Recovery Plan for the Endangered Key Largo Cotton Mouse
(Peromyscus gossypinus allapaticola)
https://www.fws.gov/verobeach/MSRPPDFs/KeyLargoCottonmouse.pdf

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DRAFT AMENDMENT 1

We have identified the need to amend recovery criteria for Key Largo cotton mouse (*Peromyscus gossypinus allapaticola;* KLCM) with the best available information discovered since the recovery plan was completed. In this proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and provide rationale supporting the proposed recovery plan modification. The proposed modification is shown as an addendum that supplements the South Florida Multi-Species Recovery Plan (MSRP; USFWS 1999) by adding delisting criteria for the KLCM 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 4-89 of the MSRP. Recovery plans are a non-regulatory document that provide guidance on how best to help recover species.

For
U.S. Fish and Wildlife Service
Region 4
Atlanta, Georgia

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METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

These proposed amendments to the recovery criteria were developed using the most recent and best available information for the species. This information was prepared by the U.S. Fish and Wildlife Service (Service) biologists and managers in the South Florida Ecological Services Field Office in order to develop the recovery criteria for the KLCM.

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 listing factors.

Recovery Criteria

The MSRP only provides downlisting criteria for the KLCM, and they can be found on page 4-89 of the document (https://www.fws.gov/verobeach/MSRPPDFs/KeyLargoCottonmouse.pdf).

Synthesis

New information obtained after the MSRP was finalized is detailed in the KLCM 5-Year Status Review (USFWS 2009), and synthesized below. The assessment of threats, suggested recovery actions, and life history information included in the MSRP largely remain applicable and relevant. Issues related to habitat (i.e., loss, fragmentation, need for management or restoration; Factor A) and predation and competition from non-native, invasive species and free-roaming pets (Factor C) are still directly pertinent to the KLCM's recovery.

However, some important advances in our understanding of the KLCM have been made since the MSRP. Since Burmese pythons (*Python bivittatus*) were first documented in the KLCM's range in 2007, over 50 pythons have been captured on Key Largo (EDDMapS 2017; Hanslowe et al. 2018). Evidence of a breeding population of Burmese pythons (three 18-inch hatchlings) was observed in 2016. Burmese pythons are known to kill mice. Through camera surveillance of releases of captive-bred Key Largo woodrats, free-roaming cats were found to be a threat to KLCM that far exceeds previous assessments. Free-roaming cats are known to kill cotton mice. Thousands of black and white tegus (*Salvator merianae*) have been observed in the Florida City area, and there have been two found in Key Largo (Klug et al. 2015; EDDMaps 2018). While not a documented predator of the KLCM, this omnivore is highly intelligent, capable of running at relatively high speeds, and known to consume small vertebrates.

The MSRP does not specifically address climate change or sea level rise in the KLCM recovery criteria or recovery actions. The KLCM's distribution appears to be undergoing a constriction due to encroaching mangrove areas from the coast and human infrastructure expanding from the island's interior toward the coast (i.e., "coastal squeeze"; Factor D, E). Recent models suggest that particularly at three to four feet of sea level rise, water levels will severely fragment habitat and several habitat bottlenecks will materialize (FWC 2017). This level of sea level rise is forecasted to occur in 42 to 80+ years (2060-2100; NOAA 2017), but does not account for reduction of KLCM habitat due to habitat changes (i.e., hardwood hammock transitioning into mangroves) that are likely to occur decades prior to inundation (Saha et al. 2011).

Additional information needs and data gaps still remain that could impede recovery. For example, despite multiple studies (Brown 1970; Barbour and Humphrey 1982; Humphrey 1988; Keith and Gaines 2002) focused on habitat preferences or the "hammock age", varying results have led to different theories as to which habitat types have the highest density of KLCM. Impacts to habitat from hurricane Irma may allow for some habitat comparisons to be added to current research efforts, or a specific treatment study will need to be developed. Uncertainties also exist related to the genetic structure of KLCM within their range and the level of historical and present fragmentation. Information concerning present levels of genetic diversity and variation in KLCM is not available, however there is concern that their genetic structure may parallel that of Key Largo woodrat (i.e., impacted by similar habitat fragmentation). Finally, several predators and competitors (e.g., black rats, fire ants), diseases, and parasites (e.g., raccoon roundworm, toxoplasmosis, rat lungworm) have the potential to severely impact KLCM

populations, particularly during vulnerable periods (i.e., drought, post-hurricane, natural population low)(Smyser et al. 2013; Dalton et al. 2017; Chalkowski 2017). Further surveillance of these predators, diseases, and their vectors, are needed to determine the scope and severity of these threats.

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 KLCM 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 distinct 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*.

Herein, we provide delisting criteria for the KLCM as the MSRP only developed downlisting criteria as discussed above.

Downlisting Recovery Criteria
We are not amending the existing downlisting criteria (please refer to page 4-89 of the MSRP).

Delisting Recovery Criteria

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

1. Five (5) additional populations are established or discovered within the historical range of the species that exhibit a stable or increasing population trend for multiple generations, and natural recruitment (Factor A).

2. The five (5) new populations should be located outside of Dagny Johnson Botanical Preserve State Park and Crocodile Lake National Wildlife Refuge and be connected to the extent that genetic diversity can be naturally maintained without translocations or captive breeding (Factor A, D, E).

3. Non-native species (e.g., Burmese pythons, tegus, free-roaming pets, black rats, fire ants) are reduced or eliminated to a degree that predation and competition are low enough for KLCM to remain viable for the foreseeable future (Factor C, D).

4. When, in addition to the above criteria, it can be demonstrated that habitat loss associated with sea level rise and development are diminished such that enough suitable habitat remains for KLCM to remain viable for the foreseeable future (Factor E).

Justification

The proposed delisting criteria reflect the best available and most up-to-date information of the KLCM, while incorporating information still relevant from the MSRP. 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. Provides redundancy through multiple populations and sufficient habitat, additionally reaching demographic parameters allows for resiliency to stochastic events. Since populations of many small mammals, including the KLCM, fluctuate cyclically, it is necessary to evaluate population demographics across multiple generations to assess true trends.

Criterion 2. Providing redundancy through multiple sites, resiliency through maintenance of genetic diversity in order to preserve population variability (i.e., maintain unique local adaptations) and population adaptability (i.e., capability to adapt to environmental stressors). Providing natural, functional connectivity is critical to counteract fragmentation and allow for natural gene flow.

Criterion 3. Providing a long-term solution to significantly reduce or eliminate the threat of non-native species.
Criterion 4. Ensuring sufficient habitat is expected to remain for long-term persistence, despite habitat changes and habitat loss projected due to sea level rise.

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

Rationale for Amended Recovery Criteria

The existing criteria for KLCM on page 4-89 in the MSRP (Service 1999) (https://ecos.fws.gov/docs/recovery_plan/sfl_msrp/SFL_MSRP_Species.pdf) included only downlisting criteria. With these proposed amendments, delisting has been clearly defined with measurable, objective criteria in keeping with the recovery strategy and goals outlined in the MSRP. 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 KLCM 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.

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