create a smaller multi-use path instead of drivable road and focusing foot-traffic over the dune habitat will likely lessen the effects of this action to some degree and result in a net increase of asphalt surface of 1.69 acres for the project. No clays or other soils that may have a negative effect on the natural light sands found on Perdido Key shall be used in this project. Any remnant asphalt will be removed from the site once the project is complete. The result of the proposed Action is that 99.7% of PKBM habitat will remain. Any future unforeseen impacts will be ameliorated by close coordination and management actions designed to address those impacts.*

(2) Actions that would significantly alter the natural vegetation of the coastal dune community. Such activities could include, but are not limited to, allowing non-native species to establish in the area, landscaping with plants that do not reflect habitat type prior to disturbance, landscaping that yields excessive leaf litter. These activities could alter beach mouse foraging activities and degrade or destroy beach mouse habitat. *Analysis: The proposed project is not likely to affect this constituent element because no non-native plants or landscaping are proposed. Native plants will either be planted or will recruit to restore habitat adjacent to the multi-use path and dune walkovers. Speed of natural recruitment will dictate management option.*

(3) Actions that would significantly alter the natural predator/prey balance of the coastal dune community. Such activities could include, but are not limited to, allowing unmanaged refuse in the area that attracts beach mouse predators and competitors, and allowing or encouraging feral cat communities. These activities could alter PKBM foraging activities, the availability of foraging resources, and directly alter beach mouse survival. *Analysis: The proposed action is expected to have a limited effect on this constituent element because the existing management plan includes predator management efforts throughout GINS. The project will use dumpsters for debris that are for construction materials alone, not trash. Long term effects of this action as*

well as ongoing visitor use on GINS will be further ameliorated by installing and maintaining predator proof trash receptacles at the parking lots and not on the beaches or dune walkovers.

(4) Actions that would significantly alter natural lighting. Such activities could include, but are not limited to installing or allowing artificial lighting that does not comply with wildlife lighting specifications. These activities could alter beach mouse movement and foraging activities, increase predation upon beach mice, and reduce the use of otherwise suitable beach mouse habitat. *Analysis: The proposed action is not expected to affect this constituent element because the project does not include new lighting at the parking lots. Any lighting at the entrance station will be wildlife-friendly lighting using the most current technology. The applicant will strive to meet the standards set forth by the Organic Act of 1916 which directs the National Park Service to "conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." According to the NPS, the night sky is considered a natural resource. Furthermore, the USFWS encourages all applicants to conform to the International Dark-Sky Associations' initiative to keep our night skies dark for the benefit of all nocturnal species.*

(5) Actions that would directly result in a significant loss of habitat and/or elimination or degradation of functional pathways within and among critical habitat units. Such activities could include, but are not limited to residential or commercial development, road widening, or land clearing. These activities eliminate beach mouse habitat, reduce connectivity necessary for gene flow, reduce all necessary resources such as food, mates, burrow sites, refugia from storms; and decrease space available to conduct natural behaviors, thereby limiting their ability to persist. *Analysis: The proposed action would permanently destroy 2.35 acres of beach mouse habitat, which represents a total habitat loss of 0.31% of PKBM habitat within the Action Area. Restoration activities will result in a reduction of 0.66 acre of asphalt surface, resulting in a net increase of asphalt surface of 1.69 acres for the project. Proposed conservation measures to restore habitat impacts and maintain habitat connectivity are expected to allow and enhance for movement through the Action Area.*

Direct and Indirect Impacts

Effects to the species

Project activities including site preparation and construction activities have the potential to adversely affect beach mice of any life stage including those able to leave their burrows and search for food as well as those still in the burrow and dependent on a lactating female. Beach mice disturbed and able to leave the immediate area are subject to increased pressures from predation while they search out a new territory or move from one burrow to another. Pregnant and lactating females that are disturbed may abort their current litter or leave young in burrows. Loss of PKBM individuals is anticipated from the proposed 2.35 acres of long term habitat alterations but will be gained by restoration of 0.66 ac. However, micro-siting of the parking lots will allow GINS to avoid high elevation and large dune features that serve as refugia for beach mice during and after storms.

The quality and connectivity of PKBM habitat are important factors in maintaining and facilitating beach mouse survival and recovery. Contiguous tracts and functionally connected patches of suitable habitat are essential to the conservation of PKBM. This project does fragment the existing larger intact habitat on the north side of Johnson Beach Road.

Research has shown that beach mice travel great distances (up to 1 mile) within one night within a natural landscape (Swilling et al. 1998; Lynn 2000; Moyers and Shea 2002). Beach mice have also been observed crossing two-lane roadways (Gore and Schaefer 1993; USFWS 2004). However; travel distances, minimum width of corridor use, and use of linear areas of habitat within commercial or residential development is still largely unknown. This project is introducing development features within existing natural landscape adjacent to existing development.

Maintaining beach mice on site and preserving the connectivity between the populations centered at GSP, GINS, and PKSP are vital to persistence of the PKBM. Actions that prevent or temporarily prevent the dune connectivity hinder the movement of PKBM and consequently impede PKBM dispersal, population expansion, and access to refuge during and after storm events. Recovery actions needed to ensure the functional connectivity is restored and maintained include working with GINS, their visitors, and local partners.

In addition to the direct effects of this parking lot expansion, indirect effects to beach mice may occur due to the increased human population and presence. Increased human use of beach mouse habitat is expected to occur as Perdido Key grows and easier access to GINS is provided. Foot traffic across sand dunes destroys vegetation essential for dune development and maintenance. An increase in recreational use of GINS Johnson Beach may occur from human visitation to the area which may result in additional disturbance or behavior modification of individual mice. The project conservation measures include provisions which control access and foot traffic in PKBM habitat through dune walkovers, directed movement patterns from parking lots, and signage.

Injury or death to individual beach mice may occur incidental to the site preparation and construction phase. Effects to beach mice are expected to be a result of the following: (1) direct loss or injury of adult and sub-adult beach mice from physical injury caused by use of heavy equipment and construction activities; (2) adult female beach mice aborting litters caused by physical injury or stress due to disturbance from heavy equipment use and construction activities; (3) loss of newly born or juvenile beach mice left alone in the burrow resulting from the loss of a lactating adult female; and (4) loss of adult, juvenile, and newborn beach mice resulting from the temporary and/or permanent destruction or damage to coastal habitat used by the PKBM for foraging, nesting, and refugia. In addition, beach mouse habitat may be affected by foot traffic from workers present on-site.

Effects to critical habitat

The permanent loss of PKBM critical habitat amounts to approximately 2.35 acres or 0.31% of the Action Area. Proposed conservation measures include restoration of 0.66 acres, dune walkovers, directed pedestrian traffic by use of fences and post and rope, micro-siting of project features to avoid larger dunes or significant habitat features, install no pet signage, install predator proof trash receptacles, install and enforce no parking signs along roadside, install speed

humps and speed limit signs along Johnson Beach Road, prohibit non-emergency driving after 10:00 pm throughout nighttime hours, and improve posting/roping of nesting bird and other sensitive habitat to reduce disturbance from visitors. In addition, GINS is working on the creation of a wilderness and backcountry management plan to address camping, boating, and foot access.

The USFWS believes the ecological function within the critical habitat unit will remain viable with unimpaired PCEs. The conservation measures will further enhance the ecological function and PCEs. The ability of GINS to continue to connect PKBM habitat within the Action Area and throughout the species range for gene flow, population expansion, and refuge from storm events will be maintained.

Subject to the one time disturbance allowed by the construction of this parking lot and entrance expansion project, permanent impacts will total approximately 2.35 acres of PKBM critical habitat. The conservation measures, as well as the restored habitat along the ROW and multi-use path should offset the impacts to 2.35 acres. Continued monitoring and working with the USFWS to prevent further impacts from habitat fragmentation, pedestrian impacts, and increased attraction of predators is required to ensure success.

Species Response to a Proposed Action

The project would result in the permanent loss of approximately 2.35 acres of PKBM critical habitat. To offset the permanent loss of approximately 2.35 acres, the project design will provide conservation measures that minimize the effect of habitat loss and ensure that the ecological functions of the PCEs associated with critical habitat and suitable habitat are not significantly impaired. These habitat impacts and restoration acres will be tracked and monitored for PKBM use. Use of the remaining PKBM habitat within GINS will be monitored as well. Unexpected impacts stemming from the construction and use of this parking project will be monitored; and management will occur if additional unexpected impacts are found. Other measures adopted by GINS such as use of dark skies or wildlife friendly lighting, educational signage, enforcement of rules, and predator control will provide both short- and long-term benefits for the conservation of the PKBM.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur within the Action Area considered in this BO. Future Federal actions that are unrelated to the proposed project are not considered in this opinion because they require separate consultation pursuant to section 7 of the ESA. Except areas set aside for wildlife and natural resources within the public areas, existing land uses on Perdido Key are primarily related to coastal development for human recreation and habitation.

It is reasonably certain to expect that human occupancy and recreational use of GINS-Johnson Beach and Perdido Key as a whole will increase in the future. Development and re-development activities are on the rise after several years of recession. Projects that are within endangered or threatened species habitat will require section 7 or 10 permitting from the USFWS. Escambia County currently has an active larger ITP that covers smaller development projects through

Section 10 on Perdido Key. Therefore the USFWS receives a yearly report that reflects these impacts. Those projects outside of the coastal dune habitat will ultimately add to the infrastructural and recreational pressures on the beaches and dunes of Perdido Key. We expect that the conservation measures adopted by GINS will reduce some detrimental effects of these increasing pressures.

While we are not aware of any additional future actions that are reasonably certain to occur within the Action Area that will not require separate section 7 or 10 permitting in the future, we nonetheless mention several of the more significant actions below to demonstrate the coordination efforts and large scale conservation efforts that are likely to result from these actions.

Escambia County is pursuing a coastal dunes restoration project with funds they obtained from the NRDA program. This project proposes to offset impacts to PKBM and coastal dune habitat that occurred during the 2010 oil spill response. It is in the initial stage of design. This project should have beneficial effects to PKBM and their habitat throughout the entire species range. Past Escambia County projects following hurricanes have required emergency response efforts that include debris removal, heavy equipment on the beach, excess personnel in dune habitat, berm placement, restoration efforts, etc. Additionally, beach nourishment and dredge placement projects have been conducted in the past and are likely to continue over time in the future.

CONCLUSION

After reviewing the current status of the PKBM, the environmental baseline, the proposed impacts, the effects of the action, the proposed conservation measures, as well as the expected cumulative effects, it is the USFWS's biological opinion that the Gulf Islands National Seashore Johnson Beach parking lot expansion project will not jeopardize the continued existence of the PKBM, and will not adversely modify their critical habitat.

Suitable and designated critical habitat for the PKBM encompasses the majority of the Action Area. Currently, monitoring suggests PKBM occupy most of the habitat within the Action Area which is considered one of three core populations. Habitat throughout the Action Area provides essential connectivity within this core population and between frontal and scrub dune habitat. The Action Area also provides habitat for natural movements, some refuge from storm surge, and population persistence. Actions that prevent or temporarily impede these movements within the Action Area also prohibit these natural behaviors and reduce the likelihood of PKBM persistence.

The project would directly and indirectly effect approximately 2.35 acres of PKBM critical habitat, including new parking lots, the expanded park lot, and a wider entrance area. Additionally, 0.66 acre of current asphalt roadway will be removed to create a narrower non-drivable multi-use path. Proposed conservation measures include dune walkovers, directed pedestrian traffic by use of fences and post and rope, micro-siting of project features to avoid larger dunes or significant habitat features, install no pet signage, install predator proof trash receptacles, install and enforce no parking signs along roadside, install speed humps and speed limit signs along Johnson Beach Road, prohibit non-emergency driving after 10:00 pm throughout nighttime hours, and improve posting/roping of nesting bird and other sensitive

habitat to reduce disturbance from visitors. In addition, GINS is working on the creation of a wilderness and backcountry management plan to address camping, boating, and foot access. Approximately 99.7% of PKBM habitat will remain within the Action Area. This remaining acreage of PKBM habitat (almost 750 acres) will be protected and managed according to GINS management plan.

As discussed in the Effects of the Action section of this BO, we would not expect the carrying capacity of the Action Area to be appreciably reduced. While permanent impacts of the action will occur from a loss of 2.35 acres of habitat, this loss is mitigated by the above mentioned conservation measures and habitat management. The PKBM habitat remaining will continue to provide for the biological needs of the species as demonstrated by the following measures:

1. The remaining high quality habitat will continue to provide a contiguous mosaic of habitat within the Action Area to ensure the core PKBM population continues to survive and grow.

2. The limited amount of higher secondary and scrub dune habitat will remain connected to the primary dune habitat to act as refugia following storm events. All higher elevation dune habitat will be avoided and restored following storm events.

3. Installation of dune walkovers will prevent degradation to the primary dune habitat along the Gulf and bayside beaches.

4. Installation of wildlife-friendly trash receptacles at parking lots will prevent attracting predators.

5. Installation and enforcement of no roadside parking will enhance and restore habitat along the roadside.

6. Installation of speed humps and speed limit signs to slow traffic and prohibit driving after 10 pm throughout nighttime hours will reduce road-associated mortality.

7. Improved posting and roping along sensitive habitat and in bird nesting areas will reduce disturbance from visitors.

8. Elimination of driving within the vegetated dunes by GINS staff conducting park operations will reduce habitat degradation.

9. Prohibition of pets on the beach and participation in predator control programs will reduce stress and mortality.

Based on the project design parameters and conservation measures, we do not anticipate that the loss of the critical habitat would preclude the remaining critical habitat from meeting the PCEs for the Action Area or appreciably diminish the habitats' capability to provide the intended conservation role for PKBM.

INCIDENTAL TAKE STATEMENT

Section 9 of the Endangered Species Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Endangered Species Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

The proposed GINS parking and entrance expansion project and the associated documents clearly identify expected impacts to affected species likely to result from the proposed taking and the measures that are necessary and proper to minimize those impacts. All conservation measures described in the biological assessment and biological opinion are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this ITS under 50 CFR §402.14(I). The NPS must insure that they become binding conditions of any contract or permit issued to carry out the proposed action for the exemption in section 7(o)(2) to apply. The NPS has a continuing duty to regulate the action covered by this incidental take statement. If the NPS: (1) fails to assume and implement the terms and conditions or, (2) fails to require any contracted group to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the NPS must report the progress of the action and its impact on the species to the USFWS as specified in the ITS [50 CFR §402.14(I)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The USFWS has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated for: (1) harm of PKBM within the 2.35 acre construction footprint; (2) harm of PKBM within the temporary impact area that will be restored; and (3) harassment through behavior modification of all PKBM on the remaining development area due to the changes onsite from the site preparation and construction resulting in altered interactions with other beach mice, foraging or dispersal activities, and potential population expansion, and increased natural predation.

Incidental take is anticipated from the project including site preparation, construction implementation, and for the use of the park over the life of the development. The USFWS anticipates incidental take of beach mice would be difficult to detect and quantify for the following reasons: (1) the inability to predict the timing of the project activities to occur during the peak beach mouse reproduction and dispersal seasons, (2) beach mice are nocturnal and are

outside of their burrows only at night and consequently, mice affected by the project may not be found as a result of predation or death within a burrow, and (3) an unknown number of beach mice may have reduced life spans and/or may not be able to disperse for population expansion and genetic exchange. Therefore, NPS will monitor the extent of PKBM take using the acreage and duration of the construction activities. The acreage for the parking lot expansion will not exceed 2.35 acres and the duration for the construction will not exceed 6 months. These are surrogate measures that indicate the magnitude and frequency of conditions created by the project operations that cause the anticipated taking. Exceeding these surrogate measures of the levels of incidental take for PKBM shall prompt a reinitiation of this consultation.

EFFECT OF THE TAKE

In the accompanying BO, the USFWS determined that the level of anticipated take for project construction and associated indirect effects would not result in jeopardy to the species or adverse modification of designated critical habitat.

REASONABLE AND PRUDENT MEASURES

The USFWS believes the following Reasonable and Prudent Measure (RPM) is necessary and appropriate to minimize impacts of the incidental take of PKBM:

The National Park Service shall implement actions identified in the PKBM recovery plan and recent 5-year review to ensure adherence to Section 7(a)(1) of the Act.

TERMS AND CONDITIONS

All conservation measures described in this Biological Opinion are hereby incorporated pursuant to 50 CFR § 402.14(I) with the addition of the following terms and conditions. In order to be exempt from the prohibition of section 9 of the Act, the NPS must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are mandatory. Terms and conditions, the RPM, and conservation measures are subject to the availability of funds by Congress, or revenue from operations. The NPS will exercise its best efforts to secure funding for those activities. In the event the necessary funding is not obtained to accomplish the RPM activities by the dates established, the NPS will reinitiate consultation with USFWS. Compliance and enforcement of the terms and conditions of this Biological Opinion will be accomplished by Federal and State agencies that have the ability to enforce provisions of the Act as they relate to the taking of an endangered species with respect to each specific occurrence.

Species Monitoring

1. Access to habitat within the GINS-Johnson Beach Unit will be granted to the USFWS, FWC, and their representatives to conduct PKBM monitoring, trapping, translocation, reintroduction, and predator control. These activities will be coordinated with GINS staff.

2. GINS staff will assist USFWS staff with monitoring, trapping, translocation, reintroduction, and predator control as needed.

3. GINS staff will assess PKBM habitat function and restoration needs and coordinate with the USFWS to fulfill these needs.

4. GINS staff will notify and work with existing trappers if predator tracks are noticed, specifically feral cats and coyotes.

5. GINS staff will assess and work with USFWS staff to achieve restoration actions following severe impacts from storm damage. These actions should be coordinated and conducted within 3 months of the storm to evaluate needs and implement management action to restore damaged habitat.

Project Design and Construction

6. GINS will adhere to the Dark-Skies Initiative to protect night skies for wildlife and natural resources whenever possible. Where lighting is deemed necessary, wildlife-friendly lighting shall be used according to current standards and efficient fixtures/bulbs.

7. A summary and education on the conservation measures and terms and conditions of this BO shall be provided by GINS staff to the general contractor and sub-contractors to ensure understanding of endangered species issues and the consequences for violation. Proof that each contractor receives and understand the educational material shall be provided to the USFWS once completed.

8. No permanent barriers that would preclude PKBM movement will be installed.

9. Micro-siting to avoid high elevation habitat, larger dunes, or other significant habitat features will be incorporated during project design and coordinated with the USFWS.

Operation and Maintenance

10. Educational signs informing of the habitat importance and species that occupy those areas shall be developed and installed along the public accesses. This also includes “no pet” signage along beach accesses.

11. Install signage and enforce no roadside parking.

12. Install speed humps and speed limit signage along Johnson Beach Road.

13. Preclude driving after 10 pm throughout nighttime hours to limit disturbance to nocturnal species.

14. Install post and rope around sensitive habitat to prevent disturbance.

15. Irrigation of any planted dune vegetation within any restoration areas shall be by hose or backpack, no surface or subsurface irrigation pipes will be permitted.

16. Post and rope or split rail fence will be installed around the new parking lots to direct foot traffic to the appropriate access points.

17. Restoration of habitat along the edges of the multi-use trail after asphalt removal.

Reporting

18. Monthly reporting to USFWS PCFO office on the progress of the project is required. This can be done by email.

19. Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification shall be made to the U.S. Fish and Wildlife Service Law Enforcement Office, Groveland, Florida at (352) 429-1037 and to the U.S. Fish and Wildlife Service Panama City Field Office at (850) 769-0552 within 24 hours. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by conducting conservation programs for the benefit of endangered and threatened species. Towards this end, conservation recommendations are discretionary activities that are within an action agency's authority may undertake to minimize or avoid the adverse effects of a proposed action, help implement recovery plans, or develop information useful for the conservation of listed species.

The Recovery Plan for the PKBM, published in 1987, identified recovery objectives for the Gulf coast beach mouse species: stabilize populations by preventing further habitat deterioration, re-establish populations in areas from which they have been extirpated, and education of the general public. Efforts to achieve these objectives have been only moderately successful depending on the location, effects of weather events, land management and regulations, and funding. The USFWS will be revising the Recovery Plan in the future. However, in the interim the 2014 PKBM 5-year review and the PKBM Conservation Strategy Plan will supplement the Recovery Plan in providing guidance for implementing recovery actions. The following conservation recommendations will serve as the USFWS' long-term conservation strategy for the PKBM.

1. Complete revision of the 1987 Recovery Plan for the PKBM.

2. Implement the PKBM Conservation Strategy Plan and update the Plan as necessary. Conservation objectives for the Perdido Key beach mouse are:

    a. To create, enhance, and maintain PKBM and habitats in PKSP, GINS, and GSP.

    b. To restore, enhance, and maintain beach mice and contiguous PKBM habitat in the primary, interdunal, secondary and scrub dune systems within and between GINS, PKSP, and GSP.

3. Continue to work with land managers and partners to protect endangered and threatened species on public lands.

4. In coordination with FWC complete valuation of current management practices and their appropriateness for conservation and recovery of PKBM.

6. Continue to fund projects to provide beach mouse food source plants for dune restoration and maintenance.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the BO. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information shows that the action may affect listed species in a manner or to an extent not considered in this BO; (3) the action is subsequently modified in a manner that causes an effect to the listed species not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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