

Choctawhatchee Beach Mouse
(Peromyscus polionotus allophrys)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Southeast Region
Panama City Field Office
Panama City, Florida

5-YEAR REVIEW
Choctawhatchee Beach Mouse/*Peromyscus polionotus allophrys*

I. GENERAL INFORMATION

A. Methodology used to complete the review

This review was completed by the Service's lead recovery biologist for the Choctawhatchee beach mouse located at the Panama City Field Office. Information sources include the Recovery Plan for the Choctawhatchee Beach Mouse, Perdido Key Beach Mouse, and Alabama Beach Mouse (1987), peer-reviewed scientific publications, unpublished reports, ongoing field survey results and information from qualified Service and State biologists, the final rule listing the subspecies, recently revised critical habitat (2006), and peer review comments (Appendix A). All literature and documents used for this review are on file at the Panama City Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Choctawhatchee beach mouse. 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.

B. Reviewers

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Panama City Field Office (Lead) – Sandra Sneckenberger, 850-769-0552 x239

Peer Reviewers – Jeffery Gore, Ron Loggins, Harold Mitchell

C. Background

1. FR Notice citation announcing initiation of this review: 71 FR 56545-56547, September 27, 2006.

2. Species status: Declining; Recovery Data Call 2006; Chronic flooding and damage to habitat from the tropical storm events of 2004 and 2005, a feral cat population at one translocation site, and continued habitat loss and fragmentation are believed to be causes of the decline observed in trapping data.

3. Recovery achieved: 2 (25-50% recovery objectives achieved); Recovery Data Call 2006

4. Listing history

Original Listing

FR notice: 50 FR 23872

Date listed: June 6, 1985

Entity listed: Subspecies

Classification: Endangered

5. Associated rulemakings

Critical habitat was designated at the time of listing (1985), and revised October 12, 2006 (71 FR 60238).

6. Review History

Recovery Plan, August 12, 1987

Status Review, 1991: In this review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors and threats as they pertained to the different species' recovery. The notices summarily listed these species and stated that no changes in the designation of these species were warranted at that time. In particular, no changes were proposed for the status of the Choctawhatchee beach mouse in the review. Recovery Data Calls: 2000 (stable); 2001 (improving); 2002 (improving); 2003 (improving); 2004 (unknown); 2005 (unknown); 2006 (declining).

7. Species' Recovery Priority Number at start of review (48 FR 43098): 3c

The Choctawhatchee beach mouse is assigned a recovery priority of 3c because the degree of threat to its persistence is high, it is a subspecies with high level of taxonomic distinctness, and its potential for recovery is great if threats can be eliminated or minimized. Recovery of the Choctawhatchee beach mouse is in conflict with economic activities, such as development, a factor which further elevates its priority ranking.

8. Recovery Plan or Outline

Name of plan: Choctawhatchee Beach Mouse, Perdido Key Beach Mouse, and Alabama Beach Mouse Recovery Plan

Date issued: August 12, 1987

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. Is the species under review listed as a DPS? No.

2. 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?

No, the approved recovery plan for the Choctawhatchee beach mouse (1987) is not up-to-date in regard to species' status and threats. Recovery criteria may be considered subjective or not measurable, since "self-sustaining" and "protected" and even "occupied" can be difficult to define. The criteria do not address specific threats to the species. Also, as CBM critical habitat has been revised, the criterion involving a percentage of occupied and protected critical habitat may also warrant modification. Revision of the recovery plan and recovery criteria are recommended. Our recommendations within this review are based on recent demographic information and the five factor or threat analysis.

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, the five listing factors are not addressed in the current recovery plan's recovery criteria.

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.

"Each subspecies of beach mouse can be considered for downlisting to threatened when there are 3 distinct, self-sustaining populations in each of the critical habitat areas, and a minimum of 50% of the critical habitat is protected and occupied by mice."

The first criterion (minimum of 3 distinct, self-sustaining populations) has not been met. Currently, CBM are known to be present at Topsail Hill Preserve State Park, Shell Island/West Crooked Island, Grayton Beach State Park, and Deer Lake State Park; as well as on some adjacent private lands. The current status of the populations on Shell Island/ West Crooked Island, Deer Lake, and Grayton Beach are unknown. The most recent trapping data would not characterize the CBM populations as self-sustaining, particularly the Grayton Beach and Deer Lake populations which are results of translocations. Since the Recovery Plan was finalized (1987), several populations of CBM have likely been extirpated including those at Grayton Beach and St. Andrew State Park (mainland).

Critical habitat has been recently revised (71 FR 60238). The second criterion

(minimum of 50% of critical is protected and occupied by mice) has not been met for either the original critical habitat or the recently revised critical habitat.

C. Updated Information and Current Species Status

1. Biology and Habitat

Recent information concerning their biology and habitat can be found in the revised critical habitat designation (70 FR 74426, 71 FR 60238) and is summarized below.

a. Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), 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 1971; 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 CBM are based on occupation or simple comparisons in recent tracking or trapping sessions, sometimes of only one site.

In 1979, the population estimate for CBM was over 515 individuals (Humphrey and Barbour 1981). While this estimate was obtained through a census of all suitable habitat, CBM were only captured on Shell Island and Topsail Hill. In 1982, the population at Shell Island appeared stable (Meyers 1983). More recent population estimates at Shell Island were 338, 105, 800-1200, and 195 in 1993, 1994, 1995, and 1998 (Moyers et al. 1996; 1999). Trapping in 2000 to 2003 yielded estimates of 24 to 67 individuals (Van Zant, unpublished data; Service 2002, 2003a). Shell Island has not been trapped since 2003; tracking data collected in 2006 indicated low densities of CBM at the site.

In 1987, two trapping sessions at Topsail yielded only two captures (Holler 1992). Trapping of four 100-trap transects yielded population estimates of 190, 250, <10 (too few to estimate), and 87 in 2003, 2005, 2006, and 2007, respectively (Service 2003b; 2005; 2006; unpublished data).

The Grayton Beach population (central unit) was reestablished in 1987 and 1988. Population estimates from 1995 to 1999 were 25 to 116 individuals (Moyers et al. 1999). In 2002, no CBM were captured in the central unit. This area has not been trapped since 2002. Multiple tracking efforts have indicated no signs of CBM within the western unit of the Grayton Beach State Park (Moyers et al. 1999).

The Deer Lake site has been reestablished through translocations from Topsail Hill to adjacent private lands in 2003 and 2005 (Service 2003b; 2005). Deer Lake State Park has not been trapped, but tracks have been observed on the site following the translocation. Trapping on the adjacent private lands has been sporadic, but has yielded population estimates of 5 to 46 individuals in 2003 to 2006 (Moyers 2007).

In summary, CBM populations fluctuate greatly, and many public land areas have not been trapped in several years. With the exception of the Topsail population, which may be recovering from population lows following the hurricanes of 2004 and 2005, CBM populations appear to be on the decline and/or at disconcertingly low densities. Since many sites have not been trapped following the hurricanes, information reported above may be overly optimistic. Furthermore, as the area within CBM's historic range has experienced continued rapid growth, little suitable habitat on private lands remains and therefore CBM are restricted to public lands and rely on these lands for recovery and persistence.

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 2000b). 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).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama have demonstrated that their average life span is about nine months (Swilling 2000). Other research indicated that 63% of Alabama beach mice lived (or remained in the trapping

area) for four months or less, 37% lived five months or greater, and 2% lived 12 to 20 months (Rave and Holler 1992). Less than half (44 percent) of beach mice captured for the first time were recaptured the next season (Holler et al. 1997). Greater than ten percent of mice were recaptured three seasons after first capture, and four to eight percent were recaptured more than one year after initial capture. Beach mice held in captivity have lived three years or more (Blair 1951; Holler 1995).

b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.)

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.

In 1995, the Service contracted a genetic analysis of: 1) post-re-establishment gene structure in the Perdido Key beach mouse and CBM; 2) microgeographic patterning and its relevance to alternate management approaches for the Alabama beach mouse on the Bon Secour National Wildlife Refuge; and 3) if feasible, the historical relationship of St. Andrews Beach Mouse from Crooked Island relative to CBM from Shell Island and SABM from St. Joseph Peninsula.

Results of the work for CBM found: 1) founder effects were observed in the Grayton Beach State Park population (fixation of alleles common to the donor population and allele frequency shifts); 2) incongruity in number and size of several alleles was observed between Grayton Beach State Park and Shell Island; 3) overall genetic divergence between the donor and re-established population was moderate; 4) genetic differences between Topsail Hill Preserve State Park and other CBM sites were higher than expected given the spatial proximity; 5) Topsail Hill Preserve State Park appears to be a reservoir for unique variation within the remaining populations of CBM; and 6) the overall relatedness estimated for Grayton Beach State Park suggested that any mating would involve close relatives (Wooten and Holler 1999).

Management of the Grayton Beach State Park population for genetic characteristics was recommended; however, additional genetic analyses would be needed. Relocation of CBM to Grayton Beach State Park from Shell Island was suggested as an important future action (Wooten and Holler 1999).

Information from these genetic studies has been useful in managing CBM populations. Planning of translocations has become a more complex and informed process since isolated populations were determined to differ greatly. Furthermore, the results from Grayton Beach State Park indicated that regardless

of population size, further translocation and exchange programs need to take place before the population is likely to be self-sustaining or persist in the long-term. Lastly, the findings regarding the uniqueness of the Topsail Hill Preserve State Park population highlights the importance of maintaining this population.

c. Taxonomic classification or changes in nomenclature

Since the listing of the CBM, 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 (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.)

The historic range of the CBM extended 53 miles between the Destin Pass, Choctawhatchee Bay in Okaloosa County and East Pass in St. Andrew Bay, Bay County in Florida (50 FR 23872). In the 1950s, the CBM was widespread and abundant according to Bowen (1968). Habitat loss and fragmentation associated with residential and commercial real estate development has reduced the distribution of the CBM to a portion of its historic range (Holler 1992; Humphrey 1992). By 1979, only 40 percent of the original habitat remained undeveloped in non-contiguous areas and CBM had been extirpated from seven of its nine historical localities (Humphrey and Barbour 1981). In 1985 when the CBM became federally protected, CBM were only known from the Topsail Hill area and Shell Island, an area consisting of about ten miles of coastline (50 FR 23872). In 1987 and 1988, a cooperative interagency effort reintroduced CBM onto the central and west units of Grayton Beach State Park increasing the occupied coastline by another mile (Holler and Mason 1989). In 1999, with the closing of East Pass and Shell Island connecting to West Crooked Island, CBM increased their range by approximately four miles (Lynn 2000a). Coastal development is the primary threat contributing to the endangered status of beach mice (Holler 1992; Humphrey 1992), and has fragmented the subspecies into the disjunct populations discussed in I.C.1.a.

There are four populations of CBM that currently exist: 1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands); 2) Shell Island/West Crooked Island (includes St. Andrew State Park mainland and Shell Island with private inholdings and Tyndall Air Force Base); 3) Grayton Beach (and adjacent eastern private lands); and 4) Deer Lake State Park (and adjacent eastern private lands). Translocations to establish a fifth population of CBM occurred in March of 2003 and 2005. Twenty-six CBM from Topsail Hill Preserve State Park were

moved to private lands at Camp Creek/WaterSound in Walton County, Florida (Service 2003b; Service 2005a, 2005b, 2005c, 2005d). The reestablished population at WaterSound appears to be relatively stable (Moyers 2006).

Topsail Hill Preserve State Park consists of 1,637 acres of which 277 acres provide CBM habitat. Private lands on the east side total approximately 10 acres, seven acres of which is the development known as the Stallworth Preserve. The remaining 3 acres was purchased by Walton County with a grant from the Service. Private lands on the west side of the Preserve consist of 24 acres and include Four-Mile Village, a low density single family development, and the Coffeen Nature Preserve managed by the Sierra Club.

Shell Island consists of lands within the St. Andrew State Park, Tyndall Air Force Base, and private lands. The St. Andrew State Park mainland consists of 1,260 acres of which 123 acres are beach mouse habitat. Several tracking efforts looking for signs of CBM on the mainland were made between 1995 and 1998; no evidence was found that indicated the presence of the beach mouse (Moyers et al. 1996; Moyers et al. 1999). However, live-trapping to document the absence of the CBM has not been conducted. Reintroduction to this area is considered an action to support recovery of CBM. While historically a healthy population (Novak 1995; Moyers et al. 1996; Moyers et al. 1999), Shell Island itself has not been trapped since 2002 and has since weathered the tropical storms of 2004 and 2005. Recreational pressure on the island has also increased greatly in the last five years (Mitchell 2007).

West Crooked Island consists of 1,558 acres of which 730 acres provide CBM habitat and remains occupied by CBM (Service 2004). The West Crooked Island population resulted from its connection to Shell Island in 1998 -1999. The passes and barrier island connections are dynamic in this area; East Pass has opened and closed again since the colonization of CBM. The status of CBM in this area is unknown; trapping data from 1995 to 2004 indicate a stable population (Moyers et al. 1996, Moyers et al. 1999, Service 2004).

The Grayton Beach area consists of two units in Grayton Beach State Park. The Park is divided into a central and western unit and is connected by a narrow band of primary dunes. Total acreage of the Park is 2,236 acres with 162 acres providing suitable CBM habitat. CBM were extirpated from this area prior to listing, and translocations to Grayton Beach State Park have yielded mixed success (see Van Zant and Wooten 2003). The status of CBM in this area is unknown; trapping data from 1995 to 2002 indicate a declining population (Moyers et al. 1996, Moyers et al. 1999, unpublished data 2002). Portions of private lands (WaterColor and Seaside developments) on the east side of the central unit are occupied by CBM or provide suitable habitat.

The Deer Lake area consists of 49 acres and encompasses beach mouse habitat within the boundary of Deer Lake State Park as well as adjacent private lands.

Live-trapping efforts in this area have been limited to incidental trapping, and beach mice were not detected in 1998 (Moyers et al. 1999). Choctawhatchee beach mice were translocated from Topsail Hill Preserve State Park to private lands adjacent to this unit in 2003 and 2005 (Service 2003b; 2005a, 2005b, 2005c, 2005d). Trapping at the translocation site since the first release in 2003 has documented mice on the site up to June 2006 (Moyers 2007). Tracking within the adjacent State park lands have indicated expansion of the population into the park.

Henderson Beach State Park is not currently occupied, but translocation to the area has been identified as a potential recovery action.

While CBM benefit from having several populations - greatly increasing the probability of the subspecies' long-term persistence - further population data collection is warranted for all populations and sites to more accurately estimate population trends and spatial distribution. The Topsail Hill and Shell Island/West Crooked Island populations seem the most likely to persist in the near future. However, even these populations are vulnerable from recent storms. The Deer Lake and Grayton Beach populations do not appear to be self-sustaining in the long-term.

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 (e.g., amount, distribution, and suitability of the habitat or ecosystem)

Choctawhatchee beach mice inhabit coastal dune ecosystems. This habitat is generally categorized as: primary dunes (characterized by sea oats [*Uniola paniculata*] and other grasses), secondary dunes (similar to primary dunes but also frequently include such plants as woody goldenrod [*Chrysoma pauciflosculosa*], false rosemary [*Conradina canescens*]), and interior or scrub dunes (often dominated by scrub oaks [*Quercus geminata* spp.] and yaupon holly [*Ilex vomitoria*]).

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.

Approximately 2,500 acres of CBM habitat currently exists. While approximately 96 percent of their remaining habitat is public land, due to recent hurricanes and increasing recreational pressure on public lands, habitat loss and degradation remain as threats to beach mice. Maintaining habitat on private lands continues to be imperative to preserve connectivity and allow for population expansion.

2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

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

Due to coastal development, from the CBM's historic range of 53 miles of coastal dune habitat (50 FR 23872), an estimated 10 to 15 miles remain. By 1979, only two populations remained (Humphrey and Barbour 1981). Two translocation programs increased the number of populations to four, but the persistence of the Grayton Beach population is uncertain. Much of the remaining coastal dune habitat is degraded due to fragmentation from residential and commercial development, impacts from tropical storms, recreational pressure, introduction of non-native predators, and other anthropogenic factors.

The conservation of multiple large, contiguous tracts of habitat is a key to the persistence of beach mice. At present, large parcels exist mainly on public lands. Protection, management, and conservation of beach mice on public areas have been complicated by increased recreational use by humans as public lands are rapidly becoming the only natural areas left on the coast. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local and complete extinctions due to storms and other stochastic events (Shaffer and Stein 2000; Oli et al. 2001; Danielson 2005). Protecting multiple populations increases the chance of at least one population within the range of a subspecies will survive episodic storm events and persist while vegetation and dune structure recover.

Isolation of small populations of beach mice also reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by free roaming domestic or feral cats), diseases, and competition with house mice, are intensified in small, isolated populations which may be rapidly extirpated by these pressures. Especially when coupled with events such as tropical storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996).

Habitat connectivity also becomes essential where mice occupy fragmented areas lacking one or more habitat types. If scrub habitat is lacking from a particular tract, adjacent or connected tracts with scrub habitat are necessary for food and burrow sites when resources are scarce in the frontal dunes, and are essential to beach mouse populations during and immediately after hurricanes. Trapping data suggests that beach mice occupying the scrub following hurricanes recolonize the frontal dunes once vegetation and some dune structure have recovered (Swilling et al. 1998; Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract and a functional pathway to frontal dune habitat does not exist, beach mice may not be able to attain the resources necessary to expand the population and reach the densities necessary to persist through the harsh summer season or the next storm (Sneckenberger 2001). Functional pathways may allow for natural behavior such as dispersal and exploratory movements, as well as gene flow to maintain genetic variability of the population within fragmented or isolated areas. To that end, contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

Numerous guidelines, conservation measures, and regulatory mechanisms are in place to minimize impacts to CBM and their habitat. Construction guidelines and best management practices for road projects developed by the Service are provided to developers, consultants, and the Florida Department of Transportation. These guidelines offer recommendations aimed to minimize impacts pre-construction, during construction, and in operation and management following construction. Such measures include prohibiting cats and unleashed dogs, providing controlled access to the beach, use of predator-proof refuse containers, prohibiting use of clay materials in roadbeds within coastal areas, and use of wildlife-friendly lighting.

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 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 domestic and feral cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968; Linzey 1978) and are considered to be 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).

A predator control program has been implemented since 1996 on coastal public lands across northwest Florida. The program is ongoing, and a permanent USDA position was established in northwest Florida to conduct the control work (Northwest Florida Partnership 2000; Daniel et al. 2002).

Diseases and parasites pose no known threat to beach mouse populations at this time.

d. Inadequacy of existing regulatory mechanisms

Choctawhatchee beach mice are also a state-listed species. The Florida Fish and Wildlife Conservation Commission's mandate is that proposed projects must show a benefit to the listed species in order for issuance of a take permit.

Coastal dunes are protected from pedestrian traffic and disturbance of vegetation on state and federal lands (through the Florida Administrative Code 62D-2 2.013(2) and park or base-specific laws and policies, respectively), but there are no such regulations pertaining to coastal dunes on private lands. The Florida Beach and Shore Preservation Act protects beach and dune systems from imprudent upland construction that could weaken, damage, or destroy the integrity of the beach and dune system. While construction is not prohibited, projects must meet special siting and design criteria.

Walton County has an ordinance that addresses animal control. Pets are not permitted to roam at large off one's property; nor are they permitted on the public beaches (county residences with permits may bring leashed dogs to the beach during restricted time periods). Feeding or harboring of feral cats is also prohibited. Bay County prohibits pets from public beaches. Animals repeatedly at large are declared nuisance animals. Okaloosa County ordinances state that pets not confined to property must be under direct control. Harboring of stray animals must be reported to the county. Despite these regulations, feral cats remain a problem in these counties. Enforcement of these ordinances by the counties is difficult and is often unpopular with the public.

e. Other natural or manmade factors affecting its continued existence:

Hurricanes affect beach mouse population densities in various habitats. Possible mechanisms for effects include direct mortality of individuals, relocation/dispersal, and subsequent long-term effects of habitat alterations (i.e., impact on food resource availability and dune structure). Habitat impacts can be widespread, encompassing the range of the subspecies.

Hurricanes affect CBM habitat in the following ways:

- 1) tidal surge and wave action overwashes habitat leaving a flat sand surface denuded of vegetation;
- 2) sand deposition completely or partially covers vegetation;
- 3) blowouts occurs between the Gulf and bay/lagoon leaving a patchy landscape of bare sand, dune, and scrub habitat;
- 4) the frontal portion of the primary dune habitat is sheared (damage to landward areas varies in severity);
- 5) vegetation is killed by salt spray; and
- 6) islands may be breached entirely and channels from the Gulf to bay/lagoon may be created.

Although hurricanes can significantly alter CBM habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes are responsible for maintaining coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Hurricanes could function to break up population subgroups and force population mixing (Holler et al. 1999). The resultant breeding between members of formerly isolated subgroups increases genetic heterogeneity and could moderate effects of genetic drift and bottlenecks.

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. This alteration in behavioral patterns causes beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird

et al. 2004). Since 2000, the Service has provided funds under the Partners for Fish and Wildlife Program for wildlife lighting changes on private lands in Walton County. The Service has also partnered with the State of Florida to produce a website to assist property owners and local governments locate and purchase wildlife lighting.

D. Synthesis

No change is recommended to the classification or priority ranking of the endangered Choctawhatchee beach mouse. The degree of threat to its persistence remains high. It is a subspecies with high level of taxonomic distinctness, and its potential for recovery is considerable if threats can be eliminated or minimized. Recovery of the Choctawhatchee beach mouse is in conflict with some economic activities, more so today than at the time of listing, which further elevates its priority ranking.

The approved recovery plan for CBM (1987) does contain recovery criteria, though it is not up-to-date in regard to species' status and threats. Impacts to CBM and CBM habitat quality have increased in the recent past from feral cat populations and residential and commercial development. With the additional stress of recent active hurricane seasons, many populations are currently fragile. Specifically, about 2,500 acres of CBM habitat remains, and with the exception of the Topsail population, which may be recovering from population lows following the hurricanes of 2004 and 2005, CBM populations appear to be on the decline or at disconcertingly low densities. Since many sites have not been trapped following the hurricanes, information reported above may be overly optimistic.

Regulatory mechanisms are in place to track impacts to CBM habitat and aid in minimizing impacts from development on public lands. However, the subspecies' requirements for corridor size and level of tolerance for fragmentation are unknown. Predator control programs have been in place on public lands since 1996, though non-native predators continue to pose a major threat to beach mice.

III. RESULTS

A. Recommended Classification

No change is needed

III.B. New Recovery Priority Number n/a

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

The following suggested recommendations are in order of priority. Please note that these actions are not necessarily specific to CBM. 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.

A. Recovery Coordinator

A full time beach mouse recovery coordinator position should be filled. Without such a position, few of the recommendations suggested can be accomplished for CBM as well other beach mouse subspecies. Furthermore, this position would allow for Field Office coordination and consistency with permitting aspects, monitoring and trapping protocols, permit compliance, research, and recovery activities such as translocations and outreach. This would also allow for more informed and consistent guidance presented to land managers and local governments.

B. Revise Recovery Plan

The 1987 Recovery Plan should be revised and updated to reflect the current status and threats to the CBM, and recovery criteria, objectives, and tasks should be developed or revised.

C. Population and Habitat Assessment program

A monitoring program should be developed and implemented for CBM. This plan should include clear goals and objectives that the data collected would be used to achieve. Aspects of this program may include habitat mapping; obtaining demographic, landscape, or dispersal data; estimating future population trends or the likelihood of extinction; assessing management options; developing criteria for recovery; 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.

D. Emergency Response Plan

A contingency plan should be developed to outline actions taken in case of severe threats to the persistence of CBM (i.e., forecasted category 5 hurricane, feral cat population increase, population crash) (Traylor-Holzer and Lacy 2007).

E. Land Acquisition

Appropriate parcels for land acquisition should be identified using LIDAR data (to identify high-elevation habitat) and current knowledge of CBM movements and habitat use. With this knowledge, the Service would be prepared to work with partners to acquire lands when opportunities arise.

F. Corridor size persistence, HCP studies

Research should be conducted to investigate the effectiveness of corridors currently set aside in HCPs. Studies should determine the minimum dimensions needed by CBM to ensure movement of individuals and genetic exchange through corridors.

G. Translocation

Multiple core populations of CBM are crucial for their long-term persistence. A comprehensive translocation plan is needed 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 should include a 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.

H. Outreach/ Education

Opportunities to convey the importance of coastal dune habitat to the public should be sought and pursued. Additional “Share the Shore” signs have been purchased by the Service and will be distributed in the summer of 2007. In addition, an outreach/education program focused on the threats feral cats pose to wildlife should also be developed.

I. Hurricane response studies

One project is underway to determine how beach mice recolonize areas after storm events. Further research should be implemented to determine the response of beach mice to storm events. This may include placing transmitters on beach mice immediately prior to a hurricane event to determine whether (or to what extent) beach mice retreat to the scrub dunes, remain in their burrows, or perish. A study to investigate the effects of revegetation and habitat modification on beach mouse habitat use and foraging patterns following storm events should be conducted.

J. Fertilization, habitat quality improvement projects

Habitat restoration projects should be developed and implemented to improve the habitat quality of areas recovering from hurricane damage. Previous studies have shown that sand fencing and application of fertilizer have yielded greater vegetative cover and greater densities of beach mice (Boyd et al. 2004).

The State greenhouse project should be continued to conduct research on cultivating and to produce commercially unavailable vegetation for dune restoration of CBM habitats.

Additional research on the effects of artificial lighting on beach mice should be undertaken. The research should focus on the different types of “wildlife lighting lamps” and how they affect beach mouse breeding, foraging and movement behavior and home range.

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**U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF THE
CHOCTAWHATCHEE BEACH MOUSE, (*Peromyscus polionotus allophrys*)**

Current Classification _____
Recommendation resulting from the 5-Year Review

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number, if applicable _____

Review Conducted By Sandra Sneckenberger, Panama City Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve *Sara A. Carmody* Date 8/15/07

The lead Field Office must ensure that other offices within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. The lead field office should document this coordination in the agency record.

REGIONAL OFFICE APPROVAL:

The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.

Lead Regional Director, Fish and Wildlife Service

Approve *Nancy E. Walsh* Date 9/4/07

The Lead Region must ensure that other regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. If a change in classification is recommended, written concurrence from other regions is required

APPENDIX A: Summary of peer review for the 5-year review of the Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*)

A. Peer Review Method:

The draft 5-year review was provided to beach mouse experts on May 30, 2006. Reviewers responded in writing by July 16, 2007.

B. Peer Review Charge:

The following instructions and guidance was provided to the peer reviewers:

“We are interested in all comments you may have about the document, but we especially seek your appraisal of our overall assessment of the status of the Choctawhatchee and Perdido Key beach mice. Do the data summarized, or any other pertinent data of which you are aware, suggest that these species should remain listed as endangered (in danger of extinction throughout all or a significant portion of its range), downlisted to threatened (likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range), or delisted?”

Peer reviewers were provided with the 5-year review draft, and Peer Review in Endangered Species Act Activities, the July 1, 1994, *Federal Register* notice establishing a peer review process for all listing and recovery actions taken under the authorities of the Endangered Species Act.

C. Summary of Peer Review Comments/Report

Comments made by Dr. Jeff Gore included suggestions to clarify historical accounts of habitat use by beach mice and how populations were assessed and classified as self-sustaining. Dr. Gore identified an error in the draft concerning the naming of the four CBM populations. He agreed that revising the recovery plan should be a priority and suggested that the revised plan have measurable population goals. Concerning future actions, Dr. Gore addressed the need for a monitoring program, a comprehensive translocation plan, as well as alternatives to land acquisition (i.e., public-private partnerships and easements).

Comments made by Dr. Ron Loggins focused on recommendations for future actions. He suggested conducting a habitat use and food habit study to elucidate the effects of revegetation and habitat modification following storm events, evaluating the corridor use and size requirements for functional corridors, improving local government cooperation in conservation efforts and regulation enforcement, developing a statewide beach mouse trapping protocol, and establishing a full time position to coordinate research, monitoring, and recovery actions of all beach mouse subspecies. Dr. Loggins also agrees that revision of the recovery plan is warranted and suggest it be a high priority. He also suggested St. Andrew State Park as a recipient site for translocation project. Dr. Loggins also suggested that habitat restoration and fertilization projects should be implemented and should be a high priority recovery action.

Comments made by Mr. Harold Mitchell included changes to improve clarity of the text, and suggested language to improve guidance provided to land managers.

D. Response to Peer Review

The Service agreed with comments and suggestions provided by the peer reviewers. The draft five-year review was modified in accordance with the reviewers' suggestions.