

Anastasia Island Beach Mouse
(*Peromyscus polionotus phasma*)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Jacksonville Ecological Services Field Office
Southeast Region
Jacksonville, Florida

5-YEAR REVIEW
Species reviewed: Anastasia Island Beach Mouse
(Peromyscus polionotus phamsa)

TABLE OF CONTENTS

I.	GENERAL INFORMATION.....	1
A.	Methodology Used to Complete the Review.....	1
B.	Reviewers	1
C.	Background.....	1
II.	REVIEW ANALYSIS.....	2
A.	Application of the 1996 Distinct Population Segment (DPS) Policy.....	2
B.	Recovery Criteria.....	2
C.	Updated Information and Current Species Status.....	4
D.	Synthesis.....	16
III.	RESULTS.....	17
A.	Recommended Classification.....	17
IV.	RECOMMENDATIONS FOR FUTURE ACTIONS.....	17
V.	REFERENCES.....	19

5-YEAR REVIEW

Anastasia Island Beach Mouse/ *Peromyscus polionotus phasma*

I. GENERAL INFORMATION

A. Methodology used to complete the review: In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life history, and habitat of this species. The Service lead recovery biologist for this species conducted the review. Our sources include the final rule listing this species under the Act; the recovery plan; peer reviewed scientific publications; unpublished field observations by the Service, State, and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists. Comments and suggestions regarding the review were requested from peer reviewers from outside the Service. No part of the review was contracted to an outside party. The public notice for this review was published on September 27, 2006, with a 60-day public comment period. No comments were received for this species.

B. Reviewers

Lead Region -- Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office -- Jacksonville, FL, Ecological Services: Annie Dziergowski, 904-232-2580

C. Background

- 1. FR Notice citation announcing initiation of this review:** 71 FR 56545, September 27, 2006
- 2. Species status:** Stable (2006 Recovery Data Call). "Monitoring studies in 2005/2006 show that the two populations at Anastasia State Park and Fort Matanzas National Monument had good reproductive years based on an increase in the number of mice trapped. The beach mice population located at Guana Tolomato Matanzas National Estuarine Research Reserve has been in decline in recent years. Since July of 2005 to March 2007, mice have only been detected during the summer trapping season of 2006."
- 3. Recovery achieved:** 2 (25-50% recovery objectives achieved) (2006 Recovery Data Call)

4. **Listing history:**
Original Listing
FR notice: 54 FR 20598
Date listed: May 12, 1989
Entity listed: Subspecies
Classification: Endangered
5. **Associated rulemakings:** None
6. **Review History:**
Previous 5-year review for this species was noticed on November 6, 1991 (56 FR 56384). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors, threats, etc. as they pertained to the individual species. The notices summarily listed these species and stated that no changes in the designation of these species were appropriate at that time. In particular, no changes were proposed for the status of this species in this review.

Final Recovery Plan – 1993

Recovery Data Call - 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, and 1998.
7. **Species' Recovery Priority Number at start of review (48 FR 43098):**
6C. The number “6c” reflects a subspecies with a high degree of threat and low degree of recovery potential and some degree of conflict between the species' recovery efforts and economic development.
8. **Recovery Plan:**
Name of plan: Recovery Plan for the Anastasia Island Beach Mouse (*Peromyscus polionotus phasma*) and Southeastern Beach Mouse (*Peromyscus polionotus niveiventris*)
Date issued: September 23, 1993

II. REVIEW ANALYSIS

- A. **Application of the 1996 Distinct Population Segment (DPS) policy**
 1. **Is the species under review a vertebrate?** Yes
 2. **Is the species under review listed as a DPS?** No.
 3. **Is there relevant new information that would lead you to consider listing this species as a DPS in accordance with the 1996 policy?** No.

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes.
2. **Adequacy of recovery criteria.**
 - a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?** Since the recovery plan was written, much of the information on the biology and habitat of the AIBM has not changed. The recovery criteria can provide a basis on what is needed to change the status of this subspecies. However, based on the extent of habitat loss and other factors addressed in this review, it may be difficult to meet the recovery criteria.
 - b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** No. Factor A (present or threatened destruction, modification or curtailment of its habitat or range) was identified as the primary factor affecting the species at the time of listing, and is only partially addressed in the recovery criteria. Factor E (other natural or manmade factors affecting its continued existence) should be included in the recovery criteria since hurricanes or other storm events could have a serious impact on the remaining populations of AIBM. Factor C (disease and predation) is discussed in the recovery plan as a serious threat, but is not addressed in the recovery criteria. Factors B and D are not relevant to the subspecies.
3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.**

“The Anastasia Island beach mouse can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies’ historical range has been permanently destroyed, it is not likely that it can be fully recovered or delisted.”

At the time of listing in 1989, AIBM was only located at the two ends of Anastasia Island (Anastasia State Park (ASP) and Fort Matanzas National

Monument (FMNM)) an island 14.5 miles in length, St. Johns County, Florida.

The AIBM has maintained a stable population at ASP. ASP continues to provide 3.5 miles of suitable habitat to support AIBM. AIBM are present at FMNM, however, it has less suitable habitat (less than one mile in length) than at ASP. Mice were reintroduced at Guana River State Park (now known as Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR-Guana River)) in 1992-1993 and 1999-2000. Quarterly surveys have been conducted at GTMNERR-Guana River since the reintroduction. No beach mice have been captured since September 2006. The habitat continues to decrease in size due to considerable beach erosion providing only a small narrow dune system for AIBM to use. It is important to maintain this population to provide a geographically separate population from the Anastasia Island populations to decrease the probability of extinction of the subspecies. AIBM have been located between ASP and FMNM on both private lands as well as several St. Johns County Parks (10 miles). However, due to the lack of suitable habitat throughout the 18.7 miles historic range of the AIBM, it will not be possible to establish five viable, self-sustaining populations to meet the recovery criteria for reclassification to threatened status.

C. Updated Information and Current Species Status

1. Biology and Habitat

- a. **Abundance, population trends, demographic features, or demographic trends:** Long-term trapping data have shown that beach mouse densities are cyclic and fluctuate by magnitudes on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951; Bowen 1968; Smith 1966; Hill 1989; Rave and Holler 1992b; Swilling et al. 1998; Swilling 2000; Sneckenberger 2001). Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources.

Unlike many species that have annually-based life cycles and can be sampled annually to determine population parameters, beach mice breed year-round with up to 13 generations (overlapping and asynchronous among individuals) within one year. To calculate demographic and population growth rates for beach mouse populations, trapping would need to occur on a monthly or bi-monthly basis. Furthermore, because of annual and seasonal

population fluctuations common to small mammals and differences between sites, abundance data alone carry little meaning, particularly when trapping is incidental. Consequently, as the data we currently collect or have access to are limited, population trends of AIBM are based on occupation or simple comparisons in recent tracking or trapping sessions, sometimes of only one site.

Beach mouse populations on Anastasia Island are highly variable between seasons and years, with densities ranging from 2 to 90 mice per hectare (Frank and Humphrey 1992). Quarterly trapping at ASP each year has not shown a substantial increase or decrease in the population. The AIBM populations at ASP continue to be stable since listing the subspecies in 1989. There is enough habitat at ASP to support a viable population. As indicated in the Recovery Plan, the population on Anastasia Island could be eliminated by a single catastrophic storm, if most of the habitat is impacted.

Establishing additional viable populations within the historic range would significantly reduce the probability of extinction of AIBM from hurricanes (Frank and Humphrey 1992). AIBM were introduced at GTMNERR-Guana River in 1992-1993 and 1999-2000. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss or alteration from storms (M.Love, GTMNERR-Guana River, personal communication, 2007).

AIBM are present at FMNM, but the abundance of beach mice is unknown. FMNM has not monitored on a regular basis for the past several years. The last survey was conducted in 2006 and had presence of beach mice. In 2005, the Service funded a project with the Florida Fish and Wildlife Conservation Commission (FFWCC) to trap AIBM at FMNM to assess the effects of past hurricanes on the habitat. This project will be completed in 2008.

The private and county lands located on Anastasia Island only provide small fragmented habitats. Further surveys are needed to determine if these populations could be considered viable.

Because of their close ancestry and analogous life histories, research on one beach mouse subspecies is often inferred to the other subspecies. Based on research on old-field mice and beach mouse subspecies, beach mice are considered monogamous (Smith 1966; Foltz 1981; Lynn 2000). While a majority of individuals appear to pair for life, paired males may sire extra litters with

unpaired females. Beach mice are considered sexually mature at 55 days of age; however some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Fleming and Holler 1990). Littering intervals may be as short as 26 days (Bowen 1968). Peak breeding season for beach mice is autumn and winter, declining in spring, and falling to low levels in summer (Blair 1951). However, pregnant and lactating beach mice have been observed in all seasons (Moyers et al. 1999).

b. Genetics, genetic variation, or trends in genetic variation:

An electrophoretic study conducted on 30 populations of *Peromyscus polionotus* estimated that the level of allozyme variation found in beach mouse populations was at least 40 percent lower than the level of variation in nearby inland populations (Selander et al. 1971). This study indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population.

Genetic samples were collected at ASP and FMNM by the University of Central Florida to look for genetic differences between AIBM at these sites. They found that the population of Anastasia Island beach mice (AIBM) appears to consist of a single mitochondrial DNA (mtDNA) lineage. Sequencing analysis did show an individual with a different haplotype; however, because it was a single individual the nucleotide differences could be an artifact of the sequencing process. The AIBM lineage is, relatively, quite distinct from the southeastern beach mouse. Inbreeding depression can be difficult to assess in natural populations. However, microsatellite DNA analysis can be used to determine the average genetic relatedness. If the average genetic relatedness is high, the population might be considered at risk for inbreeding effects.

c. Taxonomic classification or changes in nomenclature:

Since the listing of the AIBM, further research concerning the taxonomic validity of the subspecific classification of beach mice has been initiated and/or conducted. Preliminary results from these studies support the separation of beach mice from inland forms, and support the currently accepted (Bowen 1968) taxonomy that each beach mouse group represents a unique and isolated subspecies.

d. Spatial distribution, trends in spatial distribution, or historic range: AIBM was historically known from the vicinity of the

Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Frank and Humphrey 1992). Currently AIBM populations are found along 14.5-miles of Anastasia Island, mainly on 3.5 miles at ASP and one mile at FMNM. AIBM have been found at low densities in remnant dunes on the remainder of the island. Beach mice have also been located along sections of the 4.2 miles of dune habitat at GTMNERR-Guana River. Anastasia Island is separated from the mainland of Florida to the west by extensive salt marshes and the Mantanzas River, to the north by the St. Augustine Inlet, and to the south by the Matanzas Inlet which are both maintained and open. This has restricted the range of AIBM to 14.5 mile length of Anastasia Island and sections of GTMNERR-Guana River.

The population at GTMNERR-Guana River was thought to be extirpated between 1949 and 1986 because of either habitat modification (e.g., storms) or exotic animal predation and competition (e.g., house cats and house mice) (NERR 2007). Frank (1995) stated that the extirpation could have resulted when severe hurricanes such as Donna in 1960 and David in 1979 passed through the area and damaged much of the habitat.

In 1992-1993, beach mice were translocated from ASP and FMNM to GTMNERR-Guana River. The translocation involved moving 55 mice, 37 from ASP and 18 from FMNM. Collecting mice at both locations will provide genetic variability into the translocated population (Frank 1995). Follow-up trapping of GTMNERR-Guana River from January 1993 to October 1994 found that the entire 4.2-mile length of the park was occupied; 34 mice were captured and it was estimated that the population totaled 220 (USFWS 1993). It is believed that after the translocation AIBM expanded its range onto suitable habitat north and south of GTMNERR-Guana River. Fewer AIBM were found at the south end of GTMNERR-Guana River since the habitat was impacted by a severe nor'easter in October 1992 where the waves completely overwashed the dunes. In late 1999-early 2000, another translocation of 31 beach mice from ASP were moved to GTMNERR-Guana River. Additional mice were going to be moved from FMNM to GTMNERR-Guana River, but before that could happen a nor'easter hit GTMNERR-Guana River and a decision was made to wait and see how the foredunes recovered. No mice were ever moved from FMNM to GTMNERR-Guana River as part of the 1999-2000 translocation effort. Quarterly surveys have continued at GTMNERR-Guana River since the first translocation took place in 1992-1993. The population has been showing signs of declining since 1992-1993. The entire dune

system continues to be affected by storms resulting in major erosion to the primary dunes.

ASP is composed of 3.5 miles of continuous primary and secondary dunes, including the scrub vegetation. Most of the suitable habitat for AIBM occurs on a narrow peninsula known as Conch Island within ASP (Frank and Humphrey 1992). The northwestern corner of Conch Island was created by the placement of dredge spoil from the relocation of the St. Augustine Inlet. This resulted in a different topography from the rest of Anastasia Island. The rest of Anastasia Island has been created through accretion of sand. AIBM have been located throughout Conch Island; even in wax myrtle (*Myrica cerifera*). ASP is working on mowing to reduce the dense vegetation (Florida Department of Environmental Protection (FDEP) 2004). The mowing projects have reduced the height of the wax myrtles in areas that appear to be good travel corridors for AIBM across Conch Island (A. Bard, FDEP, personal communication, 2007).

FMNM provides AIBM with 1 mile of continuous primary and secondary dunes. Most of the habitat is found along primary dunes along the Atlantic Ocean side of the park. AIBM are restricted in their movement since Matanzas Inlet is located just south and little habitat remains north of FMNM due to coastal development. Over the past several years, sand has accreted along the beachfront providing additional habitat for AIBM to use for foraging and burrowing.

Past actions in St. Augustine Beach, south of ASP, have resulted in the Service consulting on AIBM issues. These consultations resulted in coastal developments minimizing impacts to AIBM by avoiding the primary dunes. It is believed that AIBM are still located in this area. Recent surveys in 2006 located AIBM between ASP and FMNM at St. Johns County parks (J. Van Zant, UCF, personal communication, 2007). We also believe beach mice are located on private lands adjacent to the county parks.

Other subspecies of beach mice, such as the southeastern beach mouse (*Peromyscus polionotus niveiventris*), have been known to move inland and occupy transitional areas with scrub habitats. GTMNERR-Guana River has scrub habitat located beyond the steep dune system that could provide habitat for AIBM. These areas have been burned in the past and further restoration such as clearing ground cover and opening the canopy could provide additional habitat to expand the range of AIBM at GTMNERR-Guana River.

Beach mouse populations naturally persist through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increased and dispersal occurred from adjacent populated areas. From a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As residential and commercial development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline does not currently exist and any hurricane can impact the entire range of the subspecies, the probability of beach mice persisting would be enhanced by the restoration of contiguous tracts of suitable habitat occupied by multiple independent populations (Shaffer and Stein 2000; Danielson 2005).

e. **Habitat or ecosystem conditions:**

Beach mice occupy both frontal (primary and secondary) and scrub dunes on a permanent basis and studies have found no detectable differences between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling et al. 1998; Swilling 2000; Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. Furthermore, the scrub dunes appear to serve as refugia for beach mice during and after a tropical storm event (Holliman 1983, Swilling et al. 1998), from which recolonization of the frontal dunes takes place (Swilling et al. 1998, Sneckenberger 2001). This suggests that access to primary, secondary and scrub dune habitat is essential to beach mice at the individual level.

Anastasia Island is a typical barrier island on the Atlantic coast. Vegetation on the foredunes is generally sparse, consisting of salt-tolerant species adapted to harsh conditions. The most important of these species are the sea oats (*Uniola paniculata*), railroad vine (*Ipomoea pes-caprae*), beach morning glory (*I. stolonifera*), and beach elder (*Iva imbricata*), which are important in dune formation, trapping windblown sand, and stabilizing the dune (Frank and Humphrey 1992).

At Anastasia State Park, a majority of the beach dune community is located in the northern part of the park on Conch Island and is in good to excellent condition. These dunes support the largest population of the AIBM on state owned lands. Approximately 30 percent of the beach dune community on Conch Island has been invaded by wax myrtle and elderberry (*Sambucus* spp.) as part of the succession of inter-dune swales into maritime hammock (FDEP 2004). Most of Conch Island is less than 60 years old. It contains a well-developed dune field with a series of inter-dune swales, some hundreds of feet wide. Frank and Humphrey (1992) identified succession as a mechanism that would contribute to habitat loss and put additional pressure on populations of beach mice. The wax myrtles on Conch Island could allow AIBM to form groups, which could reduce the rate at which genetic variation is lost from the populations across the island.

The park began a program to maintain these swales in a very early, grass/sedge dominated habitat in 1999. In 2002, chosen swales were mowed and mulched to ground level (FDEP 2004). Mowing has continued into 2007 to reduce the woody vegetation (A. Bard, FDEP, personal communication, 2007). These areas will eventually need to be burned in subsequent years to maintain this open character. If burning objectives cannot be met, then additional mowing/mulching may be warranted.

The beach dune community in the southern end of ASP has suffered from erosion and associated overwash, and is in poor condition. A beach nourishment and restoration project which constructed a berm and primary dune on the southern two miles of the park, was completed in 2002. Sea oats and bitter panic grass (*Panicum amarum*) were planted on the dune, and slope to the berm, along the entire park project. This restoration appears to have created suitable habitat for AIBM.

Habitat at FMNM is similar to ASP; however, beyond the primary dunes the habitat becomes woody, contains dense swales, and is bordered by oak forest to the west, which may prevent movement of beach mice into this area (Frank and Humphrey 1992). Without proper management at FMNM, the invasion of exotic plants will reduce the quality of the habitat relative to beach mice. The beaches are experiencing accretion of sand along the dunes creating more suitable habitat for AIBM. Recent surveys have shown that they are using these newly created dunes to forage on vegetation such as sea oats.

There are 4.2 miles of undeveloped Atlantic Ocean oceanfront located at GTMNERR-Guana River. The basic profile of this beach is a 2-4 foot primary dune inland of the beach, with a narrow trough between the primary and secondary dunes, which then climaxes to a 20-35+ foot secondary dune. This area is composed of some of the highest dunes in Florida. The dunes have provided a storm barrier since they are high and stabilized by vegetation. In 1964, Hurricane Dora affected this area creating gaps in the dunes. Since then nor'easters and tropical storms have continued to cause erosion to the primary dunes; this has limited the amount of suitable habitat for AIBM (NERR 2007). Dense vegetation between the primary and secondary dunes could be limiting the movement of beach mice along the beach. Coastal strand habitat found inland of the dunes could provide additional habitat for AIBM if the habitat is managed with prescribed burning. Further research in the management of this habitat with fire is needed to understand the response of AIBM to applied management activities.

2. Five-Factor Analysis

a. **Present or threatened destruction, modification, or curtailment of its habitat or range:**

Habitat destruction caused by coastal development, beach driving, and public use has continued along Anastasia Island since the time of listing. The Service consulted on several coastal development projects along St. Augustine Beach where there have been minimal impacts to the primary dunes by creating dune crossovers. The State of Florida also requires coastal setbacks for coastal development to protect primary dunes. This has reduced impacts to primary dunes occupied by AIBM. Most of the coastal development has already occurred and few private lands exist where AIBM occur. The areas with the largest populations of AIBM (ASP, FMNM, and GTMNERR-Guana River) are in State or Federal ownership. They all have management plans that include the protection of suitable habitat for AIBM.

Beach driving has occurred on Anastasia Island for many years. In 2000, beach driving was no longer allowed at ASP (FDEP 2004) greatly reducing the effect visitors have on the dunes. ASP now has designated crossovers to access the beach. Although ASP still receives a large number of visitors, they have to access the beach on foot or by bicycle.

FMNM allows beach driving on the beach outside the mean high water line since this falls outside their property boundary. Sand accretion is creating new habitat in this area that could be impacted by beach driving. Since FMNM only restricts activities within the dune habitat to the mean high water line, the FFWCC has posted this area outside the mean high water line to keep cars out of the newly created dune areas. Driving on the beaches is prohibited from 8:00 PM to 8:00 AM from May 1 through October 31 each year to be consistent with St. Johns County ordinances and the St. Johns County Habitat Conservation Plan (FMNM Park Copenidium - 36 CFR 1.7 (b)). FMNM has designated elevated crossovers to access the beach to reduce impacts to the dunes.

The beach driving that occurs on state submerged land on Anastasia Island between ASP and FMNM could still result in impacts to dune habitat. Although there is little habitat left due to coastal development in St. Augustine Beach, these areas are still occupied by beach mice. Primary dunes in certain areas are still intact and enforcement efforts are needed to keep cars and visitors out of the dunes. Habitat degradation of the dunes is likely to continue if pedestrians do not use the designated crossovers in these areas. Human use at FMNM is high and damage to the dunes does occur. The lack of suitable restroom facilities has resulted in further impacts to the dunes by humans using the beach.

At GTMNERR-Guana River, pedestrians continue to use large blowouts in the secondary dune to access the beach. This has resulted in the loss of stabilizing vegetation and exposure of the sediments to erosion by wind (NERR 2007). GTMNERR-Guana River has increased the amount of public parking and crossovers to try to reduce human impacts on the dune system.

- b. **Overutilization for commercial, recreational, scientific, or educational purposes:** Not known as a threat at the time of listing or at present. Although scientific research does involve trapping and taking genetic samples (i.e., tail snips), there has not been a significant loss of AIBM to scientific purposes.
- c. **Disease or predation:** Beach mice have a number of natural predators including the coachwhip (*Masticophis flagellum*), corn snake (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), Eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared (*Asio flammeus*) and great-horned owl (*Bubo virginianus*),

great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*) skunk (*Mephitis mephitis*), weasel (*Mustela frenata*), and raccoon (*Procyon lotor*) (Blair 1951; Bowen 1968; Holler 1992; Novak 1997; Moyers et al. 1999; Van Zant and Wooten 2003). Predation by natural predators in beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern.

Conversely, increased predation pressure on isolated beach mouse populations from natural and non-native predators can have a substantial impact. Free-roaming and feral cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968; Linzey 1978) and are considered the primary cause of the extirpation of isolated populations of beach mice, and a contributing factor to the extinction of the Pallid beach mouse (Bowen 1968; Holliman 1983; Humphrey 1992). Predation of beach mice by feral cats has been documented (Van Zant and Wooten 2003), and with habitat loss is considered the most serious threats to beach mouse populations (Gore *in litt.* 1994). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers et al. 1999).

Predation by feral cats continues to be a potential threat to AIBM. Feral cats can affect AIBM population dynamics and depress densities. Feral and house cats were observed in large numbers throughout the dunes at ASP in the late 1980s. Since that time ASP has removed cats from the park. After cats were removed at ASP, there was an increase in AIBM numbers and mean survivorship (Frank and Humphrey 1992). There have been sightings of house cats from adjacent residences at FMNM and GTMNERR-Guana River. It is unknown if these cats have had any effect on AIBM. Feral cats have been documented at St. Johns County parks located along the beaches where AIBM have been located.

At GTMNERR-Guana River, the quarterly trapping is finding that the number of cotton mice (*Peromyscus gossypinus*) and cotton rats (*Sigmodon* spp.) have increased while the number of AIBM have decreased. The reason for this change in species dynamics is uncertain; however, it may be due to the change in habitat conditions (i.e., erosion of the primary dunes).

- d. **Inadequacy of existing regulatory mechanisms:** The AIBM is state listed by FFWCC, which allows the state to protect

beach mice under Florida Administrative Code (F.A.C) 68A-27 along with the FDEP. Several state and federal properties (ASP, FMNM, and GTMNERR-Guana River) have protection measures for AIBM included in their management plans. The Service has addressed the impacts to AIBM using several existing regulatory mechanisms (e.g. Section 7 and 10 of the Endangered Species Act, as amended) that are working to benefit this subspecies. The Service has issued St. Johns County a countywide incidental take permit that will protect beach mice and their habitat.

Acquisition of ASP started in 1949 with the final purchase by the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida in 1987. They then turned the lease over to FDEP's Division of Recreation and Park for 99 years. The lease requires FDEP to manage ASP for the conservation and protection of natural, historical, and cultural resources and for resource-based public outdoor recreation compatible with the conservation and protection of the property (FDEP 2004). The F.A.C 253.03 and 259.03, Chapter 18-2, requires a State Land Management Plan for all state parks such as ASP and GTMNERR-Guana River. Both of these site have approved management plans that address the protection and monitoring of AIBM.

The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida first purchased Guana River State Park's uplands in 1984. In 1999, Guana River State Park was designated a National Estuarine Research Reserve (NERR) to be administered by the National Oceanic and Atmospheric Administration (NOAA) and became GTMNERR-Guana River. FDEP's Office of Coastal and Aquatic Managed Areas (OCAMA) then took over managing the park in 2004. Management authority was then conveyed to FDEP's OCAMA. NOAA requires the preparation of a management plan under the NERR regulations (Coastal Zone Management Act section 315, and 15 Code of Federal Regulations (CFR) Part 921) for the conservation of resources. As mentioned earlier, GTMNERR-Guana River has an approved management in place to protect AIBM.

FMNM is currently working on a draft management plan that should be completed in 2007.

- e. **Other natural or manmade factors affecting its continued existence:** One of the greatest threats to AIBM is the potential

for a catastrophic loss of the entire population because of a severe hurricane. A large hurricane could cause waves to overwash the dunes along Anastasia Island, possibly resulting in the extinction of the AIBM (Frank and Humphrey 1992). The establishment of additional populations within the historic range would reduce the possibility of extinction.

Hurricanes or another severe storm could result in the extinction of the AIBM on Anastasia Island. FDEP has proposed to establish an emergency action plan that calls for an inter-agency rescue effort of beach mice prior to the storm event (Frank 1995). An emergency action plan has been established at ASP, which provides a protocol for the live trapping and removal of mice from the park in case of a hurricane (FDEP 2004). However, the plan needs to consider that there is usually little time prior to a hurricane to collect beach mice due to the potential hazards to personnel. The loss of beach mice is not generally from the initial hurricane strike. It is the factors that result from hurricanes, such as habitat loss through erosion and habitat degradation due to overwash that may in fact determine if beach mice persist or not. The most efficient course of action may be to trap following the hurricane/storm. A captive breeding program may hold promise; however, without a pilot program to evaluate the effects of captive breeding on translocations, supplementation, and maintaining genetic diversity it should not be implemented.

In March 2007, the Service held a Captive Management Feasibility Workshop to explore the feasibility of and options for developing a captive management program for beach mouse subspecies. Workshop participants developed a list of potential roles that captive populations might play in beach mouse conservation: 1) provide an insurance policy against subspecies extinction; 2) provide a source population for reintroduction into new habitat or habitat from which beach mouse populations have been extirpated; 3) provide a source for demographic supplementation of small populations; 4) provide a source for genetic supplementation of small (inbred) populations; 5) preserve a genetic reservoir to guard against sudden population bottlenecks; 6) preserve unique genetic lines to guard against loss of local genetically distinct populations; 7) serve as ambassadors through education outreach to reduce threats associated with human activities; and 8) provide research opportunities to gain knowledge of the species and to improve the effectiveness of management actions. The final

report describes both the pros and cons of short and long-term captive programs. The report provides valuable information for us to determine what needs to be done to protect the remaining populations of AIBM in case of a catastrophic event such as a hurricane (Traylor-Holzer and Lacy 2007).

Of the five listing factors, habitat loss and degradation (Factor A), predators (Factor C), and other natural factors such as hurricanes (Factor E) are all considered major threats to AIBM and are addressed in the recovery plan. Factors B and D are not considered threats at this time.

D. Synthesis

When this subspecies was first documented by Bangs in 1898, it was only located at two locations, Anastasia Island and north of St. Augustine Inlet to the Duval and St. Johns County border in Florida. Distribution of AIBM populations has decreased and is now found within fragments of the historic range, which includes at ASP, FMNM, GTMNERR-Guana River, and private lands along Anastasia Island. ASP has been regularly surveyed and has documented stable populations of AIBM. The population of beach mice at FMNM is unknown. By 2008, FWC will have completed a project that will monitor and evaluate the condition of the habitat. The translocation events that occurred at GTMNERR-Guana River in 1992-1993 and 1999-2000 have shown some success; however, the population now seems to be declining. Future augmentation may need to be considered to maintain the populations only after the reasons for the decline are addressed. The coastal strand habitat at GTMNERR-Guana River could provide additional habitat needed to support this population. ASP and GTMNERR-Guana River have updated management plans that address management of the habitat. FMNM is currently working on its management plan.

There are still several threats that are affecting AIBM throughout its range. Habitat loss was considered the major threat when this subspecies was first listed. Habitat loss continues to occur throughout the range mainly due to erosion caused by nor'easters and tropical storms. Coastal development has already affected most of Anastasia Island with little habitat left to be developed or acquired for conservation of the AIBM. Habitat loss has also occurred due to physical damage caused by beach driving and foot traffic through the dunes. ASP, FMNM, and GTMNERR-Guana River have built crossovers that allow visitors to access the beach, and this has alleviated some of the impacts to the dunes. ASP is working on restoring the habitat at Conch Island by mowing the wax myrtle to create openings for AIBM. ASP no longer allows beach driving at the park, which has greatly reduced impacts to the dunes. Beach driving still occurs along 75 percent of Anastasia Island including FMNM.

Predation by feral and house cats is an important threat to AIBM. When the AIBM was first listed, feral cats were documented on ASP. However, ASP has conducted an extensive feral cat removal program at the park. It is unknown if feral cats could still be considered a significant threat to AIBM at FMNM, GTMNERR-Guana River, and St. Johns County parks since these sites have adjacent residences where house cats could impact beach mice. The release of a few cats within Anastasia Island or resident fox could have serious effects on these populations. Thus, predator control should be an ongoing aspect of beach mice management on Anastasia Island (including ASP and FMNM) and GTMNERR-Guana River.

Hurricanes are the most catastrophic threat to the entire AIBM population. If Anastasia Island (including ASP and FMNM) receives a direct hit from a storm, waves could completely overwash the island and eliminate habitat. This is why it is critical to establish additional populations, like the one at GTMNERR-Guana River, within the historic range.

The above-mentioned threats continue for AIBM and could result in a major impact to AIBM populations. For this reason, we are recommending that the status of AIBM remain the same. The recovery criteria for AIBM have not been met. The recovery criteria state that AIBM could be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. However, most of the historic range of the AIBM has been altered or destroyed.

III. RESULTS

- A. **Recommended Classification:** No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

The following suggested recommendations are in order of priority. Please note that these actions are not necessarily specific to AIBM. To that end, many actions listed are appropriate for all beach mouse subspecies, and in most cases research conducted or plans developed for one subspecies would serve all subspecies.

1. Revise the current recovery plan to include updated objective and measurable recovery criteria. Currently, the recovery plan includes both the AIBM and the southeastern beach mouse. Individual plans should be developed for these two subspecies to address the specific recovery actions relating to each subspecies.
2. Provide funding and technical support for further research on:
 - a. The effects of prescribed burning and other management tools (e.g., removal of wax myrtle) on AIBM. Continue working with public land managers to increase management on their sites.

- b. Improve the management of coastal strand habitat at GTMNERR-Guana River to expand the available habitat for AIBM. It should be supported by research to appropriately address the ecological requirements of AIBM to achieve habitat restoration needs (e.g., prescribed fire and mechanical treatment of the vegetative component in the coastal strand).
 - c. Continue genetic sampling of the different populations. Goals for genetic sampling should be defined and a protocol established to achieve these goals. Such sampling can tell us if inbreeding depression is occurring. This information can also help the Service determine what constitutes a stable population for AIBM recovery.
 - d. Perform a population viability analysis to estimate the probability of survival of animal populations of differing effective breeding size.
3. Develop an emergency response plan to outline actions taken in case of severe threats to the persistence of AIBM (i.e., forecasted category 5 hurricane, feral cat population increase, population crash)(Traylor-Holzer and Lacy 2007).
4. Develop and implement a monitoring program for AIBM. This plan should include some goals and objectives such as habitat mapping; obtaining demographic, landscape, or dispersal data; estimating future population trends or the likelihood of extinction; assessing management options; or evaluating future research priorities. A monitoring program is necessary for several other recommendations listed, particularly the Emergency Response Plan, land acquisition, translocation, and habitat management projects.
5. Discuss with FMNM on how to better monitor beach mouse populations and manage the habitat, and address threats for AIBM. Complete the project with FWC to determine population trends of AIBM at FMNM.
6. Develop a translocation plan to identify key sites, set criteria for when translocations are needed, consider genetic as well as demographic characteristics of the donor and recipient populations, and include an assessment of the suitability of the recipient habitat (i.e., habitat quality, have feral cats and other threats been minimized or removed). Public-private partnerships and easements should also be explored. Future translocation of AIBM to GTMNERR-Guana River should be considered if it can be shown that there is enough habitat (e.g. the coastal strand/scrub habitat) to support additional mice
7. Continue to educate the public at the public parks about the importance of the dune habitat. In addition, an outreach/education program should be developed and focused on the threats feral cats pose to wildlife.
8. Enforce the use of crossovers in areas with suitable beach mouse habitat to reduce

impacts to the dunes. Restore habitats with native plant species that are also food sources for AIBM.

9. Continue feral cat removal and control from areas of suitable AIBM habitat.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Anastasia Island Beach Mouse (*Peromyscus polionotus phasma*)

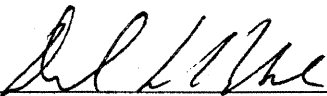
Current Classification: Endangered

Recommendation resulting from the 5-Year Review: No change is needed

Review Conducted By: Annie Dziergowski

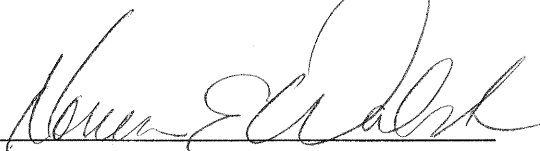
FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve  Date 8/27/07
David L. Hankla

REGIONAL OFFICE APPROVAL:

for Lead Regional Director, Fish and Wildlife Service

Approve  Date 9/6/07

APPENDIX

Summary of peer review for the 5-year review of Anastasia Island beach mouse (*Peromyscus polionotus phasma*)

A. Peer Review Method: See B. below.

B. Peer Review Charge: On July 5, 2007, the following letter and Guidance for Peer Reviewers of Five-Year Status Reviews were sent via e-mail to potential reviewers requesting comments on the 5-year review. Requests were sent to Alice Bard (Department of Environmental Protection, Division of Recreation and Parks), Matt Love (Guana Tolomato Matanzas National Estuarine Research Reserve), Jeff Van Zant (University of Central Florida), and Terry Doonan (Florida Fish and Wildlife Conservation Commission).

*We request your assistance in serving as a peer reviewer of the U.S. Fish and Wildlife Service (Service) 5-year status review of the endangered Anastasia Island beach mouse (*Peromyscus polionotus phasma*). The 5-year review is required by section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.). A 5-year review is a periodic process conducted to ensure the listing classification of a species as threatened or endangered on the Federal List of Endangered and Threatened Wildlife and Plants is accurate. The initiation of the 5-year review for the Anastasia Island beach mouse was announced in the Federal Register on September 27, 2006, and the public comment period closed on November 27, 2006. Public comments have been incorporated into the status review.*

The enclosed draft of the status review has been prepared by the Service pursuant to the Act. In keeping with Service directives for maintaining a high level of scientific integrity in the official documents our agency produces, we are seeking your assistance as a peer reviewer for this draft. Guidance for peer reviewers is enclosed with this letter. If you are able to assist us, we request your comments be received in this office on or before July 20, 2007. Please send your comments to Annie Dziergowski at the address on this letter. You may fax your comments to Annie Dziergowski at (904)232-2404 or send comments by e-mail to Annie_Dziergowski@fws.gov.

We appreciate your assistance in helping to ensure our decisions continue to be based on the best available science. If you have any questions or need additional information, please contact Annie Dziergowski at (904)232-2580 extension 116. Thank you for your assistance.

Sincerely yours,

*David L. Hankla
Field Supervisor*

Enclosures

Guidance for Peer Reviewers of Five-Year Status Reviews
U.S. Fish and Wildlife Service, North Florida Ecological Services Office

July 5, 2007

As a peer reviewer, you are asked to adhere to the following guidance to ensure your review complies with Service policy.

Peer reviewers should:

- 1. Review all materials provided by the Service.*
- 2. Identify, review, and provide other relevant data apparently not used by the Service.*
- 3. Not provide recommendations on the Endangered Species Act (ESA) classification (e.g., endangered, threatened) of the species.*
- 4. Provide written comments on:*
 - Validity of any models, data, or analyses used or relied on in the review.*
 - Adequacy of the data (e.g., are the data sufficient to support the biological conclusions reached). If data are inadequate, identify additional data or studies that are needed to adequately justify biological conclusions.*
 - Oversights, omissions, and inconsistencies.*
 - Reasonableness of judgments made from the scientific evidence.*
 - Scientific uncertainties by ensuring that they are clearly identified and characterized, and that potential implications of uncertainties for the technical conclusions drawn are clear.*
 - Strengths and limitation of the overall product.*
- 5. Keep in mind the requirement that we must use the best available scientific data in determining the species' status. This does not mean we must have statistically significant data on population trends or data from all known populations.*

All peer reviews and comments will be public documents, and portions may be incorporated verbatim into our final decision document with appropriate credit given to the author of the review.

Questions regarding this guidance, the peer review process, or other aspects of the Service's recovery planning process should be referred to Annie Dziergowski, U.S. Fish and Wildlife Service, at 904-232-2580 extension 116, email: annie_dziergowski@fws.gov.

C. Summary of Peer Review Comments/Report

A summary of peer review comments is provided below. The complete set of comments is available at the North Florida Ecological Services Field Office, U.S. Fish and Wildlife Service, 6620 Southpoint Dr. South, Suite 310, Jacksonville, Florida, 32216.

The Services accepted all minor edits from peer reviewers. Overall reviewers felt the draft document adequately characterizes the known information on the status and threats of the listed

populations. The following discussion is limited to where there was disagreement or additional information was provided.

Alice Bard, Florida Department of Environmental Protection, Office of Recreation and Parks: Ms. Bard provided information to update Subsection C to include the additional translocation of AIBM that occurred in 1999-2000. She also pointed out that more information is needed to determine how the mowing of wax myrtle is affecting beach mice. She clarified information regarding the purchase and ownership of GTMNERR. More information was asked for regarding if feral cats were still a threat at FMNM and GTMNERR. Numerous minor edits were suggested.

Matt Love, Guana Tolomato Matanzas National Estuarine Research Reserve, Ponte Vedra Beach, Florida: Mr. Love provided information to update Subsection C to include updated survey information. He also clarified information regarding the purchase and ownership of GTMNERR. He also suggested that further research is needed to determine the habitat requirements of AIBM to adequately guide the management activities on public land to maintain this species. Numerous minor edits were suggested.

Dr. Jeff Van Zant, University of Central Florida, Orlando, Florida: Mr. Van Zant provided information on several sections throughout the document. He suggested under the recovery criteria section that although the population at GTMNERR-Guana River is important, unless habitat is maintained no further translocation should occur. He also provided input as to the status of the populations on FMNM and some of the threats affecting that population. He elaborated on the genetic research being conducted on AIBM. Under subsection E, he commented on the removal of wax myrtle at ASP. He also provided additional information on the predation by fox. He has suggested that a while an emergency protection plan is important to have in case of a hurricane, it may be difficult to implement prior to a storm. He recommends waiting until after the storm to evaluate the impacts to the habitat. In the recommendation section, he also provided comments.

D. Response to Peer Review:

Alice Bard, Florida Department of Environmental Protection, Office of Recreation and Parks, Orlando, Florida: All suggested edits and new information were incorporated.

Matt Love, Guana Tolomato Matanzas National Estuarine Research Reserve, Ponte Vedra Beach, Florida: All suggested edits and new information were incorporated.

Dr. Jeff Van Zant, University of Central Florida, Orlando, Florida: All comments and new data suggested by Dr. Van Zant were incorporated.