

Recovery Plan for the Endangered Lower Keys Marsh Rabbit (*Sylvilagus palustris hefneri*)  
<https://www.fws.gov/verobeach/MSRPPDFs/LowerKeysRabbit.pdf>

Original Approved: May 18, 1999

Original Prepared by: South Florida Ecological Services Office staff

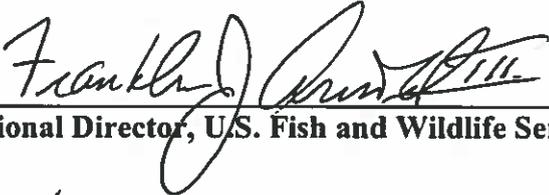
#### AMENDMENT 1

We have identified the need to amend recovery criteria for Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*; LKMR) with the best available information discovered since the recovery plan was completed. In this modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and provide rationale supporting the recovery plan modification. The modification is shown as an addendum that supplements the South Florida Multi-Species Recovery Plan (MSRP; USFWS 1999) by adding delisting criteria for the LKMR 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 4-165 of the MSRP. Recovery plans are non-regulatory documents that provide guidance on how best to help recover species.

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

Approved: \_\_\_\_\_

Acting

  
Regional Director, U.S. Fish and Wildlife Service

Date: \_\_\_\_\_

11/12/19

#### METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

These 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 LKMR.

#### 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 LKMR, and they can be found on page 4-165 of the document (<https://www.fws.gov/verobeach/MSRPPDFs/LowerKeysRabbit.pdf>).

## Synthesis

New information, attained after the MSRP was finalized, is detailed in the LKMR 5-Year Status Review (USFWS 2007) 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 of freshwater wetlands; Factor A) and predation from non-native, invasive species and free-roaming pets (Factor C) are still directly pertinent to the LKMR recovery. Relevant, ongoing issues and important advances in our understanding of the LKMR that have been made since the MSRP are summarized below.

Encroachment of woody vegetation or buttonwood (*Conocarpus erectus*) overgrowth has occurred due to a lack of natural disturbance within LKMR habitat patches. Instead of marsh and wetland habitat generally dominated by cordgrass (*Spartina* spp.) with sparse buttonwood, buttonwood grows to form a thick forest. Where buttonwood forms this dense canopy, herbaceous cover is generally sparse, which leads to local LKMR extirpations. Conversely, recent habitat conversion work on Naval Air Station – Key West to clear visual obstructions for aircraft has altered the hydrology and vegetative structure of the site, resulting in an increase of acres of grassy marsh and prairie habitat. This resulted in local population increases for the LKMR.

Overall, genetic variation within LKMR is low, but two genetic lineages exist (Crouse et al. 2009). These eastern (Big Pine Key area) and western (Boca Chica Key area) metapopulations exhibit strong genetic differentiation, and very limited or no genetic exchange. This is likely due to dispersal barriers, but maintaining these separate clades should be considered in any future translocation or captive breeding planning.

Sea level rise is a contemporary issue for the LKMR. From 1959 to 2006, 64 percent of LKMR habitat was lost, and 48 percent was lost due to sea level rise (Schmidt et al. 2012). LKMR require freshwater habitats and recent models suggests that particularly at an estimated 3 feet of sea level rise, water levels will result in permanently brackish conditions within representative wetlands on Big Pine Key (FWC 2017). This level of sea level rise is forecasted to occur in less than 45 years (NOAA 2017), but does not account for reduction of LKMR habitat due to habitat changes (i.e., saltwater intrusion into marshes) that are likely to occur decades prior to inundation (Saha et al. 2011). These climate change effects are further exacerbated by development, which worsens the effects of habitat fragmentation and invasive species.

Free-ranging cat populations in the Florida Keys are primarily comprised of house cats and semi-feral, “managed” cat colonies. Feral cat densities on Big Pine Key are over 4 times that in Key Largo (Cove et al. 2018a), where they also prey upon endangered species. Reducing the number of free-ranging cats was found to be an effective management practice that promotes LKMR

colonization of vacant habitats (Cove et al. 2018b). Burmese pythons (*Python bivittatus*) were not a threat, or known to be a threat, at the time of the MSRP, but were first documented in the Keys in 2007. At least 4 pythons have been captured west of the Seven-mile Bridge (just east of Big Pine Key) since then (EDDMapS 2018; Hanslowe et al. 2018).

Additional information needs and data gaps still remain that could impede recovery. For example, further information regarding vehicle-related mortality, pesticide use and its effects on LKMR, disease, altered hydrology, and the design and efficacy of wetland restoration projects are needed to determine their scope, severity, and potential effects.

## **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 LKMR 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 LKMR as the MSRP only developed downlisting criteria, as discussed above.

### **Downlisting Recovery Criteria**

We are not amending the existing downlisting criteria, they can be found on page 4-165 of the document (<https://www.fws.gov/verobeach/MSRPPDFs/LowerKeysRabbit.pdf>).

## **Delisting Recovery Criteria**

The Lower Keys marsh rabbit will be considered for delisting when all the following criteria have been met:

1. At least 13 LKMR populations on eight (8) islands connected by U.S. Highway 1 and five (5) “backcountry” islands exhibit a stable or increasing trend, as evidenced by natural recruitment for multiple generations. (Factor A)
2. The LKMR metapopulation is connected to the extent that genetic diversity can be naturally maintained without translocations or captive breeding. (Factors A, D, E)
3. Predation from non-native species (e.g., Burmese pythons and free-roaming pets) is low enough for LKMR to remain viable for the foreseeable future. (Factors C, D)
4. When, in addition to the above criteria, it can be demonstrated that habitat loss associated with sea level rise, development, fire suppression, lack of natural disturbance, and buttonwood encroachment are diminished or reversed such that enough suitable habitat remains in the foreseeable future for LKMR to remain viable. (Factors A, E)

## **Justification**

The delisting criteria reflect the best available and most up-to-date information on the LKMR, 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. Providing redundancy through multiple populations and sufficient habitat, and reaching demographic parameters that allow for resilient and stable populations. Since populations of many small mammals, including the LKMR, typically fluctuate, it is necessary to evaluate population demographics across multiple generations (i.e., at least 10 years, considering the species’ natural population variability) to assess true trends. Furthermore, a specific measure of occupancy (i.e., 80% occupancy per survey, on average across 10 years) for all potentially suitable habitat is needed to assess and address any impediments to recovery. Historically, LKMR occupied most if not all of the 30 islands (approximate) from Big Pine Key to Boca Chica Key, and likely Key West (DePourtales 1877, Layne 1974, Howe 1988, Lazell 1989). We identified the need for resilient populations on a minimum of 13 keys (8 main, 5 backcountry) via basic spatial analysis, considering the space and connectivity available in close proximity to occupied habitat, and what is needed (estimated) to reach a low probability of extinction. These keys are required, not only to comprise the amount and diversity of habitat needed and redundancy in light of known threats, but also to maintain the LKMR’s disparate genetic clades.

Criterion 2. Providing 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 (demonstrated by genetic or movement data) is also critical to counteract fragmentation and allow for natural gene flow.

Criterion 3. Providing a long-term solution (i.e., 50 years or longer) to significantly reduce or eliminate the threat of predation by non-native species. Habitat should be free of predators like pythons and free-roaming cats for a minimum of 5 years.

Criterion 4. Providing redundancy and resiliency through sufficient habitat that allows for stable populations, and ensuring sufficient habitat is expected to remain for long-term persistence (i.e., 50 years or longer), despite habitat changes and habitat loss projected due to sea level rise and development. The LKMR is highly susceptible to 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 cover threats related to habitat loss and fragmentation, non-native predators, genetic diversity, and climate change; all of which are likely drivers of the LKMR's population demographics and the species' long-term persistence.

### **Rationale for Amended Recovery Criteria**

The existing criteria for LKMR on page 4-165 in the MSRP (USFWS 1999) ([https://ecos.fws.gov/docs/recovery\\_plan/sfl\\_msrp/SFL\\_MSRP\\_Species.pdf](https://ecos.fws.gov/docs/recovery_plan/sfl_msrp/SFL_MSRP_Species.pdf)) included only downlisting criteria. With these 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 LKMR 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**

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## **APPENDIX – SUMMARY OF PUBLIC, PARTNER, AND PEER REVIEW COMMENTS RECEIVED**

### **Summary of Public Comments**

We published a notice of availability in the Federal Register on August 6, 2019 (84 FR 38284) to announce that the draft amendment to the Lower Keys Marsh Rabbit 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. An electronic version of the draft amendment was posted on the Service's Species Profile website

([https://ecos.fws.gov/docs/recovery\\_plan/Lower%20Keys%20Marsh%20Rabbit%20Recovery%20Plan%20Amendment.pdf](https://ecos.fws.gov/docs/recovery_plan/Lower%20Keys%20Marsh%20Rabbit%20Recovery%20Plan%20Amendment.pdf)). We also developed and implemented an outreach plan that included (1) publishing a news release on our national webpage (<https://www.fws.gov/news/>) on August 5, 2019, (2) sending specific notifications to Congressional contacts in all Florida Districts, and (3) sending specific notifications to key stakeholders in conservation and recovery efforts. These outreach efforts were conducted in advance of the *Federal Register* publication to ensure that we provided adequate notification to all potentially interested audiences of the opportunity to review and comment on the draft amendment.

We received one public comment response in total, from a non-governmental organization. We have considered this a substantive comment; we thank the reviewer for the comment and to the extent appropriate, we have incorporated the applicable information or suggested changes into the final revised recovery plan. This comment did not lead to significant changes in the draft plan. Below, we provide a summary of the comments received. 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 revised final recovery plan, in accordance with section 4(f)(5) of the Endangered Species Act (Act).

*Topic 1:* Delisting standards should be stronger and more detailed than downlisting standards, yet they are not.

*Response:* The strength of the Lower Keys marsh rabbit (LKMR) downlisting recovery criteria developed in 1999 and the delisting recovery criteria outlined above are not easily comparable. However, where they parallel (i.e., distribution, non-native predators, population trend), the delisting recovery criteria describe a higher threshold than the downlisting criteria. We have added additional details, particularly to the justification section, and further information will be included in a recovery implementation strategy developed in the future.

### **Summary of Peer Review Comments**

We solicited independent peer review between the draft and final revision in accordance with the requirements of the Act from State agencies and academic and scientific groups. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge related to the ecology and conservation of Lower Keys marsh rabbit and its habitat, and threats facing the Florida Keys. The qualifications of the peer reviewers are in the decision file and the administrative record for this recovery plan amendment.

In total, we solicited review and comment from four peer reviewers and two partner agencies. We

received comments from one peer reviewer and one partner agency reviewer. Partner agency reviewers that responded included representatives from the Florida Fish and Wildlife Conservation Commission. In general, the draft recovery plan revision was well-received by the peer and partner agency reviewers and garnered positive comments.

We considered all substantive comments, and to the extent appropriate, we incorporated the applicable information or suggested changes into the final revised recovery plan. Below, we provide a summary of specific comments received from peer and partner reviewers with our responses. We appreciate the input from all commenters, which helped us to consider and incorporate the best available scientific and commercial information during development and approval of the final revised recovery plan.

*Peer Review Comment 1:* We are concerned the terms “multiple generations” and “foreseeable future” are vague and undefined as used here. 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 and 50-75 years instead of foreseeable future.

*Response 1:* We agree. More specific periods of time have been incorporated into the justification with respect to “multiple generations” and “foreseeable future.” According to ESA regulations (new revisions; 84 FR 45020), the Service describes “foreseeable future” on a case-by-case basis, using the best available data and taking into account considerations such as the species' life-history characteristics, threat-projection timeframes, and environmental variability.

*Peer Review Comment 2:* We recommend that 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, thresholds for number of breeding individuals, amount of available, high-quality LKMR habitat, and the proportion of habitat that is occupied.

*Response 2:* We agree that quantifying terms used in the criteria would improve our ability to determine whether a criterion has been achieved. We have added language to the justification section to provide examples of specific metrics. We chose not to specify a minimum population size, since this is a challenging parameter to accurately measure for this species.

*Peer Review Comment 3:* For the first criterion, we recommend that “stable” be replaced by “viable” and that viable be defined in measurable terms. We recommend the term “viable” be defined in terms of maintaining an average or increasing population size or density over a defined period of time, such as that defined in the downlisting criteria in the recovery document.

*Response 3:* We agree that more measurable terms would better clarify this criteria, and we have added a specific measure of occupancy to the justification. However, we used “stable” in this criteria to mean a population growth rate of zero, or in other words, a population that is neither increasing nor decreasing, and see this as adequately measureable. We chose not to specify a population size, since this is a challenging parameter to accurately measure for this species.

*Peer Review Comment 4:* We support the ambitious effort in criteria 1 to maintain populations on 13 islands. For that criterion to be most effective, we believe that statement needs to be supported

with further clarification in the Justification section. That clarification should explain a) why 13 islands – explain the basis for that number of islands and state the names of those islands that are being recommended, b) the area of potentially suitable habitat that is present on each island and the amount or proportion of that habitat that occurs on conservation lands on each island. In addition, it would also be important to state a minimum threshold for area of potentially suitable habitat that should be present on an island and, if possible, a maximum distance between islands occupied by LKMR populations.

*Response 4:* Additional information supporting the purpose and need for LKMR populations on 13 islands has been added to the justification.

*Peer Review Comment 5:* To complement and help achieve criteria 1 and 2, we believe either a statement or separate criterion should be added that covers habitat acquisition or protection to mirror the criterion for downlisting. For example: “Suitable, unoccupied habitat is protected either through land acquisition or cooperative agreements a) prior to establishment of a new, viable population there or b) to enhance connectivity to improve movement of LKMR among areas of occupied habitat.”

*Response 5:* We agree that land acquisition or other means of perpetual conservation will likely be needed to successfully achieve criteria 1 and 2. However, no language was added to the document since this level of detail is best included in a recovery implementation strategy developed in the future.

*Peer Review Comment 6:* We believe a habitat management criterion should be added that states potentially suitable LKMR 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 suitable for LKMR populations. Also, specify a measurable threshold for management, such as the percent of potential habitat that is within management prescription criteria for high-quality LKMR habitat. Under rationale provide clarification of the standard that is to be applied for determining “high-quality” conditions.

*Response 6:* In terms of recovery planning, habitat management and management techniques are considered actions required to achieve recovery criteria, and will be outlined in detail in an effort following the amendment of recovery criteria. Recovery implementation is the next step of this process, where detailed information regarding how and where recovery actions will take place will be outlined.

*Peer Review Comment 7:* For criterion 3, we suggest stating a measurable criterion to assess when predation is “low enough for a LKMR population to remain viable.” We also believe it would be important to state in the justification or rationale references for methods that could be feasibly accomplished to reduce predation.

*Response 7:* We agree, and language has been added to the justification. Details including methods to reduce predation will be developed and provided during the recovery implementation planning step of this process.

*Peer Review Comment 8:* We agree that it is important to establish connectivity throughout the

metapopulations, as addressed by criterion 2, but we suggest including a method to measure success. Potential ways to measure success could include the observed movement of LKMR between patches or the establishment and maintenance of corridors containing suitable LKMR habitat between larger habitat patches.

*Response 8:* We agree, and language has been added to the justification. Additional details, particularly related to establishing and maintaining corridors, will be detailed in the recovery implementation step of this process, as appropriate.