# United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

IN REPLY REFER TO

AUG 16 2017

Memorandum

To: Assistant Regional Director, Ecological Services, FWS, Atlanta, GA

From: Field Supervisor, FWS, Alabama Field Office, Daphne, AL

Subject: Final Biological Opinion for the Alabama Beach Mouse (*Peromyscus polionotus ammobates*) for the Laguna Cove Little Lagoon Natural Resource Protection Project in Baldwin County, Alabama

This document is the U.S. Fish and Wildlife Service's (Service) Final Biological Opinion (BO) based on the Service's review of the March 28, 2017, Biological Assessment (BA) on the effects of the Laguna Cove Little Lagoon Natural Resource Protection Project under the Endangered Species Act of 1973, as amended (16 United States Code [U.S.C.] 1531 *et seq.*)(ESA). The BO addresses Project effects on the endangered Alabama beach mouse (*Peromyscus polionotus ammobates*) (ABM) and its designated critical habitat under section 7 of the ESA. Your March 28, 2017, letter requesting initiation of formal consultation was received by our office on March 30, 2017. Formal consultation was initiated on April 3, 2017. Our opinion is provided in accordance with Section 7 of the Endangered Species Act of 1972, as amended (ESA) of 1973, (16 U.S.C. 1531 et seq.).

This BO is based on information contained in the March 28, 2017, Biological Assessment, and other information received from the applicants, as well as published literature, survey data, and other information in the Service's files. A complete administrative record of this consultation is on file at the Service's, Alabama Field Office, located in Daphne, Alabama.

The Service determined that the Project is likely to adversely affect the ABM, but is not likely to adversely affect loggerhead, green and Kemp's ridley sea turtles (*Caretta caretta*, *Chelonia mydas*, and *Lepidochelys kempii,* respectively), and piping plover (*Charadrius melodus*). These determinations were based on the Project descriptions and proposed conservation measures contained in the respective Biological Assessment, Service files, and correspondence between the applicants and the Service.

PHONE: 251-441-5181 FAX: 251-441-6222

# Final Biological Opinion

# Laguna Cove Little Lagoon
# Natural Resources Protection Plan
# Project
# 2017-F-0531
# Gulf Shores, Alabama

**Prepared by:**
**U. S. Fish and Wildlife Service**
**Alabama Field Office**
**Daphne, Alabama**

William J. Pearson, Field Supervisor
Alabama Ecological Services Field Office
U.S. Fish and Wildlife Service

8/16/2017
Date

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## BIOLOGICAL OPINION

A Biological Opinion (BO) is the document required under the Endangered Species Act (ESA) that states the opinion of the Service 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 of the Laguna Cove Little Lagoon Natural Resource Protection Project on the endangered Alabama beach mouse (*Peromyscus polionotus ammobates*) (ABM) and its designated critical habitat. Alabama Department of Natural Resources (ADCNR) is proposing the acquisition and development of recreational amenities on two undeveloped tracts of land near Little Lagoon in Gulf Shores, Alabama. ADCNR requested initiation of formal consultation based on the occurrence of ABM habitat within the project area. Designated critical habitat does not occur within the proposed project area; therefore, this BO does not address effects to critical habitat.

"*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).

This BO is based on best available commercial and scientific data, including information provided in the March 28, 2017 biological assessment (BA), site visits, telephone conversations, e-mails, office files, published literature, field investigations, and other sources as cited herein. A complete administrative record of this consultation is on file in the Alabama Ecological Services Field Office, Daphne, Alabama.

## CONSULTATION HISTORY

*Laguna Cove Project.*

November 14, 2016: ADCNR submitted completed Biological Evaluation forms for proposed projects to be included as preferred alternatives in the Alabama RP/EIS to initiate informal consultation under ESA Section 7.

November 30, 2016: ADCNR hosted a teleconference with USFWS and NMFS to solicit input for revision of Biological Evaluation forms and determine path forward for ESA Section 7 consultation.

January 6, 2017: ADCNR submitted revised Biological Evaluation forms for proposed projects to be included as preferred alternatives in the Alabama RP/EIS to initiate informal consultation under ESA Section 7.

February 20, 2017: ADCNR submitted revised Biological Evaluation forms for proposed projects to be included as preferred alternatives in the Alabama RP/EIS.

February 22, 2017: Representatives from ADCNR, USFWS, and the City of Gulf Shores completed a site visit at the proposed Laguna Cove Little Lagoon Natural Resource Protection project site.

March 14, 2017: ADCNR hosted a teleconference with USFWS to discuss potential impacts to Alabama beach mouse habitat.

March 30, 2017: The Service received the ADCNR's request to initiate formal consultation for the Laguna Cove Little Lagoon Natural Resources Protection Project.

April 3, 2017: The Service provided ADCNR a letter acknowledging receipt of the letter requesting formal consultation and formalized the initiation.

July 2017: The Service provided a draft Biological Opinion (BO) to ADCNR.

## DESCRIPTION OF PROPOSED ACTION

The proposed project is designed to provide compensatory restoration for injured natural resources and their services resulting from the oil spill, including the loss of recreational shoreline uses in Alabama, in a manner consistent with the Final Programmatic Damage Assessment Restoration Plan/Programmatic Environmental Impact Statement.

The proposed *Laguna Cove Little Lagoon Natural Resource Protection* project would fund the acquisition of and development of recreational amenities on two undeveloped tracts of land, totaling approximately 53 acres near Little Lagoon in Gulf Shores, Southwest Baldwin County, Alabama. ADCNR State Parks Division would purchase the property from the Erie Meyer Foundation. The two tracts are bordered by Little Lagoon to the north and West Beach Boulevard (SR 182) to the south. The parcels contain low elevation dune habitat, large areas of coastal wetlands, and include approximately 6,100 linear feet of shoreline on Little Lagoon. The acquisition of these two tracts would provide additional public access to Little Lagoon. The project site is near the boundaries of the Bon Secour National Wildlife Refuge.

The acquisition of this property would include an appropriate land protection instrument (i.e., deed restriction, conservation easement) to ensure that the purpose of compensating for lost recreational use as described in this plan is maintained for the life of the project. This document would state that this property may not be disposed of in any manner or used for purposes other than conservation and restoration of natural resources and/or for passive public outdoor recreation of the type described in the Alabama Trustee Implementation Group Restoration Plan 1 and Environmental Impact Statement: Provide and Enhance Recreational Opportunities.

Once acquired, proposed infrastructure and access improvements would include the following:

- Up to 60 parking spaces are proposed on the upland portion of the property. A portion of these parking spaces would be on the eastern side of the property allowing access to the proposed fishing pier; the other spaces would be located on the western side of the property near the proposed kayak launch. Each space would be approximately 10 by 25 feet, for a total of approximately 15,000 square feet of parking area.
- Five additional asphalt ADA-accessible parking spaces would be constructed. Each space would be approximately 12 feet by 20 feet for a total of approximately 1,200 square feet of ADA-accessible parking.
- The proposed fishing pier on the eastern side of the property would be approximately 8 feet by 600 feet and include a 15-foot by 250-foot 'T 'at the end of the pier. The pier would include a ramp for ADA-compliant accessibility. This ramp would be 10 feet wide with a handrail on each side. There would be a 20 foot by 30-foot deck base at the end of the ramp. The pile-supported pier would be elevated in compliance with required permits (e.g., the Clean Water Act [CWA] Section 404 and the Coastal Zone Management Act [CZMA]).
- An ADA-compliant accessible 20-foot by 40-foot bathhouse would be located next to the landward end of the fishing pier and would be connected to the City of Gulf Shores Public Utilities.
- A boardwalk would be established on the west side of the property, approximately 8 feet by 600 feet that would provide area for viewing or fishing. This structure would be pile supported and elevated in compliance with required permits (e.g., the CWA Section 404, Rivers and Harbors Act [RHA] Section 10, and the CZMA).
- A 10-foot by 20-foot kayak launch is proposed at the waterward edge of the boardwalk in compliance with required permits (e.g., the CWA Section 404, RHA Section 10, and the CZMA).
- ADA-accessible restrooms (approximately 20 feet by 30 feet) would be located on uplands near the boardwalk/kayak launch area.
- This project would also incorporate sea turtle friendly lighting that would be reviewed and approved by the appropriate regulatory agencies.

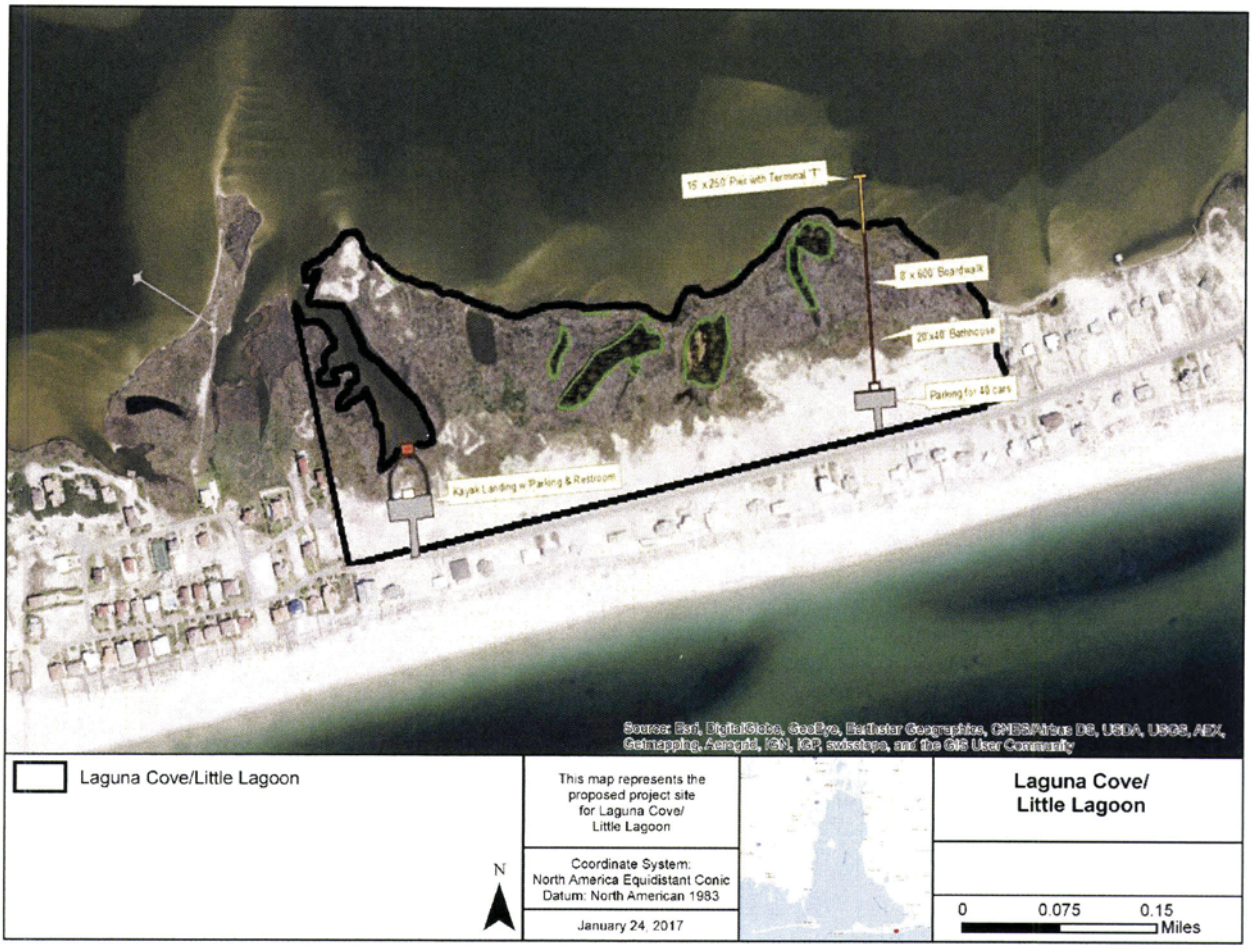


**Figure 1: Proposed Project Location**

## Construction and Implementation

Parking areas would be graded, and a layer of foundation material would be placed and topped with permeable materials, such as aggregate, parking pavers or other approved materials. The fishing pier and boardwalk would include ramps for accessibility. Utilities serving these amenities would require up to 600 feet of utility lines to service the restrooms and lighting. Areas where utilities lines would be placed would be evaluated to minimize resource impacts.

Establishment of infrastructure, including the kayak launch would avoid known areas of shoal grass (*Haloduli wrightii*). All construction activities would be designed and implemented in accordance with relevant permits and compliance guidelines.

Details of the construction methods identified to date are discussed below.

***Installation of Pilings.*** The fishing pier and elevated boardwalk would be constructed using 10, 12, and/or 14-inch diameter wooden pilings spaced at 5-foot intervals. The fishing pier would require an estimated total of 342 pilings, while the boardwalk would require an estimated total of 242 pilings. Pilings may be installed using impact hammer, vibratory hammer, or jetting methods, at the discretion of the hired contractor. Pile driving is expected take approximately 5 days to complete. Equipment would include a long-reach track hoe, which may be used from land or from a barge.

***Vehicle and Barge Operation.*** A single barge is expected to be used during installation of pilings for the pier. A long-reach track hoe would be placed on top of the barge, which would be used to drive the pilings. The barge and track-hoe would be operated for approximately 5 days. A workday would range from between 8 and 14 hours, at the discretion of the contractor, and depending on other factors and conditions.

Land-based construction equipment would include light bulldozers, track hoes, small cranes and bucket loaders as well as paving machines and/or concrete trucks.

***Duration and Timing of Construction.*** Planning and engineering and design would take approximately six months, permitting and consultation would take approximately a year, and construction activities (including in-water work) would require 6 months.

**Operations and Maintenance**

Periodic maintenance of the project components would occur which would include trash collection, restroom maintenance, and infrastructure maintenance as needed. Maintenance would be the responsibility of the City of Gulf Shores and is included in the project budget.

***Project Monitoring***. The restoration objective of this project is to restore a portion of the lost recreational use caused by the Deepwater Horizon (DWH) oil spill by acquiring land and preserving Alabama shoreline from future development, while improving the public's accessibility and enjoyment of Alabama's coastal resources. The project would be deemed successful when the land has been acquired and access improvements (pier, boardwalk, kayak launch, restrooms, and parking spaces) are in place. As such, performance criteria for this project are the satisfactory construction of the desired pier, boardwalk, kayak launch, restrooms, and parking spaces, as well as associated infrastructure.

**Conservation Measures**

The following measures would be implemented to avoid, minimize, or offset potential impacts to the ESA-listed species listed and their habitats that may occur as a result of the proposed project:

- All in-water work would comply with the Standard Manatee Conditions for In-Water Work in Alabama (Appendix A).
- Establishment of infrastructure, including the kayak launch would avoid known areas of shoal grass (*Haloduli wrightii*).
- All construction activities would be designed and implemented in accordance with relevant permits and compliance guidelines.
- Access will be provided to USFWS for ABM population monitoring before and after project implementation and for dune restoration activities.
- The lighting systems for the parking lot areas and around walkways would be designed to minimize direct and indirect illumination of Alabama beach mouse habitat.
- All new lighting would be "sea turtle friendly" lighting that is reviewed and approved by the appropriate regulatory agencies.
- Alabama Department of Environmental Management (ADEM) approved Best Management Practices (BMPs), including installation of turbidity curtains and silt fences, would be implemented to minimize erosion and runoff, which could enter Little Lagoon.
- Limited trees would be removed; boardwalks would be put over areas of emergent, herbaceous vegetation; and timber matting would be used.
- No wetlands would be filled nor would any considerable amount of wetlands be lost during the construction process.
- No night time construction would occur.
- At least 3.0 acres of upland habitats of the Laguna Cove parcel that are currently disturbed will be restored through the use of sand sifters, installation of fencing, planting native vegetation or other methods to improve the quality of existing habitats.
- The applicant will allow the Service, or the ADCNR, or other persons designated by either agency, access to the properties at any reasonable time for the general purposes specified in 50 CFR §13.21 and §17.22. This access will be for conducting ABM trapping surveys, monitoring permit compliance, monitoring and trapping of competitors/predators, sea turtle nesting surveys, sea turtle nest monitoring, habitat evaluations, or other activities associated with sea turtle and ABM recovery.

**Action Area**

Service regulations define "action area" as all areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR §402.02). Any changes resulting from the implementation of the proposed project are considered in context of existing conditions and activities to determine the resulting consequence to ESA-listed species and critical habitats. The action area is defined by measurable or detectable changes in land, air and water, or other measurable factors that result from the proposed project and interrelated or interdependent actions. Direct effects

include all immediate effects of the project on the species or its habitat. Indirect effects include those effects that are caused by or will result from the proposed project and are later in time, but still reasonably certain to occur.

For this consultation, the **Action Area** for this BO will include the West Beach Area from the western edge of the Laguna Key development to the Little Lagoon Pass (Figure 2). No critical habitat is found in this Action Area.


**Figure 2**. The Laguna Cove Action Area.

We explain our basis for this expansion of the Action Area beyond the immediate footprint of the Action under the "**EFFECTS OF THE ACTION**" section of this consultation.

Laguna Cove is located within Little Lagoon, a 10-mile lagoon that stretches from the Fort Morgan Peninsula to the western border of Gulf State Park. The proposed project site consists of approximately 53 acres of land located near the southwest portion of Little Lagoon, near the boundaries of the Bon Secour National Wildlife Refuge. Little Lagoon borders the site to the north and West Beach Boulevard (SR 182) to the south. The parcels contain low elevation dune habitat, large areas of coastal wetlands, and include approximately 6,100 linear feet of shoreline on Little Lagoon.

Little Lagoon was previously listed on Alabama Department of Environmental Management's (ADEM) 303(d) impairment list for excess nutrients. The major sources were identified as urban runoff and storm sewers. Prior to 2010, the entire waterbody was considered to be impaired. After 2010, only the central and eastern portions of the waterbody were impaired. Little Lagoon was removed from the Alabama 303(d) list in 2012.

The tidal marshes of the Laguna Cove site are designated as wetlands. Most of the marshes are designated as intertidal estuarine wetlands, with Broad-leaved Evergreen Scrub-Shrub Irregularly Flooded wetlands existing closest to the coastal beaches. As the intertidal estuarine wetlands extend in to the lagoon, they transition mostly to persistent emergent wetlands that are irregularly flooded. The wetlands at the tip of the tidal marshes extend into the lagoon and are intertidal estuarine wetlands that are unconsolidated and regularly flooded. Some small pockets within the tidal marshes are categorized as subtidal estuarine wetlands that are continuously submerged and have an unconsolidated bottom. The habitats that exist within the project boundaries are wetlands (27.11 acres) and Maritime forests/uplands (26.25 acres).

For this BO, the action area includes the proposed project site (Figures 1 and 2) and all adjacent waters and habitats.

## STATUS OF THE SPECIES/CRITICAL HABITAT

### Species/critical habitat description

The old-field mouse, (*Peromyscus polionotus*) varies in form and structure, and is genetically diverse throughout its range in the southeastern United States (Bowen 1968, Selander *et al.* 1971). Currently, there are 16 recognized subspecies of old-field mice (Hall 1981). The ABM is one of eight subspecies of the old-field mouse that occupy coastal rather than inland habitat and are referred to as "beach mice" (Lynn 2000). The ABM is one of five subspecies of the old-field mouse restricted to the coastal dunes and adjacent habitat along the Gulf Coast of Alabama and northwestern Florida. Two other existing subspecies of beach mice and one extinct subspecies are known from the Atlantic Coast of Florida. These semi-fossorial (living part of their life underground) mammals are native to coastal ecosystems along the Gulf coast of Alabama and northwestern Florida, and the Atlantic coast of Florida (Lynn 2000).

All beach mice are differentiated from the inland subspecies by differences in fur patterns on the head, shoulders, and rump. The overall dorsal (back) coloration is more reduced in coastal subspecies, is lighter in color, and is less extensive than on those of the inland subspecies (Sumner 1926, Bowen 1968). The ABM has a white abdomen, is larger than most other beach mice subspecies, and has a faint dark stripe that runs down the upper tail surface.

Howell (1909) first described ABM as being confined to the "drifting sand dunes" along the Baldwin County coast. Anderson (1960) collected 23 specimens from the Gulf Shores-Romar Beach areas that were referred to as *P. p. albifrons*. Bowen (1968) reexamined the taxonomic status of this group and assigned the population from Mobile Bay to Alabama Point, and on Ono Island, to *P. p. ammobates*. Several genetic studies support the separation of beach mice from inland forms, and support the currently accepted taxonomy (Bowen 1968) that each beach mouse group represents a unique and isolated subspecies (Steiner *et al.* 2009, ITIS 2008, Van Zant 2006).

The old-field mouse and beach mice subspecies build complex burrows in sandy soils. Burrows consist of an entrance tunnel, which descends to a nest chamber about three feet in the ground. From the back of this nest chamber, an escape tunnel is built to within one inch of the soil surface (Smith 1966). This ability has been found to be genetically controlled (Weber *et al.* 2013). Soil characteristics play an important role in determining the distribution of these semi-fossorial mice. Poorly drained soils and those underlain by hardpan constitute barriers to beach mice in creating underground burrows (Bowen 1968).

Listing History and Revised Critical Habitat

The ABM and two other Gulf coast beach mouse subspecies, Perdido Key beach mouse and Choctawhatchee beach mouse, were listed as endangered under the ESA in 1985. At that time, 1,038 ac (ac) of CH were designated for the ABM that extended along 10.6 miles of Baldwin County coastline between Fort Morgan State Historic Site (FMSHP) and Gulf State Park (GSP) (Service 1985). "Critical habitat" is defined as: (1) specific areas within the geographical area occupied by a species, at the time of listing, that contain physical or biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time of listing that have been determined to be essential for the conservation of the species.

A final rule revising designated CH was published on January 30, 2007 (72 FR 19: 4329-4369), which expanded designated CH within the ABM's range from 1,038 ac to 1,211ac (Service 2007).

The Service identified the following physical and biological features that are considered essential to the conservation of the subspecies in the revised CH for the ABM:

1. Continuous mosaic of frontal and scrub (*i.e.*, interconnected frontal and tertiary dunes, and interior scrub) vegetation and dune structure, with a balanced level of competition and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover and burrow sites;
2. Frontal 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 (*i.e.*, tertiary dune/suitable interior scrub) dunes, generally dominated by scrub oaks (*Quercus* spp.), 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. Unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas,
5. 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.

The revised CH for the ABM consists of the following five units:

1. Unit 1 – 446 ac in the Fort Morgan State Historic Park (FMSHP) and private lands to the east. It is located at the western edge of the ABM range, and consists principally of habitat that was known to be occupied at the time of listing (Service 1985) south of Hwy 180 (Fort Morgan Parkway). This unit contains all five PCEs. Threats in this unit include human generated refuse, feral cats, degraded habitat from activities associated with recreational use, and storm events (*e.g.*, loss of dune topography and vegetation, habitat fragmentation).
2. Unit 2 – 268 ac including east-to-west bands of ABM habitat and connections between habitats south of the Alabama Department of Environmental Management's (ADEM) Coastal Construction Control Line (CCCL) and along the roadway right-of-way for Fort Morgan Parkway. This unit, which can be inundated during storm events, represents the last remaining natural habitat connecting ABM populations in Units 1 and 3. This unit contains three PCEs (numbers 2-4). Threats include feral cats, artificial lighting, development, and storm events (*e.g.*, loss of dune topography and vegetation, habitat fragmentation).
3. Unit 3 – 275 ac in the central portion of the Fort Morgan Peninsula. It includes portions of the Morgantown, Surfside Shores, Cabana Beach subdivisions, and the proposed Project, as well as Bureau of Land Management properties and some areas along the Fort Morgan Parkway right-of-way (ROW). All five PCEs are present in varying amounts throughout this unit. Threats include habitat degradation and fragmentation, extensive recreational pressure, feral cats, post storm-cleanups, artificial lighting, predation, human-generated refuse, and storm events (*e.g.*, loss of dune topography and vegetation, habitat fragmentation).
4. Unit 4 – 30 ac including a Bureau of Land Management (BLM) parcel and 27 private in-holdings within the Perdue Unit (PU) of the Bon Secour National Wildlife Refuge (BSNWR). This unit contains all five PCEs. Threats may include artificial lighting from residences, human-generated refuse that may attract predators, feral cats, habitat fragmentation from the construction of properties, and storm events (*e.g.*, loss of dune topography and vegetation, habitat fragmentation).
5. Unit 5 –192 ac in Gulf State Park (GSP), immediately east of the City of Gulf Shores and west of the City of Orange Beach. It represents the last

remaining large block of ABM habitat on the eastern portion of the ABM's historic range. This unit contains two PCEs (numbers 2 and 3). Threats to ABM habitat include habitat destruction from retail and residential development and recreational use, human-generated refuse that could attract predators, feral cats, artificial lighting, invasive species, mowing and storm events (*e.g.*, loss of dune topography and vegetation, habitat fragmentation).

The Recovery Plan (Service 1987) for the ABM identifies the primary recovery objectives to be: (1) the stabilization of present populations by preventing further habitat deterioration, (2) the re-establishment of populations in areas where they have been extirpated, and (3) education of the general public (of the plight and recovery objectives of each subspecies). For the ABM to be considered for down listing to threatened, the plan requires that there be a minimum of three distinct self-sustaining populations in designated CH with at least 50 percent of the CH being protected and occupied by beach mice (Service 1987). While the original plan is still operative at this time, the Service is currently developing a revised recovery plan for the ABM with the assistance of a recovery team consisting of scientific experts, and individuals from local, state and federal government agencies, and community organizations.

**Habitat and distribution**

ABM habitat is a mix of interconnected habitats including frontal, tertiary, and interior scrub dunes, along with interdunal areas (Service 2011). Beach mice dig burrows in the primary, secondary, tertiary, and interior scrub dunes where the vegetation provides cover. Most ABM surveys conducted prior to the early 1990s were in frontal dunes that were thought to be preferred beach mouse habitat based on the best information available at the time. The distribution and relative abundance of ABM in tertiary dunes and in other interior habitat types were less well known due to limited surveys. In coastal environments, the term "scrub" and "scrub dune" refer to habitat or vegetation types where scrub oaks are dominants of a community adjacent to and landward of frontal dunes. Interior habitat can include vegetation types such as grassy forbs. There is substantial variation in scrub oak density and cover within and among scrub dunes throughout the ranges of beach mice. The variation, resembling an ecological gradient, is represented by scrub oak woodland with a relatively closed canopy at one extreme, with scrub dunes relatively open with patchy scrub ridges and intervening swales or interdunal flats dominated by herbaceous plants at the other extreme.

Meyers (1983) estimated that the minimum area needed to maintain a population of beach mice is about 50 hectares (124 acres), but the preferable size is at least 100-200 hectares (247-494 acres), and there should be natural corridors for migration between these areas. He also indicated that protection of several separate areas of habitat for beach mice was needed for long-term survival. For example, if a population of beach mice exists in only one small area of habitat, it will be much more vulnerable to extinction through the effects of tropical storms, disease outbreaks, predation, etc.

Recent information indicates habitat may be a limiting factor for some beach mouse species following periods of population increases or catastrophic weather events such as hurricanes (Danielson 2005). Tertiary dunes, as well as other interior scrub habitats landward, support permanent beach mice populations, provide habitat for population expansion, and reduce the risk of extirpation due to a hurricane by providing refuge habitat during and following the storm.

In 2011, there was about 2,450 ac of ABM habitat (Figures 3a and 3b) (Service 2011) divided into two distinct areas (GSP and the Fort Morgan Peninsula):

> *GSP.* ABM were extirpated at GSP in the early 1980s (Service 1985). Extirpation was due to a combination of: isolation of the habitat; effects of tropical storms; predation (i.e., feral cats); and competition with house mice. ABM were reintroduced to GSP in 1998 (Swilling *et al.* 1999). Trapping in 1999-2000 demonstrated that the reintroduction was successful (i.e., reintroduced population increasing). Service trapping efforts in 2003 indicated that the GSP continued to support a growing ABM population on suitable habitats south of Middle Lake, Lake Shelby, and on the east side of the former lodge and convention center south of Highway 182. After the tropical storm seasons of 2004-2005, ABM were again extirpated at GSP (Service 2011). In 2010, ABM were again reintroduced to GSP after the habitat was deemed sufficient to support a population. Trapping since 2010 has demonstrated the reintroduction was again successful, with ABM found in all suitable habitats within the park boundaries on both sides of Hwy. 182 (Service 2013; Volkert, Inc., 2016).
>
> *Fort Morgan Peninsula.* Efforts to characterize ABM populations and habitat, based on trapping, prior to the occurrence of Hurricane Opal in 1995 were restricted to primary and secondary dunes. Field observations since the occurrence of Hurricane Opal expanded the knowledge of habitat types utilized by ABM. Trapping efforts in recent years have included sampling of all ABM habitat types on the peninsula, and have confirmed ABM use of these habitats. ABM habitat on the peninsula extends from Little Lagoon Pass westward and generally south of Highway 180 (with a few localized exceptions where ABM are found north of this road) to the tip of Fort Morgan (Service 2011). This habitat is spread out amongst a mix of public and private lands (some of which are developed). The private lands consist of single family, low-density multi-family and high-density multi-family housing zones.

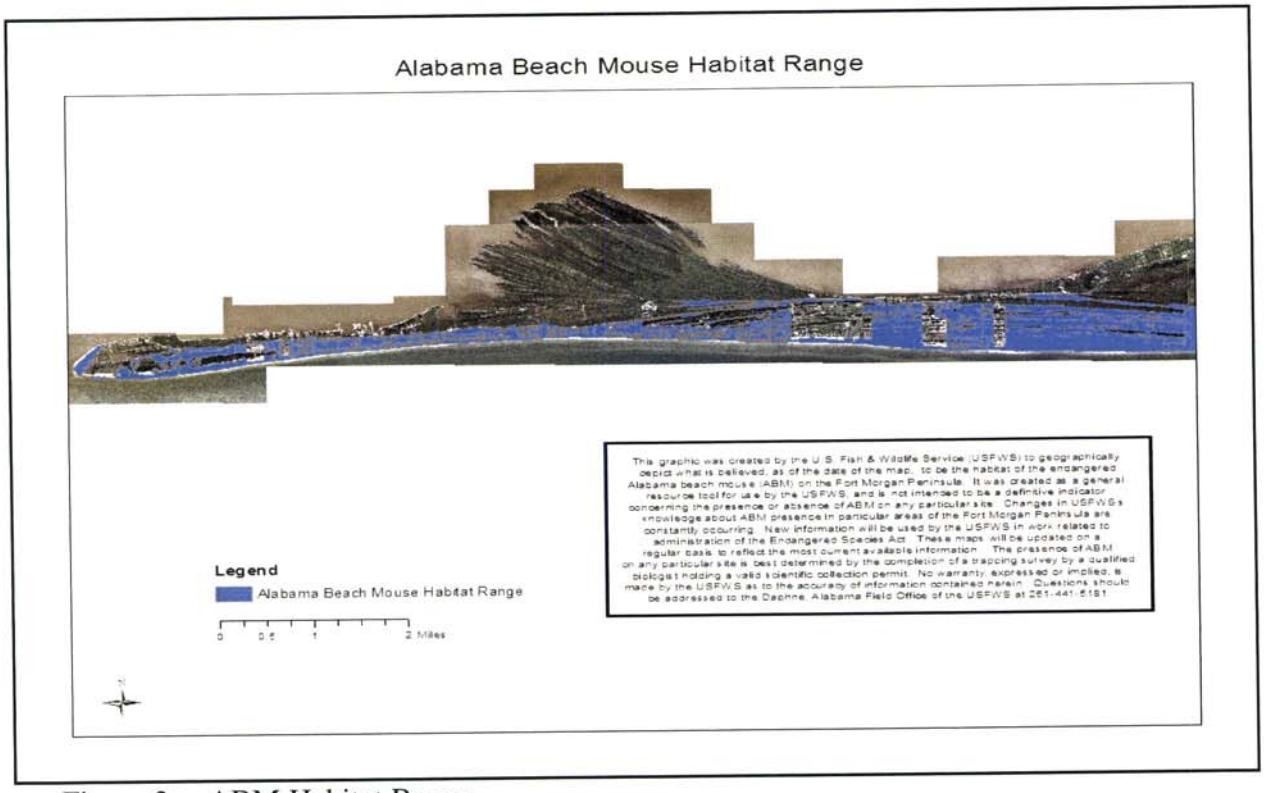


Figure 3a. ABM Habitat Range

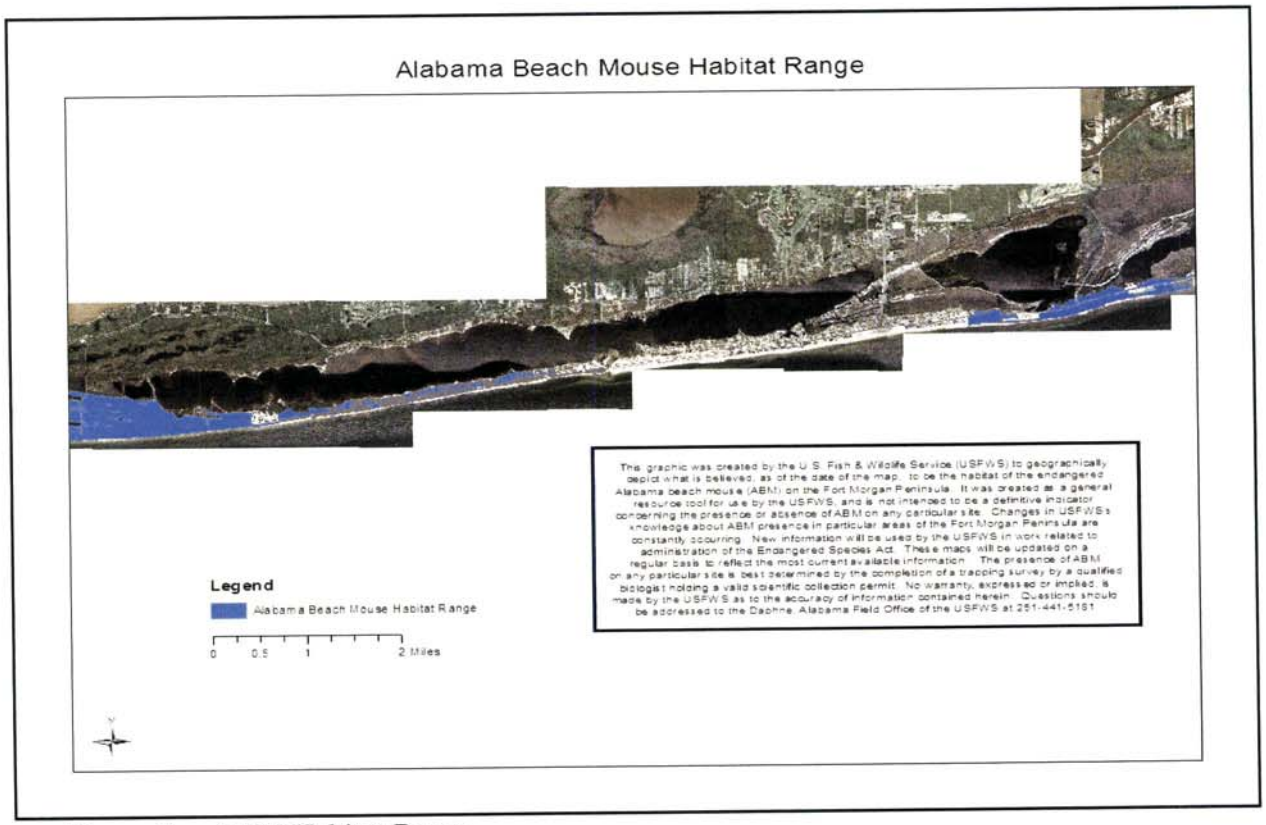


Figure 3b. ABM Habitat Range

The underlying components of ABM habitat include the availability of resources, such as burrow sites, cover, and/or foraging areas (Swilling 2000). Limited abundance of these elements can negatively influence ABM populations. Areas included as ABM habitat provide at least one of the following attributes:

1. Burrowing sites – Burrows are required by beach mice to provide protection from predators, intense heat, and other harsh environmental conditions, as well as refuge for activities such as birthing, resting and caching of food items. The presence of potential burrow sites may be a limiting factor in the availability of ABM habitat. ABM prefer to burrow on the slopes of dunes and in areas with greater vegetative cover, less soil compaction, and higher elevation sites relative to sea level (Lynn 2000, Sneckenberger 2001).

2. Cover – Cover is described as an area that would provide protection from predators during ABM nocturnal activities, but would not necessarily be used for foraging or burrowing (Smith 2003).

3. Foraging areas – Foraging areas provide food sources, which are generally seasonal and dependent on rainfall and storm patterns during any given year (Sneckenberger 2001). In addition, ABM are opportunistic omnivores (*i.e.*, use whatever food items are available at the time) and typically consume insects, seeds and acorns. Insects (particularly beetles) appear to make up a substantial portion of their diet during the summer season (Moyers 1996).

Although some researchers have indicated that beach mice are restricted to or prefer frontal dunes (Ivey 1949, Blair 1951, Pournelle and Barrington 1953, Bowen 1968), early observations (Howell 1909) suggested ABM also occur in open coastal scrub (*i.e.*, tertiary dunes and open interior scrub). ABM have been observed moving 300-500 ft inland from the primary dunes to use food sources in the scrub (*i.e.*, tertiary dunes and open interior scrub). In addition to providing burrow sites, food resources, and cover, tertiary dune/interior scrub habitats can serve as higher elevation refugia during storm events and as population sources for recovering storm-impacted frontal dunes (Swilling *et al.* 1998, Sneckenberger 2001). This suggests that connections between frontal/tertiary dune and interior scrub habitats are also essential to individual beach mice. The transition from scrub habitat to maritime forest (characterized by large pines and oaks, thick leaf litter, and dense understory) or perennially inundated wetlands frequently identifies the northern or landward extent of the majority of suitable beach mouse habitat. Extremely overgrown or densely vegetated areas are also unsuitable for the ABM due to the potential for high predation rates, poor burrowing substrate, and competition with other rodent species (Swilling 2000, Sneckenberger 2001).

**Life History**

The ABM life cycle consists essentially of four life-stage events: (1) newborns; (2) older weaned juveniles about 22 or more days of age; (3) subadults; and (4) adults. ABM

populations have life-stage structure with a number of individuals in each stage at any particular time. For any particular ABM population, the change in adult population size between two time periods depends on the number of adult ABM that have survived since the last period plus the number of new adults recruited by reproduction in the population. Adult survivorship and reproductive recruitment will account for population change as long as two conditions are satisfied: (1) the ABM does not disperse from or move away (emigrate) from a population and (2) the ABM does not immigrate to or arrive from another population. If these conditions exist, then population growth occurs when births or the recruitment of young ABM exceeds deaths. Field studies of two ABM populations have provided long-term data on population dynamics (Hill 1989, Swilling *et al.* 1998). These studies were based on standard scientific trapping methods of mark-recapture studies. These investigations involved capturing ABM alive (capture), marking new individuals, immediately releasing all individuals, and recording any previously marked individuals (recapture).

**Age/sex structure**

Age structure is the proportion of individuals in different age groups. Long-term studies show overall turnover rates in ABM populations are typical high. Hill (1989) demonstrated that 87 percent of the ABM throughout her study lived four months or less beyond first capture and found only five ABM (0.8 percent) lived at least twelve months or longer. Swilling (2000) found ABM generally live about nine months, but may live as long as 20 months. However, beach mice held in captivity at Auburn University have lived three years or more. In general, the vast majority of individuals in an ABM population are replaced with new individuals within a ten to twelve-month period (Rave and Holler 1992).

Male and female ratios of adult and subadult ABM were found to be generally a 1:1 ratio (Lynn 2000, Swilling and Wooten 2002). However, seasonal difference can exist. Females have been found to significantly outnumber males during winter at the FMSHP of BSNWR (Hill 1989, Sneckenberger 2001). ABM subadults are most abundant during winter and least abundant during summer (Rave and Holler 1992).

**Reproductive Strategy**

Parental genetic and other studies (Foltz 1981, Smith 1966, Lynn 2000 and VanZant 2006) have reported that beach mice are monogamous, pairing for life. Male beach mice are capable of breeding at an age of 25 days. Female beach mice are able to begin breeding at an age of 35 days. The mean age of first estrus for *P. polionotus* is 30 days (Clark 1938). Gestation averages 24 days and litter sizes average three to four with extremes of one and eight individuals (Smith 1966). Littering intervals may be as short as 26 days with the peak breeding season in autumn and winter. In essence, mature female beach mice can produce a litter every month and may live long enough to breed over a period of about eight months. Thus, on an annual basis, a pair could produce an average of 24 to 32 young a year.

ABM population size is usually greater in winter and spring, than summer when the population cycle and reproductive success are lower (Rave and Holler 1992). For example, the proportion of captured females exhibiting reproductive activity (lactating or pregnant) is lowest during summer and greatest in winter. In addition to greater reproductive activity during winter, the actual survival of newborn offspring and recruitment of subadults apparently increases in autumn and winter when food resources are more abundant (Rave and Holler 1992).

**Recruitment and Dispersal**

For ABM, population reproduction, survival, and density are at seasonal highs during autumn and winter, reflecting subadult recruitment into the population (Rave and Holler 1992). Swilling and Wooten (2002) concluded that ABM form family groups in patches of high quality habitat where home range overlap was generally tolerated. It appeared from their study that adults share home ranges with subadults. They found subadult males and females did not differ significantly in the likelihood of dispersal, dispersal distance, or the size of mean home ranges. However, they did find recaptured subadults remaining within their natal site had smaller home ranges and lower survivorship than dispersing subadults. Increased predation is offered as a possible explanation (e.g. predators may have focused on areas of high ABM density). Habitat type (tertiary/interior scrub vs. frontal dunes) did not appear to be a factor in the selection of habitat in which to settle for dispersing subadults. Long distance movement of subadults was documented (up to 0.87 miles)(Swilling and Wooten 2002).

**Food Habits**

Available data regarding possible seasonal use of food has come from two recent studies (Moyers 1996, Sneckenberger 2001). These studies indicated that various habitats provide a variety of food types throughout the year and that some ABM exploit these food differences. ABM feed primarily on seeds and fruits of bluestem *(Schizachyrium maritimum)*, sea oats *(Uniola paniculata),* and evening primrose *(Oenothera humifusa)*; however, insects are also an important summertime component of their diet. In most cases, seeds and fruits consumed by ABM are either produced by low-growing, prostrate plants, or become available as fallen seeds (Moyers 1996). Nutritional analysis of ABM foods indicated that plant species in both frontal dunes and tertiary/interior scrub habitats provide a similar range of nutritional quality.

Sneckenberger (2001) performed nutritional analyses of seed and fruit samples found in ABM habitats. Protein content ranged from 7.8 to 32.6 percent in the frontal dunes and from 2.8 to 40 percent in the tertiary/interior scrub. Spartina (*Spartina patens*), bluestem, panic grass (*Panicum amarum*), and sea oats were the most common plants used by ABM inhabiting the frontal dunes during her study. ABM in the tertiary/interior scrub habitat used sand live oak (*Quercus geminata*), bluestem, greenbrier (*Smilax* spp.), gopher apple (*Licania michauxii*), and jointweed (*Polygonella* spp.) (Sneckenberger 2001).

ABM inhabiting the frontal dunes undergo feast (fall and winter) and famine periods

(spring and summer). In contrast, the tertiary/interior scrub habitat appears to maintain a more stable, though patchy, level of food resources throughout the year (Sneckenberger 2001). Weather conditions, and other factors, may also influence food availability, both temporally and spatially. Bird *et al.* (2003) determined that beach mice use of foraging areas was significantly affected by the presence of illumination, type of light, and the distance from the light source. Predation risks, which also may be increased by artificial lighting, play a role in beach mice foraging patterns (Bird 2003).

**Population dynamics**

Estimating animal abundance or population size remains an important and challenging scientific issue in wildlife biology (Otis *et al.* 1978, Pollock *et al.* 1990). Beach mice 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. Live-traps are small aluminum boxes in which bait (usually oats) is placed on a trip-pan at the rear of the trap. When a mouse enters the trap and steps on the bait-pan to feed, the bait-pan depresses and the entrance door is triggered to close. ABM are captured at night in live-traps placed along lines or grids, and each captured individual is checked to determine if it has been captured for the first time (unmarked) or if it is a recapture, indicated by an existing mark. Newly captured individuals are marked, and all trapped individuals are immediately released. The numbers of consecutive nights ABM are live-trapped for mark-recapture study varied in early surveys and studies, but, since 1987, a five-night minimum (three of which should be consecutive) trapping period has become standard practice. The actual data produced from such surveys have been computed or expressed, with varying degrees of accuracy and bias, as number of individual ABM captured, minimum number of ABM known alive (MNKA), number of ABM captured per 100 trap-nights (ABM/100 trap-nights), or a mathematically modeled statistical estimate (program CAPTURE).

Generally, populations of beach mice reach peak numbers in the late autumn into spring (Rave and Holler 1992). This high population level follows increased availability of seeds and fruits from the previous growing season. Studies have indicated that there is monthly, seasonal, and annual variation in size of individual populations (Hill 1989, Rave and Holler 1992, Holler *et al.* 1997, Swilling *et al.* 1998). These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Swilling *et al.* 1998).

Population Viability Analyses (PVAs)

Population viability analyses (PVAs) and population and habitat viability analyses (PHVAs) are quantitative models designed for assessing extinction risks or population status for a given species (Morris and Doak 2002). Prior to 2008, five PVA's had been conducted by the Service to gain a better understanding of ABM population dynamics, to determine the relative impact of various management scenarios, and to address questions regarding size and long-term viability of ABM populations. However, all five PVA's extinction probabilities were found to be sensitive to various model assumptions,

particularly dispersal rate, carrying capacity, hurricane impacts, and demographic parameters (Sankaran 1993, Oli *et al.* 2001, Traylor-Holzer *et al.* 2005, Traylor-Holzer 2005, Reed and Traylor-Holzer 2006).

The Service contracted Conroy and Runge (2008) to review the earlier five PVA's and conducted another PVA using a "state-space" approach and a "reverse-time" capture-recapture model. They concluded that past PVA estimates of extinction probability were not reliable because input and output uncertainties were not properly addressed. Their model estimated that the probability of extinction for ABM over the next 200 years is between 0.31 and 0.33. However, standard errors near the end of that period were 0.46 – 0.47 which indicate high uncertainty, probably due to the input parameters used to drive the model (Conroy and Runge 2008). Consequently, the Service determined that the PVAs would be more appropriate for qualitative assessments of development alternatives, mitigation strategies, and management practices within ABM populations and habitats, as well as identifying data gaps and species' risks.

**Status and distribution**

Reasons for listing

ABM, Perdido Key beach mouse (*P.p. trissyllepsis*) (PKBM), and Choctawhatchee beach mouse (*P.p. allophyrs*) (CBM) were listed as endangered species primarily because of the fragmentation, adverse alteration, and/or loss of habitat due to coastal development. The threat of development-related habitat loss continues to increase. Other contributing factors included low population numbers, habitat loss from a variety of sources (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the lack of regulations on coastal development (Service 1987).

*Coastal development*

Habitat loss and fragmentation associated with residential and commercial real estate development are the most important factors contributing to the endangered status of beach mice (Humphrey 1992). Between 1921 and 1983, 62% of ABM habitat had been converted to commercial and residential development (Holliman 1983). By 1996, little land suitable for development in Orange Beach and Gulf Shores remained (SARPC 2001).

Major features of development on Fort Morgan Peninsula now include single-family units along roads, residential subdivisions, duplexes, small condominiums, and large, high-rise condominiums. Much of the remaining contiguous undeveloped beachfront tracts remain within FMSHP, PU of BSNWR, and GSP. Protection, management, and recovery of beach mice on public areas, such as GSP, have been complicated by increased recreational use. Development pressures have increased in the cities of Gulf Shores, Orange Beach and on the Fort Morgan Peninsula.

Current ABM habitat is now fragmented by residential and commercial developments, which may act as partial or complete barriers. 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). Whether beach mice can be considered isolated by development depends on several factors, including the density and size of the development, the siting of the development in beach mouse habitat, the amount and type of beach mouse habitat affected by development, and the distance between tracts of undeveloped land containing beach mouse habitat. Meyers (1983) believed that intense development could act as a barrier to migration, isolating mice within habitat segments.

ABM have been found in dune habitats within single-family residential developments and high density developments along the West Beach area of Gulf Shores and on the Fort Morgan Peninsula. These populations are probably connected to other populations through corridors of habitat. The potential importance of corridors (areas of native vegetation or habitat connecting otherwise isolated sections) have been explored since the mid-1970s (Hobbs 1992). The basis for the importance of corridors included the following: (1) If an area must be divided, chances of extinction will be lower when the fragments can be connected by corridors of natural habitat that provide adequate habitat for the movement of native animals; and, (2) If there are several disjunct reserves, connecting them by strips of the protected habitat may significantly improve their conservation function at little further cost in land withdrawn from development (Hobbs 1992).

The table below estimates the ABM habitat affected by developments with non-federal ESA Section 10 ITP's on the Fort Morgan Peninsula. Because no accurate baseline information is available prior to human habitation on the Peninsula, it is difficult to estimate the amount of historic ABM habitat that has been lost. Our best guess is that up to 7,000 - 8,000 ac of coastal dune habitat were historically occupied by ABM (Service 2011).

**Table 1**. Major Developments in the range of the ABM and habitat lost and preserved by those Actions (Service 2016). (ABM habitat information for this table was taken from each development's biological opinion, ITP or permit application. ABM habitat in this table is based on the Service's knowledge of ABM habitat at the time of ITP issuance; therefore, some of the older projects did not consider tertiary dune/interior scrub dunes as ABM habitat.)

| Development Name and Year of ITP Issuance | Total Acres On-Site | Acres of ABM Habitat Lost | Acres of ABM Habitat Preserved |
|---|---|---|---|
| Laguna Key (1994) | 46 | 25 | 8 |
| Martinique on the Gulf (1996) | 52 | 7.5 | 10.5 |
| Beach Club (1996) | 86 | 42 | 16 |
| Gulf Shores Plantation* (1982) | 69 | 38 | 16 |
| Plantation Palms (1996) | 4 | 2 | 2 |
| Kiva Dunes (1994) | 252 | 91 | 32 |
| Bay to Breakers (1996) | 11 | 1.5 | 2 |

| | | | |
|---|---|---|---|
| The Dunes (1996) | 35 | 27 | 8 |
| Batch I, 17 Single Family Homes (2004) | 16.2 | 2.9 | 13.3 |
| Batch II, 54 Single-Family Homes (2005) | 23.8 | 4 | 19.8 |
| Batch III, 48 Single-Family Homes (2007) | 20.7 | 5.1 | 15.8 |
| Caldwell Comm. Cntr. (2008) | 5.3 | 2.8 | 2.02 |
| Batch IV, 42 Single-Family Homes (2008) | 23.2 | 4.3 | 19.5 |
| Batch V, 32 Single-Family Homes (2009) | 16.9 | 3.6 | 13.7 |
| General Conservation Plan (**to date**) | 29.34 | 4.8 | 24.5 |
| **Total** | **690.44** | **261.50** | **203.12** |

* Gulf Shores Plantation was constructed prior to ABM listing, but provides multiple dune walkovers protecting CH.

*Hurricanes*

Hurricanes generally produce damaging winds, storm tides and surges, and rain that erode beaches and dunes on barrier islands, peninsulas, and mainland beaches, and flood inland coastal areas. Hurricanes may result in beach mice drowning in their burrows, surviving the storm in place, or seeking refuge in adjacent areas due to loss of habitat (during or after the storm). The effects of hurricanes to beach mice depend primarily on hurricane characteristics (e.g., winds, storm surge, rainfall), time of year, and where the eye crosses land (e.g., side of hurricane; generally land areas affected by the east side of the eye wall are subjected to significantly more damage than land areas affected by the west side). Historically, hurricanes probably maintained coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. The amount of pre-development, contiguous, coastal dune habitat along the Gulf Coast allowed beach mice to survive even the most severe hurricane events and to repopulate dune habitat as it recovered.

Beach mouse populations located in areas without frontal dunes and/or tertiary/interior scrub habitat are susceptible to catastrophic loss during tropical storms and hurricanes. Holliman (1983) first considered that higher, interior scrub habitats may provide a "refuge" for the population occupying primary and secondary dunes during a storm event (i.e., Hurricane Frederic in 1979), as a high ground for fleeing ABM and resident ABM to avoid drowning. Following Hurricane Opal in 1995, Swilling *et al.* (1998) reported higher scrub habitat continued to provide refugia after landfall, and within seven months, as dune vegetation began to recover, the frontal dunes were re-occupied (i.e., use of interior habitats as a refuge began to wane).

Hurricane Ivan made landfall in Alabama on September 16, 2004, and destroyed or severely impacted 90-95 percent of the frontal dune habitat along Baldwin County's coastline. In 2005, Hurricane Katrina (Service 2011) impacted about 50 percent of the ABM habitats recovering from Hurricane Ivan. The Service conducted a preliminary evaluation of habitats where ABM might persist after these two hurricanes. This post-Ivan/Katrina evaluation effort was based on presence/absence data from traps and/or tracking tubes in limited portions of the PU, FMSHP and GSP units, multi-family HCPs associated with Service-issued ITP's under Section 10(a)(1)(B) of the ESA, and some single-family residential HCPs where ABM were previously known to exist. The damages caused by these hurricanes essentially restricted ABM to tertiary dune and some open interior scrub (*e.g.*, Hwy 180 ROW) habitats in most areas until the frontal dunes began to show significant recovery and increasing ABM populations (Service 2011).

Hurricanes may lead to localized often dramatic fluctuations in ABM populations and changes in allele frequencies. If sufficient habitat is available for population expansion after a hurricane, ABM can recover very well from population size reductions and bottlenecks (Wooten 1994). With continued fragmentation from residential and commercial development, beach mice may be unable to recolonize these areas as they did in the past (Holliman 1983). The current distribution of ABM along the Alabama coastline is much more restricted and fragmented as compared to historic conditions. Therefore, it is more likely that a hurricane making landfall in or near Alabama could impact the entire range of the subspecies. It is reasonable to conclude that the restoration of relatively contiguous tracts of suitable ABM habitat over a wider area with multiple independent local populations would improve the probability of ABM persistence (Danielson 2005).

Following hurricanes, the dune system begins a slow natural repair process that may take three to 20 years depending on the magnitude of dune loss (Salmon *et al.* 1982). Assessment of various types of experimental dune restoration techniques were conducted on Eglin Air Force Base's, Okaloosa/Santa Rosa Island after Hurricane Opal (Miller *et al.* 1999). The study showed that a minimum of four years is needed between catastrophic events like hurricanes for dunes to become re-established. Additional work by Auburn University indicated that at BSNWR, six years are needed for dunes to be re-established (Boyd *et al.* 2003). (Note: re-established does not mean a return to pre-event size or height but rather stable and growing). In areas where dunes are left to naturally rebuild, habitat restoration may be delayed until pioneer plants begin to re-establish.

*Predation*

Beach mice have a number of natural predators including Eastern coachwhip (*Masticophis flagellum flagellum*), corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius barbouri*), diamondback rattlesnakes (*Crotalus adamateus*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), great blue herons (*Ardea herodias*), Northern harriers (*Circus cyaneus*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), and weasels (*Mustela frenata*) (Novak 1997, Blair 1951, Bowen 1968, Holler 1992, Moyers

*et al.* 1999, Van Zant and Wooten 2003). Predation in beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern. However, predation pressure from natural and non-native predators may result in the extirpation of small, local populations of beach mice.

A major issue for beach mice is predation from free-roaming and feral domestic cats. Feral cats are estimated to kill hundreds of millions of birds, small mammals, reptiles, and amphibians each year (American Bird Conservancy 1999). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers *et al.* 1999). Artificial factors influencing cat predation include groups or individuals that allow their pet cats to roam freely or provide food for feral cats by placing food in dune habitats.

These activities have been considered to contribute to the low populations and possible extirpation of beach mouse populations. For example, cats roaming or ranging within dune habitats may have contributed to the loss of the PKBM population at the Florida Point Unit of GSP in Alabama after Hurricane Opal (Service 2011) stressed the population. PVA modeling has shown that one cat killing one ABM per day in each of the six model units resulted in virtually certain extinction of ABM in less than 20 years. If 10 or more cats occur within each unit, the models predicted that the species would be extinct in 5 years or less (Traylor-Holzer *et al.* 2005). Therefore, development planning should incorporate measures to control feral or free-roaming cats on project lands within and adjacent to beach mouse habitats.

*Competition*

Beach mice are the only small mammal that exclusively lives within the coastal dune landscape containing frontal, tertiary, interior scrub dunes and associated interdunal habitats. Other small mammals such as the cotton rat and cotton mice are commonly found in the forested portions of coastal habitats. The house mouse (*Mus musculus*) and other exotic rodent species such as the Norway (*Rattus norvegicus*) and black rats (*Rattus rattus*) occur in areas associated with humans.

Generally, research has shown that house mice exhibit overlapping food habitats (Gentry 1966) with beach mice. It is thought the house mice may compete with beach mice for food resources. Other work has shown an inverse relationship between population densities of beach mice and house mice (Meyers 1983). These studies concluded that house mice are poor competitors with beach mice under optimal conditions for beach mice, but may be capable of coexisting with beach mice. Briese and Smith (1973) concluded that house mice primarily invade disturbed areas or areas where human structures provide suitable places to live, but that the species seldom coexist in undisturbed natural habitats. The presence of house mice may be an indicator of poor habitat conditions for beach mice. Frank and Humphrey (1996) concluded from their work on the Anastasia Island beach mouse (*P.p. phasma*) that house mice could coexist in dune habitats with beach mice and not be a serious threat to their persistence under optimal conditions for beach mice.

Range-wide Trends

Coastal development has increased in recent years, and we anticipate that development pressures will increase as the depressed real estate market continues to recover. If continued development results in further ABM habitat fragmentation and degradation, then it would likely have adverse effects on the distribution and/or density of the ABM population, depending on the location and density of those residential and commercial developments. In turn, this could exacerbate the impacts from large storm events that intermittently occur, as well as the effects on ABM numbers due to continuing predation and competition from non-native species.

New Threats

*Climate Change*

The IPCC (2007) reported the following global implications of climate change on small islands with "high" or "very high confidence":

- Sea level rise will exacerbate inundation, storm surge and erosion;
- Beach erosion and other deteriorating coastal conditions will affect local resources;
- Freshwater resources will be reduced; and,
- Higher temperatures will allow increased invasion of non-native species.

The magnitude, rate and effects of relative sea level increase will vary regionally because of differences in land subsidence, tectonic uplift, isostatic rebound, and the compaction of muddy soils (Gutierrez *et al.* 2007 and Anthony *et al.* 2009).

Along most of the U.S. Atlantic and Gulf coasts, sea level has been rising 0.08 – 0.12 in/year (203 – 305 mm/century). Mean monthly sea level readings between 1966 and 2006 indicate sea level has increased at Dauphin Island, Alabama (immediately west of the mouth of Mobile Bay), an average of 2.98 mm/year or nearly 1 foot/century (NOAA 2009). By 2100, ocean levels around Alabama could be 15 inches (38 cm) higher than today, if the average subsidence rate of 2 inches per century continues under a moderate sea-level rise scenario. Models used by Wigley (1999), which assumed a temperature rise between 1.9 and 2.9 degrees C combined with ice melt, arrived at sea-level rise projections between 46 and 58 cm (about 1.5 – 2 ft) by the end of this century (Davenport 2007). The Alabama Gulf coast has about 55 miles of open-water shoreline along Baldwin and Mobile Counties. About half of this shoreline is receding, generally by 2-5 feet in recent decades. The rate of shoreline retreat is a function of the slope of the inundated land and the rate of sea-level rise. In coastal areas with gentle slopes, a very small increase in sea level would cause substantial island migration (Bush *et al.* 2001).

The consequences of sea level increase become acute during storm events as a result of increased erosion and high storm surges that can rapidly redistribute sediment (Fenster and Dolan 1993). During periods of high storm surge, low barrier islands can be over-washed, moving sediment from the front of the barrier and depositing it onto inland flats

and lagoons (Leatherman 1981). Increased storm intensity will likely cause more frequent breaches of barrier islands (Morton and Sallenger 2003).

The implications for changes to the Alabama Gulf coast, particularly within the ABM's range, are far from clear and could likely be influenced by a number of factors, such as shoreline elevation and structure, sand availability, and underlying land formation. Even with this level of uncertainty, it is reasonable to assume that beach mouse habitat, particularly the frontal dunes, would be adversely impacted over the short and long-term by shoreline inundation and erosion, as well as the effects of salt spray on interior dune vegetation, associated with predicted increases sea level and/or storm activity along the Gulf coast.

*Invasive Species and Mowing*

Invasive species such as cogongrass (*Imperata cylindrical*), torpedo grass (*Panicum repens*), pampas grass (*Cortaderia selloana*), and beach vitex (*Vitex rotundifolia*) are also new threats to ABM habitat. These species can crowd out native plants through rapid growth, rapid vegetative production and massive fruit or seed production. They are also easily spread through mowing (Willard and Shilling 1990).

In addition to spreading invasive species, frequent mowing affects small mammals by limiting movements, reducing cover, interrupting habitat formation and reducing habitat quality (Slade and Crain 2006). Frequent mowing also reduces the diversity of native vegetation, and reduces small mammal abundance and diversity (Barras, *et al.* 2000). Local governments, the Alabama Department of Transportation (ALDOT) have maintained varying widths of ROW containing beach mouse habitat with tractor-attached bush hogs and infrequent mowing. However, local governments and landscaping companies are switching to commercial, zero-turn style mowers. These zero-turn mowers are capable of mowing vegetation to lower levels than the tractor-based bush hogs. Outside of existing structural footprints, remaining natural area of the lots are being mowed. These areas are usually secondary dune fields. Mowing impacts ABM habitat by preventing dune formation or alerting existing dunes, limiting cover, formation of cover, and changing the existing dune vegetation to a grass like stage. An increase in mowing frequency within the range of the ABM and habitat impacts has been noted (Bill Lynn, Service, pers. observation).

**Analysis of the species/critical habitat likely to be affected**

The ABM population within the Action Area could be directly and/or indirectly affected by the proposed projects. Adverse effects to ABM would result from direct taking, as well as indirectly through the loss and fragmentation of ABM habitat by construction of the permanent structures and infrastructure of the project(s), temporary impacts related to on-site construction activities, competition from non-native rodents and ongoing human activities resulting from project occupation including artificial lighting, trash and refuse, and associated ABM predators/competitors (Service 2011). The loss of this habitat and human occupation at the proposed projects may also negatively affect ABM movement in

frontal dune habitats between the project site, private lots to the south, Laguna Key, BSNWR, and other parcels located east of the Project (**Figure 3**). The Laguna Cove project and Action Area does not contain any CH.

**Table 2**. Biological Opinions for Section 7 Federal projects that have been issued for adverse impacts to the Alabama beach mouse within the range of the Alabama beach mouse.

| OPINIONS/ FWS Log Number[1] | SPECIES | HABITAT | |
|---|---|---|---|
| | | Critical Habitat | Habitat |
| 2005 04-1417b | ABM | 0 | 4.32 |
| 2006 05-0295 | ABM | 0 | 0.50 |
| 2006 43410-P-0027 | ABM | 0 | 0.86 |
| 2013-I-0377 | ABM | 0.73 | 2.46 |
| **TOTAL** | | 0.73 | 7.94 |

1 Year/FWS Identifying Number.

## ENVIRONMENTAL BASELINE

### Status of the species within the Action Area

Delineation of the Action Areas is based on our current knowledge of the ABM, threats associated with coastal development (loss of habitat, artificial lighting, predation, landscaping, and refuse control) to ABM populations, and the extent of anticipated project impacts.

*Laguna Cove Project*

The proposed project is designed to provide compensatory restoration for injured natural resources and their services resulting from the DWH oil spill, including the loss of recreational shoreline uses in Alabama, in a manner consistent with the Final Programmatic Damage Assessment Restoration Plan/Programmatic Environmental Impact Statement. The project would provide additional public access to Little Lagoon in Gulf Shores, Alabama. Access improvements and amenities would include a fishing pier, a boardwalk, parking areas, a bathhouse, a kayak launch, and public restrooms.

The project has some well-formed frontal dune habitat (primary and secondary dunes). However, the majority of the area has been previously impacted by storm surges, storm surge associated construction debris and vehicular traffic through the dunes. No dune management has occurred on the property. Approximately, three (3) acres of upland habitat of the Laguna Cove Project that are currently disturbed will be restored through the use of sand sifters, installation of fencing, planting native vegetation or other methods to improve the quality of the existing habitats. Additionally, access will be provided to the Service for ABM population monitoring before and after project implementation and for dune restoration purposes.

Some Project-related work is anticipated in ABM habitat during construction of the project. However, no CH will be impacted by this project. There is l, 211 ac of CH range-wide for this subspecies (Service 2007). Only frontal dune ABM habitat types exists in the project site. The Laguna Cove project will not impact any tertiary dunes.

Hurricane Ivan (2004) wiped out 90-95% of the frontal dunes within the Perdue Unit, and West Beach area from the Gulf of Mexico to the Little Lagoon area, Gulf Shores, Alabama. Post-Ivan surveys indicated that no ABM survived the storm in the Gulf State Park area, due to the whole area being overwashed from the storm surge, limited food, limited habitat after the storm, and isolation from the remaining ABM range. The ABM was reintroduced in Gulf State Park in 2010 (Service 2011). Recent survey trapping data along with tracking data and field observations demonstrate that ABM have fully occupied the Action Area (Volkert, Inc. 2016). Simultaneously, ABM populations on the Fort Morgan peninsula are approaching pre-Ivan/Katrina levels or stabilizing, based on available trapping data (**Table 3**) and recovering habitat conditions.

**Table 3**. ABM survey data from 2010 to 2016 from seven HCP sites and the Bon Secour National Wildlife Refuge, Baldwin County, Alabama (derived from Service files 2016).

| Site | 2010 Sp/F/S | 2011 Sp/F/S | 2012 Sp/F/S | 2013 Sp/F/S | 2014 Sp/F/S | 2015 Sp/F/S | 2016 Sp/F/S |
|---|---|---|---|---|---|---|---|
| **Laguna Key** | | | | | | | |
| # traps | 200 | 200 | 200 | 200 | 200 | 200 | 200 |
| # Individual ABM | 4/0/1 | 7/2/0(W) | 7/2/0 (W) | 7/0/4 (W) | 3/1/2 | 10/6/11 | 9/7/6 |
| **Martinique** | | | | | | | |
| # traps | 180 | 200 | 200 | 200 | 200 | 200 | 200 |
| # Individual ABM | 28/8/ND | 13/9/16 | 11/6/20 | 17/23/41 | 32/26/58 | 37/22/53 | 37/34/11 |
| **Beach Club** | | | | | | | |
| # traps | 240 | 200 | 200 | 200 | 200 | 200 | 200 |
| # Individual ABM | 26/7/10 | 14/5/4 | 9/1/3 | 7/6/12 | 6/12/34 | 24/9/24 | 22/27/14 |
| **Plantation Palms** | | | | | | | |
| # traps | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| # Individual ABM | 0/5/ND | 3/4/3 | 4/0/0 | 6/3/2 | 7/10/7 | 7/8/3 | 11/9/10 |
| **Kiva Dunes** | | | | | | | |
| # traps | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| # Individual ABM | 21/18/8(W) | 28/17/12(W) | 28/ND/16(W) | 15/3/8(W) | 30/0/8(W) | 30/5/1(W) | 12/5/* |
| **Bay to Breakers** | | | | | | | |
| # traps | 150 | 100 | 100 | 100/50/50 | 180 | 180 | 180 |
| # Individual ABM | 3/ND/2 | 3/6/2 | 3/0/1 | 2/3/2 | 1/1/1 | 4/11/5 | 17/19/12 |
| **The Dunes** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| # traps | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| # Individual ABM | ND/4/13 | 33/ND/10 | 9/2/7 | 16/1/4 | 5/8/3 | 7/13/9 | 17/20/15 |
| **BSNWR** | | | | | | | |
| # traps | 600 | 600 | 600 | 600 | 600 | 400 | 400 |
| # Individual ABM | 237 Sp/F | 162 Sp/F | 103 Sp/F | 53 Sp/F | 64 Sp/F | 80 SP only | * |

Sp=Spring S=Summer F=Fall W=Winter ND=No data report
*data not report yet

## ABM Presence in the Project Site

*The Laguna Cove project*

An October 1999 five night trapping survey by the ENSR corporation biologist Mr. John Crowder resulted in no captures of ABM or other small mammals on this project site. However, the biologist stated area had just been recently overwashed by Hurricane Georges in 1998, which damaged the onsite habitat. A January 5, 2000, reply letter from the AFO Field Supervisor to ENSR corporation biologist Mr. John Crowder stated that prior to the 1999 survey, a previous trapping survey was conducted on the project site and resulted in a small number of ABM being captured. A survey of the Alabama Department of Transportation right of way along Highway 182 immediately south of the project site yielded captures of ABM in September of 2003 throughout the West Beach area. During the February 21, 2017, field site review of the proposed project, a potential active ABM burrow was observed onsite (Bill Lynn, FWS Biologist, pers observation).

The development immediately west of the project site, Laguna Key, has been periodically monitored for ABM since 1993. ABM have consistently been captured onsite except following devastating tropical storm activities, which is in line with typical ABM population dynamics. However, after the habitat recovered, ABM were found to have quickly reoccupied the site (Service 2016). The rest of the single family home development area to the south and east of this project site have several documented occurrences of tracks and burrows consistent with the presence of ABM throughout the West Beach area. These survey results and site visits confirm the likely presence of ABM within the Laguna Cove project site (Bill Lynn, per observation 2017).

## Factors affecting species' environment within the action area

Coastal Development

There are no State, tribal, local or private coastal development actions already affecting ABM in the Action Area. Similarly, there are not any unrelated Federal actions affecting the ABM or its CH within the Action Area.

Hurricanes

Hurricanes and tropical storms have caused impacts to ABM habitat in the Action Area. As mentioned above, ABM were heavily impacted at BSNWR and the West Beach Area in the wake of Hurricane Frederick in 1979 for reasons that are not fully understood and again in 2004 from the impact of Hurricane Ivan. Large portions of the Action Area were overwashed by storm surges.

Non-native species

The presence of feral and domestic cats in the Action Area is a continuing issue of concern. Removal of such animals is an ongoing project on an as needed basis of BSNWR and the local city animal control departments. Other non-native species, such as cogongrass, torpedo grass, beach vitex, and fire ants can invade ABM habitats and impact local ABM populations, and are

established in Gulf Shores, Orange Beach, and the Fort Morgan Peninsula. Non-native plants can replace native plants, which are important in maintaining the structure and continuity of ABM habitat, as well as in providing food resources for the ABM. Fire ants have been known to attack beach mice in live traps and may have impacts on females and their pups (Danielson and Falcy 2008). Other non-native species, such as the house mouse, domestic cat, red fox and perhaps coyote, also may place additional competition or predation pressures on ABM populations.

Climate Change

Increases in sea level, temperature, precipitation, and storms are expected with global climate change (Gutierrez *et al.* 2007). Although the implications for changes to the Alabama Gulf coast are far from clear, the possible effects of global warming/sea level rise may have significant impacts on ABM habitats 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 (Bush *et al.* 2001)

## EFFECTS OF THE ACTION

### Factors to be considered

The ABM may still be found throughout its historic range in areas of suitable habitat. Recent estimates from the Service's Alabama Field Office indicate that 2,450 ac of suitable habitat existed in 2011 (Service 2011). Since the implementation of the GCP and other permitting actions, the total remaining habitat is approximately, 2,444 ac (Service 2016). While various population estimates have been attempted for beach mouse subpopulations in select areas, differing sample methodologies and data gaps have rendered a total population estimate difficult. Since impacts cannot be assessed accurately in fluctuating populations on the sole basis of number of ABM affected, a corresponding measure is the amount of ABM habitat lost due to a project, and subsequently the ABM that depend on that habitat. A loss of one acre of habitat at one location can have different consequences as compared to the destruction of one acre of habitat at another location, depending on its connection to other habitats and value for ABM survival and recovery.

Because of the fluctuations in ABM populations, loss of a specific habitat area will represent different numbers of ABM depending on season of the year, recent tropical systems, food supply, and other factors. Because of this population fluctuation, the exact number of ABM cannot be precisely determined during project analysis. The impact to ABM is being determined by loss of habitat.

*The Laguna Cove project*

The Laguna Cove project site contains potential ABM habitat (Bill Lynn, pers. observation) but does not contain designated CH. The development proposed will result in permanent destruction

of approximately 1.5 ac of ABM habitat through construction of the parking lots and amenities. The remaining habitat (24.75 ac) will be preserved and maintained in a natural state. The ADCNR and City of Gulf Shores proposed to restore and improve three (3) acres onsite to compensate for the loss of the 1.5 acres of ABM habitat.

The 1.5 acres of ABM habitat lost is equivalent to about 0.008 percent (1.5 ac / 191 ac) and 0.0006 percent (1.5 ac / 2,444 ac) of the potential ABM habitat in the Laguna Cove Action Area and range-wide, respectively. Temporary effects for both projects may occur due to site preparation, construction, and dune restoration of ABM habitat. These temporary effects will only last until construction, dune restoration and landscaping with native vegetation of these features is complete.

**Analyses for effects of the action**

The proposed development and subsequent human use and occupancy of the development are anticipated to have direct and indirect impacts to beach mice. Long-term and permanent impacts from the Project will include the direct loss of beach mice and their habitats (Table 4).

**Table 4**. Proposed impacts (in acres) to ABM habitat associated with the construction of the Laguna Cove project.

| | ***The Laguna Cove Project*** | **Totals** |
|---|---|---|
| **Lot Acreage Involved (ABM Habitat)** | **53 acres (26.25)** | **26.25** |
| Proposed Footprint (ABM habitat loss) | 1.5 | 1.5 |
| Onsite Post-Construction ABM habitat remaining | 24.75 | 24.75 |
| Critical Habitat onsite | 0 | 0 |
| Range wide habitat loss | 1.5 | 0.0006 (1.5/2,444) |
| Habitat Loss in the Action Areas | 1.5 | 0.008 (1.5/191) |

Beneficial Effects

*Laguna Cove Project*

Onsite, 3 ac of ABM habitat of frontal dunes will be preserved, restored, enhanced after construction, and protected. The remaining ABM habitat onsite (24.75 ac) will be used for possible future compensation actions and maintained in a natural state (Laguna Cove Biological Assessment 2016).

Direct Effects

ABM may be injured, or killed by becoming entombed or crushed in their burrows during preparation of the sites for construction. The activities of individual ABM may be altered by construction noise and/or the presence of construction equipment and stockpiled materials. The number of ABM actually killed or injured cannot be accurately predicted because their density cannot accurately be determined. Habitat alternations associated with project development would permanently remove dune plants and sites used by ABM for feeding, burrowing, sheltering, and nesting. The footprints of the buildings and associated structures and features would amount to permanent conversions of habitats currently used by ABM to non-usable habitats.

It is anticipated that post-construction population numbers within the undeveloped portions of the project would be reduced as well due to the smaller amount of habitat remaining post construction. The precise extent of these differences cannot be determined. The area that would be lost is believed to be on the eastern fringe of known ABM habitat, so the project would not likely constitute a barrier to ABM use of the Action Area.

The proposed Laguna Cove project and associated features would permanently impact 1.5 ac of ABM habitat that is potentially available on-site. Work within the ABM habitat will be limited to the construction associated with the parking lots and proposed amenities. The remaining habitat for the project (24.75 ac) will undergo dune restoration and management activities (dune restoration and landscaped with native vegetation) to enhance its current ability to provide the essential ecological functions required for beach mouse survival, including the physical and biological features listed in the **Species/Critical Habitat Description** section above.

Indirect Effects

*Project Construction and Operation*

Indirect effects are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur (50 CFR §402.02). Indirect effects to ABM resulting from development are generally artifacts of human use and include the support of potential competitors (house mice), scavengers through inadequate refuse management; the introduction of artificial lighting, which may affect feeding behavior and increase predation; the introduction

of predators, such as the domestic/feral cat; and fragmentation of ABM habitat, which may reduce the probability of population persistence.

The proposed conservation measures for the project should minimize these indirect impacts. The use of rodent and scavenger proof containers and ABM population monitoring will minimize the support of potential competitors and scavengers (e.g., house mouse, red fox). The development and implementation of a wildlife friendly lighting plan will minimize possible lighting trespass into the adjacent habitat. The prohibition of any type of free roaming cats on the premises or any type of support (feeding, sheltering, etc.) should minimize the introduction of potential predators. The use of native landscaping promotes a source of food for the ABM. Monitoring by Service or ADCNR personnel will give the Service a better understanding of the potential effects of such projects upon ABM populations. These indirect impacts would be limited to the proposed project site. The remaining CH within the project and Action Areas would continue to provide the essential ecological functions required for beach mouse survival, including the physical and biological features listed in the **Species/Critical Habitat Description** section.

**Species' response to a proposed action**

The project site currently contains undeveloped frontal dunes and marsh wetlands. The applicants have proposed to protect, restore, and manage the remaining ABM onsite habitat (24.75 ac). Thus, we do not expect any project-induced changes in habitat quantity within the project site to affect the species' ability to access and recolonize new or recovering coastal habitats within the Action Area. Additionally, experience has shown that ABM within the project site will occupy any potential habitat around single-family homes in the Fort Morgan area. This would not likely change with the loss of 1.5 ac of ABM habitat within the project sites.

Therefore, based on the conservation measures proposed in the BA, it is unlikely that the proposed Project would have measureable negative impacts on the ABM population or the remaining habitat's ability to support the ABM population within the Action Area.

Effects of Proposed Conservation Measures

Conservation measures proposed by the applicants would help protect the endangered ABM, its habitat, and other federally protected species. These conservation measures, described in the proposed action section, are based on the applicant's BA and/or correspondence between the applicant's representatives and the Service.

These conservation measures will address, rectify, reduce, or compensate for impacts to ABM habitat, and any potential indirect take of ABM occupying other habitats on project lands or the Action Area. Managed habitat for ABM to repopulate within the project footprint will also be provided. Developed ABM habitat on the project sites is essentially confined to the footprint of the entryway, parking and associated amenities. Habitats that would be preserved and/or managed on-site for all projects include about 24.75 ac of frontal dunes.

## CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the Action Area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered here because they require separate consultation under Section 7 of the ESA. We are not aware of any other non-Federal actions that are reasonably certain to occur as a result of the project. Cumulative effects, as defined by the ESA are, therefore, not expected to occur.

## CONCLUSION

After reviewing the current status of ABM, the environmental baseline for the Action Area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the ABM and will not destroy or adversely modify ABM CH. This finding is based on the Service's assessment of the project, as summarized below:

1. ABM within the project footprint would be eliminated due to the loss and/or temporary modification of 1.5 ac of habitat (frontal dune habitat) for the project. About 0.008 percent of habitat potentially available to the ABM in the Laguna Cove Action Area (191 ac) will be destroyed. For the project, approximately 0.0006 percent of the potential ABM habitat range-wide will be destroyed (2,444 ac).

2. ABM movement and connectivity between frontal dune habitats on the project sites and adjacent properties would likely be reduced or curtailed by construction and human use of this project. However, the project site has been poorly maintain for dunes. With management, the area will probably have improved connectivity between adjacent frontal dune habitats which will improve ABM movement and occupancy of the project site. ABM have been found to exist around single-family homes and maintain populations in single family home areas.

3. Current site conditions promote ABM habitation but the site is relatively poor for typical frontal dune habitat. The site has been previously impacted by tropical storm surges and vehicular traffic. With management, the habitat onsite can be improved to a higher quality of habitat to better support ABM.

4. Up to 26 acres of disturbed dunes could be temporarily disturbed during gravel removal and planting activities. Any temporarily affected ABM habitat would be restored and impacts would be minimized in coordination with the Service.

## INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to Section 4(d) of the ESA prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent that as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

The proposed Laguna Cove project and their associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the proposed BA, together with the terms and conditions of this BO, are incorporated herein by reference as reasonable and prudent measures and terms and conditions within this incidental take statement as stated in 50 CFR 402.14(i). Such terms and conditions are non-discretionary. The amount or extent of incidental take anticipated under the proposed Laguna Cove project, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the BO terms and conditions.

### AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service anticipates 1.5 ac of ABM habitat will be permanently lost and 26 ac may be temporarily disturbed due to the construction of these projects and associated facilities. The Service is unable to provide an exact amount of take for ABM due to dynamic ABM population trends and environmental factors; however, we anticipate take of all individual ABM within the on-site habitat that will be destroyed as a result of the proposed action. The incidental take is expected to be in the form of harm to individual ABM or harassment of ABM through disturbance and habitat destruction.

### EFFECT OF TAKE

In the accompanying Biological Opinion, the Service determined that this level of expected take is not likely to result in jeopardy to the continued existence of the ABM or destruction or adverse modification of CH.

### REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The Service believes the following reasonable and prudent measures are necessary to minimize impacts of incidental take of the ABM:

1. Permanent alteration of ABM habitat will be minimized to the maximum practicable extent.
2. The applicant must implement the conservation measures included in the biological assessment (ADCNR 2017).
3. The material used for the parking areas shall be geoweb, asphalt, concrete, pavers or a Service approved polymer based binder.

The Service believes that no more than 1.5 ac of ABM habitat would be permanently destroyed and all individual ABM within those 1.5 ac of habitat would be incidentally taken. If during the course of the action, this level of incidental take is exceeded, based on the amount of ABM habitat impacted, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Service must compel the applicant to immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

## CONSERVATION RECOMMENDATIONS

Section 7 (a) (1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action listed species or CH, to help carry out recovery plans, or to develop information.

The Service offers the following conservation recommendations to be considered for implementation during the construction and/or operation of the project:

1. Fund a multi-year research study at a multiple single-family sites to determine the long-term movements, survival, and population dynamics of ABM within single-family neighborhoods.
2. Acquire, conserve, manage, and improve off-site habitat for the benefit of ABM. Such areas could also be used to develop improved techniques for restoring storm-damaged ABM habitats and enhancing unoccupied ABM habitats to expand beach mouse populations. This could include supporting research to determine if manipulating habitat within interior scrub dunes can improve ABM use, if tertiary dunes can be created or expanded to increase ABM storm refugia, or if methods can be developed to improve efforts to restore frontal/tertiary dunes that have been impacted by large storms.
3. Encourage collaboration between the State of Alabama and the City of Gulf Shores to address and control invasive species such as cogongrass. This would ensure better-managed habitat near the project sites.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

## REINITIATION NOTICE

This concludes formal consultation on the action outlined in the "Description of the Proposed Action" section, as described in the Biological Assessment for Laguna Cove Little Lagoon Natural Resource Protection Project. Reinitiation of formal consultation is required where discretionary Service involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take authorized by this BO is exceeded; (2) new information reveals effects of the Service action that may affect listed species or designated CH in a manner or to an extent not considered in this BO; (3) the permittees' or Service's action is subsequently modified in a manner that causes an effect to the listed species or designated CH not considered in this opinion; or (4) a new species is listed or CH 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 until reinitiation of consultation is completed (50 CFR § 402.16).

For this BO, the incidental take would be exceeded when the take exceeds 1.5 ac of ABM habitat or take of any ABM located outside of these 1.5 ac, which is what has been exempted from the prohibitions of Section 9 by this opinion. The Service appreciates the cooperation of ADCNR during this consultation and looks forward to working with their representative(s) to protect and conserve the ABM to the maximum extent practicable.

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