

Recovery Plan for Perdido Key Beach Mouse (*Peromyscus polionotus trissyllepsis*)
https://ecos.fws.gov/docs/recovery_plan/870812.pdf

Original Approved: 12 August 1987

Original Prepared by: U.S. Fish and Wildlife Service Southeast Region

We have identified best available information that indicates the need to amend recovery criteria for Perdido Key Beach Mouse (*Peromyscus polionotus trissyllepsis*; PKBM) since the recovery plan was completed. In this proposed modification, we synthesize the adequacy of the existing recovery criteria; show amended recovery criteria, and the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an addendum that supplements the Choctawhatchee Beach Mouse, Perdido Key Beach Mouse, and Alabama Beach Mouse Recovery Plan (USFWS 1987) by adding delisting criteria for the PKBM that were not developed at the time this recovery plan was completed. The original recovery objectives and the step-down outline are described on page 12 of the Recovery Plan. Recovery plans are a non-regulatory document that provide guidance on how best to help recover species.

For
U.S. Fish and Wildlife Service
Atlanta Georgia

Approved: _____

Acting

Harry Williams

Regional Director, U.S. Fish and Wildlife Service

Date: _____

December 6, 2019

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

This amendment was developed using the most recent and best available information for the Perdido Key beach mouse (PKBM) since the completion of the most current 5-Year Review: Summary and Evaluation (USFWS 2014). In addition to recent data, a primary source of information drawn upon was the 5-Year Review: Summary and Evaluation of 2007, which drew upon information from the following sources: 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Beach Mouse, Perdido Key Beach Mouse, and Alabama Beach Mouse (1987), peer-reviewed scientific publications, unpublished reports, ongoing field survey results and information from qualified Service and State biologists, the final rule listing the subspecies, revised critical habitat (2006), and peer review comments. This amendment was completed by the Service's lead recovery biologist for the Perdido Key beach mouse located at the Panama City Field Office. No part of the review was contracted to an outside party. All literature and documents used for this amendment are on file at the Panama City Field Office.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, “objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list.” Legal challenges to recovery plans (see *Fund for Animals v. Babbitt*, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five factors.

Recovery Criteria

The current Recovery Plan only provides downlisting criteria for the PKBM, and they can be found on page 12 of the document (https://ecos.fws.gov/docs/recovery_plan/870812.pdf).

Synthesis

New information and research studies have been conducted since the Recovery Plan was finalized and new data have been received since the most recent 5-Year Review. This information is synthesized below. The assessment of threats, suggested recovery actions, and life history information included in the Recovery Plan and 5-Year Review largely remain applicable and relevant. Issues related to habitat (i.e. loss, fragmentation, connectivity, management, and restoration; Factor A) and predation from non-native, invasive species and free-roaming pets (Factor C) are still directly pertinent to the PKBM’s recovery. Relevant, ongoing issues and important advances in our understanding of the PKBM that have been made since the Recovery Plan and 5-Year Review are summarized below.

Our partners have developed a noninvasive monitoring protocol that has been established across all public lands where PKBM are found. This track tube monitoring allows us to determine where PKBM are on a monthly or bi-monthly basis. While this method does not give us a population estimate, it is low impact to PKBM and less intensive than regular trapping. We get a snapshot of relative abundance over time to determine trends and when more intensive demographic monitoring or management is needed. Current track tube data suggests PKBM are doing well in three (PKBM-1 Gulf State Park, PKBM-3 Perdido Key State Park, and PKBM-5 Gulf Islands National Seashore (GINS)) out of five critical habitat units. The private lands that largely occupy the other two critical habitat units (PKBM-2 West Perdido Key and PKBM-4 Gulf Beach) are covered under the Habitat Conservation Plan (HCP) for Escambia County. This HCP has been successful in leading to the acquisition of additional County owned conservation lands and providing oversight and guidance for private landowners to develop their property with conservation measures to benefit PKBM and other coastal species. Although local extirpations are a normal part of PKBM demographics, habitat destruction and fragmentation have made it difficult for PKBM to recolonize and rebuild their population numbers without human management. Incompatible development practices and impacts from non-native species also contributed to lower population numbers. In addition, stochastic events such as hurricanes had strongly affected PKBM, i.e., almost 10 years ago Hurricane Ivan severely impacted PKBM with possible extinction. Other threats, such as free-roaming or feral cats and other non-native predators, require constant management and have not yet been adequately controlled in these developed areas. Focus on non-native predators is needed in the smaller units surrounded by development as well as a focus on habitat restoration to enhance connectivity to these units.

Connectivity between the larger core populations is a concern. This issue occurs mostly on private lands. Many private lands have developed too close to the Gulf and lost their dune ecosystem between the development and the water, this creates a barrier for PKBM to get around the structures and non-native landscaping. We are working to address this issue with new construction, but older, existing developments continue to be a concern. On Perdido Key, a vegetated berm was constructed after Hurricane Ivan that did improve connectivity between all five critical habitat units. While this was not the initial intent of the project, it did act as a corridor for PKBM to expand and have access through the private lands to the other conservation lands. This identified a mechanism to fulfill the immediate coastal protection need with the needs of wildlife.

Genetic divergence between the eastern and western portions of the PKBM range has been apparent in the past. However, the previous mentioned berm allowed mice to expand to other areas to mix with those individuals. Recent sampling has indicated PKBM was more genetically mixed throughout their entire population than the other panhandle beach mice. It is also a concerted effort to keep the genes in the captive bred population as close to the wild population as possible. The PKBM captive population is housed at three zoos in Florida (Santa Fe Teach Zoo, Brevard Zoo, Palm Beach Zoo) and is routinely managed with the lead recovery biologist and a geneticist.

Perdido Key Beach Mice depend on three types of the coastal dune habitat (primary, secondary, and scrub). This coastal dune ecosystem is dynamic and will always be changing. Storms always have the potential to completely alter the coastal dune habitat as was experienced by Hurricane Ivan which directly impacted the entire range of PKBM. With the potential for more frequent and intense storms, the coastal dune environment may not have the ability to grow and reform as it has in the past. It is likely we will lose much of the three types of the coastal dune habitat.

The Recovery Plan does not specifically address climate change or sea level rise in the PKBM recovery criteria or recovery actions. Using the NOAA Sea-level Rise Viewer tool (NOAA 2017); with a 3-foot rise in sea-level, wash overs through low lying portions of GINS are apparent. This will permanently sever connectivity between habitat on either side of the breach. Many of the larger dunes swales on GINS and PKSP become permanently flooded, thus isolating high dunes around it and preventing PKBM from accessing the swales under dry time periods. Bays and inland waters connected to the Gulf quickly engulf coastal dune swales from rising backwaters and become fragmented by newly formed connections between the bay and gulf. This intermediate scenario is predicted to occur in 50-70 years (NOAA 2017). The higher dune habitat will still be available, but upland access and connectivity will be severed.

Free-roaming and feral cat populations in PKBM range are largely comprised of outdoor pets and unwanted pets. The free-roaming/feral cats are usually associated with development near the coastal dune habitat. In previous years, cat colonies have been discovered that were responsible for localized extirpations of PKBM. Free-roaming and feral cats will always be a threat to PKBM if local ordinances and predator management actions are not enforced or adopted.

Additional information needs and data gaps still remain that could impede recovery. For example, how quickly PKBM will begin to use dune restoration sites and berms; or how effective are the conservation measures associated with the HCP and development?

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the protections afforded by the Act are no longer necessary and the Choctawhatchee beach mouse may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term “endangered species” means any species (species, sub-species, or designated population segment) which is in danger of extinction throughout all or a significant portion of its range. The term “threatened species” means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made “solely on the basis of the best scientific and commercial data available.” Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species’ status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

Downlisting Recovery Criteria

We are not amending the existing downlisting criteria. Please refer to page 12 of the Recovery Plan.

Delisting Recovery Criteria

The Perdido Key beach mouse will be considered for delisting when all the following criteria have been met:

1. Populations inhabiting all five (5) critical habitat units (see Figure 2 & 5 of the Recovery Plan) exhibit stable or increasing trends, evidenced by natural recruitment and multiple age classes (Factor A).

2. Habitat connectivity shall be maintained throughout the range to a level that genetic diversity among populations does not require translocations, captive breeding, human intervention, and populations in all 5 critical habitat units can rebound from catastrophic weather events (Factors A and E).
3. All designated PKBM critical habitat under public ownership (Federal, State, and Local entities) is protected and under a conservation management plan and private lands supporting PKBM populations implement conservation measures that focus on coastal dune habitat and beach mouse conservation (Factor A).
4. Non-native predator and competitor species removal (specifically, free-roaming/feral cats) shall be conducted to a degree that PKBM populations in all 5 critical habitat units will remain viable for the foreseeable future. (Factors C and D).
5. When, in addition to the above criteria, it can be demonstrated that habitat loss associated with climate change/sea level rise and development are diminished such that enough suitable habitat remains in the foreseeable future for PKBM to remain viable (Factor E).

Justification

The proposed delisting criteria reflect the best available and most up-to-date information of the PKBM, while incorporating information still relevant from the Recovery Plan. Furthermore, the delisting criteria developed reflect the species' overarching recovery strategy, and are consistent with current goals, objectives, and known risk levels.

Specifically, each delisting criterion ensures that the underlying causes of decline and impediments to recovery will be addressed and mitigated by:

Criterion 1. Providing redundancy through multiple populations and sufficient habitat, and reaching demographic parameters that allow for resilient and stable populations. Providing natural, functional connectivity is critical because the intensive management actions required to lessen the effects of fragmentation is very labor intensive and only provides short-term solutions. Since populations of many small mammals, including the PKBM, fluctuate cyclically, it is necessary to evaluate population demographics amongst multiple generations to assess true trends. For the PKBM it is believed that a minimum of five populations exhibiting these traits are necessary to provide sufficient redundancy to ensure the species will no longer require protection under the Act. Five populations equates to one in each of the defined critical habitat units. These units are defined in the Critical Habitat Rule (USFWS 2006). The three core units on public lands (PKBM-1, PKBM-3, and PKBM-5) will always function at a higher ecological level than the two units (PKBM-2 and PKBM-4) on public lands, but habitat in PKBM-2 and PKBM-4 is essential for connectivity and repopulating after a catastrophic storm. PKBM-4 contains valuable high elevation scrub habitat that has been conserved through consultations and partnerships. PKBM-1, PKBM-3, and PKBM-5 critical habitat units should show an average occupancy rate of 85% or better over a 20 year time period based on current track tube monitoring. PKBM-2 and PKBM-4 units will always have a lower occupancy rate due to the higher development. These areas should maintain an average of 70% occupancy over a 20 year period. Further habitat conservation provided through the Perdido Key Habitat Conservation Plan will contribute to efforts to reach a stable population on the private lands, this plan includes the development footprint over the entire range of PKBM. To implement this criterion, a time

frame of at least 20 years is necessary to evaluate population trends and whether these areas can sustain population declines after impacts from stochastic events such as hurricanes.

Criterion 2. Providing resiliency through maintenance of genetic connectivity across the entire range to ensure subspecies long-term viability. For PKBM, habitat connectivity between critical habitat units will ensure that gene flow can maintain genetically diverse populations, prevent future extended bottlenecks and isolated populations, and allow extirpated populations to reestablish themselves without translocations and captive breeding. Management actions are needed to assess the genetic diversity include trapping the entire population within each of the 5 units and collecting genetic samples every 5 years. Preservation and management of north-south and east-west suitable habitat corridors are required to achieve the needed genetic diversity and to enable movement across the species range and between critical habitat units.

Criterion 3. Developing/updating management plans and implementing recovery actions with our partner agencies on publicly owned lands will ensure sufficient habitat and proper management is available into the future. Specific commitments should be made in management plans that indicate management efforts will focus on restoring degraded or damaged coastal dune habitat back to high-quality coastal dune habitat following significant storm damage or human induced damage. Restoration efforts should consider PKBM as well as other coastal species needs.

Criterion 4. Providing a long-term solution to significantly reduce or eliminate the threat of non-native species. Non-native predator and competitor species should have no negative impacts to the viability of any PKBM population. One of the biggest threats to beach mice are predation from free roaming/feral cats. Currently, there are efforts by our partners to reduce the threat of non-native species to our native listed species. Specific mechanisms to quickly identify and remove free roaming/feral cats have been adopted in state park management plans and habitat conservation plans. Consistency and collaboration among implementing these plans should be made. Certainty of funding and objectives focused on PKBM are still needed.

Criterion 5. Ensuring sufficient habitat is expected to remain for long-term persistence, despite habitat changes and habitat loss projected due to climate change/sea level rise. Regulatory actions focused on PKBM conservation by local and state government entities is also needed to help meet this criteria. The PKBM is highly susceptible to localized extirpations and without enough habitat of sufficient quality, populations are increasingly vulnerable to threats from non-native species, climate change, and demographic limitations (i.e., populations are too small to withstand natural levels of predation, environmental variation).

Together, these recovery criteria address threats related to habitat loss and fragmentation, non-native predators, genetic diversity, and climate change; all of which are likely drivers of the PKBM's population demographics and the species' long-term persistence.

Rationale for Amended Recovery Criteria

The existing criteria for PKBM on page 12 of the Recovery Plan (USFWS 1987) (https://ecos.fws.gov/docs/recovery_plan/870812.pdf) included only downlisting criteria. The amended delisting recovery criteria provide an avenue for connectivity through private lands to

connect the larger core PKBM populations on public lands. It is imperative that the primary dune systems be restored along these private lands. It is the main pathway for connectivity between the existing PKBM populations. When populations become extirpated or significantly imperiled due to hurricanes or other climate related actions, the habitat needs to be restored or maintained to allow PKBM to repopulate these areas. Scrub habitat is a valuable resource to preserve throughout the entire range, as this is the only area PKBM will be able to survive a major hurricane and be able to repopulate from as evident from past hurricanes. Recovery of PKBM can only be achieved when the habitat is available and connectivity is established to ensure genetic diversity.

With the proposed amendments, delisting has been clearly defined with measurable, objective criteria in keeping with the recovery strategy and goals outlined in the Recovery Plan. These criteria address what is necessary to ensure resiliency, redundancy, and representation by addressing factors that threaten the species. In achieving these criteria, we expect the PKBM to have a low probability of extinction for the foreseeable future and have stable populations needed for long-term recovery. We will work together with our partners to strategically and efficiently implement the new criteria.

LITERATURE CITED

- National Oceanic and Atmospheric Association (NOAA). 2017. Global and Regional Sea Level Rise Scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. Silver Spring, MD.
- U.S. Fish and Wildlife Service. 1987. Recovery plan for the Alabama beach mouse (*Peromyscus polionotus ammobates*), Perdido Key beach mouse (*P. p. trisyllepsis*), and Choctawhatchee beach mouse (*P. p. alloparys*). U.S. Fish and Wildlife Service, Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 2006. Designation of critical habitat for the Choctawhatchee beach mouse, Perdido Key beach mouse, and St. Andrew beach mouse: Final Rule. U.S. Fish and Wildlife Service. Washington, DC.
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- Florida Fish and Wildlife Conservation Commission. 2017. Beach Mouse Track Tube Monitoring in Northwest Florida January 2017 – June 2017. Panama City, Florida.
- Florida Fish and Wildlife Conservation Commission. 2018. Beach Mouse Track Tube Monitoring in Northwest Florida July 2017 – July 2018. Panama City, Florida.

APPENDIX – SUMMARY OF PUBLIC COMMENTS RECEIVED AND RESPONSES

We published a notice of availability in the Federal Register on August 6, 2019 (84 FR 151) to announce that the draft amendment to the Perdido Key Beach Mouse Recovery Plan was available for public review, and to solicit comments by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information base, assumptions, and conclusions presented in the draft revision. We received two responses in total. These included comments from interested citizens as well as non-governmental organizations and interest groups.

Public comments ranged from providing minor editorial suggestions to specific recommendations on plan content. We have considered all substantive comments. We thank the reviewers for these comments and to the extent appropriate, we have incorporated the applicable information or suggested changes into the final recovery plan amendment.

Below, we provide a summary of public comments received; however, some of the comments that we incorporated as changes into the recovery plan amendment did not warrant an explicit response and, thus, are not presented here. We also provided copies of all comments received during the formal public comment period to all relevant Federal agencies for their consideration prior to implementation of the final recovery plan, in accordance with section 4(f)(5) of the Act.

Comment 1: In the Synthesis, in the paragraph on genetic variation, that is the first time the captive populations are mentioned. We believe it is essential to include a full summary about the status of the captive populations in the paragraph on population status. That summary should list the zoos in which those populations are held, it should include information on the status of each population and how long each population has been held in captivity. That summary also should include information about PKBM previously being held at the Peromyscus Genetic Stock center.

Response 1: The full summary of this discussion is more appropriately to be covered in the 5-year review. A sentence to mention the zoos was added.

Comment 2: In the criteria, we are concerned there is no clear period of time over which to assess stability and the terms "multiple generations" and "foreseeable future" are vague and undefined as used there. For small mammal species such as this, there could be multiple generations within a year. We recommend that explicit periods of time be incorporated to provide better guidance. For example, 6 years instead of multiple generations as a measure for viability or stability and 50-75 years instead of foreseeable future.

Response 2: We agree, and the 20 year period was added back into the justification for Criterion 1. 20 years is consistent with the delisting criteria in St. Andrew beach mouse Recovery Plan.

Comment 3: We recommend that all the delisting criteria be stated using terms that are measurable and specific to provide greater clarity and make it possible to measure accurately whether a criterion has been achieved. For example, list thresholds for number of breeding individuals, amount of available, high-quality PKBM habitat,

including thresholds for proportion of habitat that is occupied, and a quantifiable measure of threat of predation.

Response 3: It is stated that all critical habitat on public lands be managed for beach mice and the coastal ecosystem. Also, we added occupancy metrics based on our current long term track tube monitoring for each of the critical habitat units.

Comment 4: For criterion 1, we recommend that "stable" be replaced by "viable" and that there should be a specified minimum period of time over which viability is maintained (e.g., 10 years).

Response 4: We added...for a period of 20 years according to current monitoring methods in the justification. This makes it consistent with the St Andrew beach mouse delisting criteria. Stable or increasing trends is intended to capture viability. Viable is in the document numerous times as well.

Comment 5: It is possible that monitoring of the PKBM populations will not be done with sufficient frequency or with necessary methods (e.g., live trapping) to accurately measure status (i.e., population size) and trends (i.e., fluctuations in population size). Therefore, we recommend the term "viable" be defined for populations, especially any new populations, in terms of a threshold for an amount of suitable, occupied habitat for each population as the primary criterion in combination with a specific measure of occupancy. An appropriate measure of occupancy over a stated period of time (e.g., 80% occupancy per survey, on average across 10 years) should be specified as a threshold to demonstrate viability. A specified minimum population size could be included as a secondary criterion with recognition in the Justification of the challenges that have to be overcome to accurately measure population size across a given area, over a specified number of years.

Response 5: We have always chosen to focus on conservation of habitat acres as a surrogate for beach mouse population numbers due to their highly fluctuating and uncertainty of population numbers over a short period of time. Plus the inability to obtain regular population estimates for a given population makes it difficult to set and reach a specified number of individuals. We state in Criterion 3 that all critical habitat on public lands would need to be protected and under a conservation management plan that focuses on the coastal dune ecosystem and beach mouse conservation and that private lands would need to adopt conservation measures. We also added a 20 year timeframe as a target in the justification.

Comment 6: For criterion 1, we agree that it would be good to have a viable, self-sustaining PKBM population established in each of the 5 critical habitat units. However, it does not appear that there are sufficient areas of potentially suitable habitat present in either the West Perdido Key Unit (PKBM-2) or the Gulf Beach Unit (PKBM-4) for those areas to be managed as viable, self-sustaining PKBM populations. We believe it would be more reasonable to manage for 3 core populations at Gulf State Park in Alabama, and Perdido Key State Park (PKSP) and Gulf Islands National Seashore (GINS) in Florida. For PKBM conservation to be most effective we believe language in this criterion, or in the Justification for it, should be clear that where potentially suitable habitat is contiguous across multiple parcels of land, then that area would be managed as one population. For

example, habitat in the PKBM-2 unit should be managed as part of the PKSP population and habitat in the PKBM-4 unit should be managed as part of the GINS population. For more effective conservation going forward, we believe it is essential to state the area, including specific locations or site names, across which each of those populations is proposed to occur. If possible, a map should be included that shows areas encompassed by each population, the locations of the critical habitat units and all Habitat Conservation Plan lands within the PKBM range.

Response 6: We have several HCPs in the PKBM-2 and PKBM-4 critical habitat units that have requirements to conserve beach mice and their habitat. We acknowledge these areas will not function as the core units on the public conservation lands, these private lands are valuable for connectivity and are contributing towards recovery efforts. We believe these efforts are needed to fully recover the species. Clarification was made in this document to reference the full critical habitat unit name). Also, the maps are in the recovery plan and will be included in the new 5-years reviews. This delisting criteria is part of the overall recovery plan, but we could include the critical habitat unit maps for ease of reference.

Comment 7: If USFWS believes it is essential to manage for a minimum of 5 viable, self-sustaining PKBM populations, we suggest including in the Justification the evidence or expert opinion on which that minimum of 5 populations is based.

Response 7: Clarification was added to the justification.

Comment 8: We agree with the goal of criterion 2 to maintain connectivity, but we suggest the wording could be more specific to avoid any confusion about what is needed. For example, "Corridors of suitable habitat are maintained that enable beach mice to move between units or sites occupied by PKBM populations." Then in the Justification, supplement that with a statement that habitat connectivity allows genetic diversity to be maintained and extirpated populations to be re-established without the need for translocations or captive breeding. Include a measurable threshold for success as well.

Response 8: Clarification was added in Criterion 2 and justification sections.

Comment 9: For criterion 3, we recommend changing the wording from "...a conservation mechanism that addresses beach mice" to "...a conservation mechanism that requires the conservation of beach mice."

Response 9: Done, revised language was added.

Comment 10: We recommend having criterion 4 state "There are no negative impacts to the viability of any PKBM population caused by competition or predation from non-native species..." Include a measure of time for stability (e.g., 10 years) and a measure to indicate that non-native species are maintained at or below a threshold level on all sites or units occupied by PKBM over that time. Then, in the Justification provide language summarizing potential negative impacts to the viability of beach mouse populations from non-native species including competition with non-native house mice (*Mus musculus*) and predation from free-roaming and feral house cats.

Response 10: Done, revised language was added.

Comment 11: We also recommend that a habitat management criterion be added to specify that occupied or potentially suitable beach mouse habitats existing on publicly owned lands or lands protected by a conservation easement should be managed appropriately and regularly - and actively restored if damaged - so that conditions remain of high-quality for PKBM populations. Further clarification should be provided a) to define what standard is applied for determining "high-quality" conditions, b) to clarify that "damaged" is damaged or eroded as a result of human activities or natural (e.g., storms) events, and c) to clarify that "actively restored" is appropriate, active habitat restoration activities carried out to restore an area to high-quality conditions. And, we also recommend being clear in this criterion that active habitat management and restoration activities need to maintain a sufficient amount of suitable habitat available for the PKBM populations to remain above the threshold defined as the minimum for a viable population. Further, it should be stated clearly in this criterion that restoration of beach mouse habitat needs to be a high priority after severe erosion caused by storms on state, federally, or county managed lands, and should be done in coordination with actions to improve conditions for other state or federally imperiled species.

Response 11: Done, more language was added to criteria 3 and the justification section.

Comment 12: In Criterion 2 justification section this is a bit confusing - between populations ...leads to diverse population Replace with "For PKBM, habitat connectivity between critical habitat units will ensure that gene flow can maintain genetically diverse populations"

Response 12: Clarified language in justification section for Criterion 2.

Comment 13: In justification Criterion 2; instead of...preserves the subspecies and prevent bottlenecks. Maybe say "ensures subspecies long-term viability" instead?

Response 13: Done, suggested change was made.

Comment 14: "Our partners have developed a noninvasive monitoring protocol that has been established across all public lands where PKBM habitat and connectivity are found." Connectivity here is used as a noun. I would suggest rewording this to read "...public lands where PKBM habitat use, including for connectivity are found."

Response 14: Done, suggested edit was made.

Comment 15: We get a snapshot over time to determine trends and when more intensive management is needed." This seems a bit vague but may be desired to be so. Alternatively; I suggest... "We get a snapshot of relative abundance over time to determine trends and when more intensive demographic monitoring is needed."

Response 15: Done, suggested edit was made.

Comment 16: "Genetic variation between the eastern and western portions..." This is somewhat picky but variation from east to west can mean a couple things, importantly it is the genetic divergence being seen that has indicated strong effects of genetic drift due to lack of connectivity and small population sizes. Change to; "Genetic divergence between the eastern and western portions..."

Response 16: Done, suggested edit was made.

Comment 17: "Criterion 2. Providing resiliency through maintenance of genetic diversity across the entire range preserving the subspecies and prevent bottlenecks. For CBM, habitat connectivity between the populations will lead to a genetically diverse population. Management actions are in place to assess the genetic stability when required. Management and preservation of north south and east-west habitat corridors are required to achieve the needed genetic diversity across the species range and facilitate recolonization of areas after localized extirpations." The logic here is understood in spirit; however, the following wording will make this more precise with respect to the genetic effects of maintaining connectivity and its benefits. "Criterion 2. Providing resiliency through the maintenance of genetic connectivity across the entire range, thus preserving the subspecies and preventing future extended bottlenecks. For [subspecies x], habitat connectivity between the populations will increase and maintain the genetic variation of isolated populations. Management actions are in place to assess the genetic diversity when required. Management and preservation of north south and east-west habitat corridors are required to achieve the needed genetic diversity across the species range and facilitate recolonization of areas after localized extirpations."

Response 17: Done, suggested edits were made.

Comment 18: "This amendment was developed using the most recent and best available information..." I trust that this is the case, however, I was surprised that such information was not identified in the document, nor provided in "Literature cited" sections. I suggest changing the last section from "Literature Cited" to something like "Further reading" or "Relevant document".

Response 18: The literature is cited in the recovery plans, and 5-year reviews. We refer to these documents for more detailed information.