

Recovery Plan for *Pediocactus knowltonii* (Knowlton’s cactus)

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DRAFT AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for this species since the Knowlton’s Cactus (*Pediocactus knowltonii*) Recovery Plan (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 appendix that supplements the Recovery Plan, superseding only page 16 (U.S. Fish and Wildlife Service (Service) 1985: 16).

**For
U.S. Fish and Wildlife Service
Southwest Region
Albuquerque, New Mexico**

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Regional Director, Region 2
U.S. Fish and Wildlife Service

BACKGROUND INFORMATION

Recovery plans should be consulted frequently, used to initiate recovery activities, and updated as needed. A review of the recovery plan and its implementation may show that the plan is out of date or its usefulness is limited, and therefore warrants modification. Keeping recovery plans current ensures that the species benefits through timely, partner-coordinated implementation based on the best available information. The need for, and extent of, plan modifications will vary considerably among plans. Maintaining a useful and current recovery plan depends on the scope and complexity of the initial plan, the structure of the document, and the involvement of stakeholders.

An amendment involves a substantial rewrite of a portion of a recovery plan that changes any of the statutory elements. The need for an amendment may be triggered when, among other possibilities: 1) the current recovery plan is out of compliance with regard to statutory requirements; 2) new information has been identified, such as population-level threats to the species or previously unknown life history traits, that necessitates new or refined recovery actions or criteria; or 3) the current recovery plan is not achieving its objectives. The amendment replaces only that specific portion of the recovery plan, supplementing the existing recovery plan, but not completely replacing it. An amendment may be most appropriate if

significant plan improvements are needed, but resources are too scarce to accomplish a full recovery plan revision in a short time.

Although it would be inappropriate for an amendment to include changes in the recovery program that contradict the approved recovery plan, it could incorporate study findings that enhance the scientific basis of the plan, or that reduce uncertainties as to the life history, threats, or species' response to management. An amendment could serve a critical function while awaiting a revised recovery plan by: 1) refining or prioritizing recovery actions that need to be emphasized, 2) refining recovery criteria, or 3) adding a species to a multispecies or ecosystem plan. An amendment can, therefore, efficiently balance resources spent on modifying a plan against those spent on managing implementation of ongoing recovery actions.

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

The recovery criteria were developed and reviewed by species experts that included biologists and botanists from the Bureau of Land Management (BLM), New Mexico Energy, Minerals and Natural Resources Department (NMEMNRD), The Nature Conservancy (TNC), and the Service. The development process was informed by the best available science regarding species biology and current threats. The recovery criteria were designed to be objective and quantifiable, in order to meet the conditions needed to ensure species viability through sustainment of populations in the wild that demonstrate resiliency, redundancy, and representation (Wolf et al. 2015: entire).

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: 2) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five delisting factors.

Recovery Criteria

Although there is a final Recovery Plan, it does not reflect the most up-to-date information on the species' biology, nor does it address all five delisting factors that are relevant to the species. When the Recovery Plan was finalized in 1985, limited data made it difficult to quantify habitat requirements with enough precision to establish detailed and measureable recovery criteria (Service 1985: entire).

Synthesis

In 2010, we completed a 5-year review that recommended Knowlton's cactus remained classified as endangered due its limited number of populations and declining population numbers (Service 2010: 13). Currently there are two known populations of Knowlton's cactus. The largest population occurs at the Sabo Preserve (type locality) on private land owned and managed by TNC. A small portion (fewer than 50 individuals) of the Sabo Preserve population occurs on adjacent BLM land. There has been standardized monitoring of the Sabo Preserve site since 1985. This data shows a declining trend in abundance from 1994 to 2016 (Roth 2016: 7). The other Knowlton's cactus population is located at a transplant site in the BLM Reece Canyon

Area of Critical Environmental Concern (ACEC). It supports only a small number of individuals (approximately 145 as of 2016), and has shown a declining trend in abundance of transplant individuals and a stable number of seed derived individuals (Roth 2016: 13, 21). Total abundance estimates for both populations are shown in Table 1.

Table 1. Knowlton’s cactus abundance estimates.

	1979	1985	1992	1994/1995	2008	2015	2016
TNC Sabo Preserve (Type Locality)	1,000 (Service 1985)	7,000 (Service 1985)	12,000 (Sivinski and McDonald 2007)	14,000 (Roth 2016)	6,100 (Sivinski 2008)	3,500 (Roth 2015)	ND-
BLM Reese Canyon ACEC	ND	ND	137 (Sivinski 2008)	69 (Sivinski 1995)	157 (Sivinski 2008)	25 (Roth 2015)	145 (Roth 2016)

ND – no data

Current Threat Status

The largest population of Knowlton’s cactus is located on private property owned and managed by TNC. Surface disturbance is restricted by TNC ownership, but mineral rights are owned by other interests that could disturb the property for mineral extraction. Energy development (oil and gas) is also prevalent in the immediate area. A suite of indirect effects from energy development (e.g. habitat loss or fragmentation, dust, effects to pollinators) may present challenges to the long-term persistence of this population (Service 2013: 16–17). Collection is still a threat, however it is difficult to estimate the extent of the threat at this time (Roth 2016: 27). Lastly, low rates of reproduction and recruitment within both populations are correlated with long-term drought conditions (Roth 2016: 27) that may be exacerbated by predicted warmer temperatures and lower rainfall in the foreseeable future.

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 Knowlton’s cactus no longer meets the definition of an endangered or threatened species and 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 endangered to threatened. The term “endangered species” means any species (species, subspecies, 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.

We establish delisting criteria for the Knowlton’s cactus as follows:

Delisting Recovery Criteria

Current recovery criteria

Because there is inadequate biological data for Knowlton's cactus and because there is only one viable population, downlisting and delisting criteria cannot be established at this time (Service 1985: iii).

Amended recovery criteria

The Knowlton's cactus will be considered for delisting when:

1. Long-term monitoring of the Sabo Preserve Population demonstrates a stable or increasing trend in population abundance over a 20-year survey period.

Justification: A stable or increasing trend demonstrates that all threats are ameliorated. In order to provide enough data for a rigorous statistical analysis, a minimum period of 20 years will be required to determine demographic trends. A 20-year survey period is a time period that allows for variability in ecological factors (i.e., several drought cycles) and includes several generations of cacti.

2. Long-term monitoring demonstrates that the annual total estimated population size range-wide is maintained at greater than 7,500 individuals during a 20-year survey period.

Justification: A minimum of 7,500 individuals is the median of the known range of surveyed individuals at the Sabo Preserve (see Table 1 above), and is above a minimum total of 5,000 individuals which emerged as a conservation metric across taxa (Traill et al. 2007: 164). A minimum of 7,500 individuals will allow for the maintenance of genetic diversity (representation), and provides evidence of a resilient population.

3. Long-term monitoring demonstrates that a minimum of two local transplant populations are occupied at least 75 percent of a 20-year survey period (15 years).

Justification: Because of the low number (two) of existing populations, additional populations need to be established in increase redundancy to guard against extinction from catastrophic events. Establishing additional populations is intended to address the threats related to climate change. Currently there is only one population outside of Sabo Preserve; one additional population will need to be established nearby to provide additional redundancy. Recognizing that stochastic events and long-term drought may present disproportionate challenges to these small populations, both populations need to be occupied a minimum of 75 percent (15 years) of a 20-year survey period.

4. A minimum of one new climate refugia population will be established outside the current range of the species and be maintained occupied at least 75 percent of a 20-year survey period (15 years).

Justification: The effects of climate change (warmer temperatures and less precipitation) are a major threat to this species. A climate refugia population needs to be established outside the current range and wholly separate geographically. The location will be determined by modeling habitat requirements and predicted climatic conditions into the foreseeable future (Keppel et al. 2012: entire).

5. Adequate regulatory mechanisms need to be put in place to ensure the long-term ecological integrity of the Sabo Preserve.

Justification: The Sabo Preserve needs protection in perpetuity from surface disturbing activities. Addition protections, such as a development buffer for new surface disturbing activities (e.g., energy development and road, pipeline, transmission line right-of-ways) should be in place around the Sabo Preserve to protect it from indirect effects. Because of its isolated nature and lack of an on-site manager, the Sabo Preserve is susceptible to illegal collection. Better surveillance of the property is needed to minimize to risk of collection. Other populations once established should have the same protective measures.

6. A Service approved post-delisting monitoring plan will be implemented.

Justification: A post-delisting monitoring plan is necessary to ensure the ongoing conservation of the species and the continuing effectiveness of management actions.

Rationale for Recovery Criteria

All classification decisions consider the following five factors: 1) is there a present or threatened destruction, modification, or curtailment of the species' habitat or range; 2) is the species subject to overutilization for commercial, recreational scientific or educational purposes; 3) is disease or predation a factor; 4) are there inadequate existing regulatory mechanisms in place outside the Act (taking into account the efforts by states and other organizations to protect the species or habitat); and 5) are other natural or manmade factors affecting its continued existence. When delisting or downlisting a species, we first propose the action in the *Federal Register* and seek public comment and peer review. Our final decision is announced in the *Federal Register*.

The amended criteria addresses all threats. All addressable threats that do not cause the populations to decline would be negligible. If the populations are decreasing, the species would not warrant to be delisted. There will be threats, such as drought and herbivory, that will continue to exist in a natural environment.

In addition to minimizing and ameliorating the threats identified above, the recovery criteria for Knowlton's cactus address the conservation principles of the 3-Rs: representation, resiliency, and redundancy (Wolf et al. 2015: 204).

Resiliency ensures that populations is sufficiently large to withstand stochastic events, and the identified threats have been ameliorated. A stable or increasing population trend indicates that annual mortality is compensated by recruitment events, evidence of resilient populations. A minimum of 7,500 individuals will allow for the maintenance of genetic diversity (representation), and provides evidence of a resilient population.

Redundancy provides for security against extinction from catastrophic events that could impact a single population by ensuring that one or more additional populations persist. There is no evidence that this species was ever widespread, and survey efforts over the last several decades in New Mexico and Colorado has found no additional populations (Roth 2016: 2). Multiple small populations are believed to have existed near Sabo Preserve. Additional populations in the local area need to be established through transplanting to increase redundancy.

Representation involves conserving the breadth of the genetic makeup of the species to maintain its adaptive capabilities. If both existing populations and newly established populations are located in a limited area, long-term drought and variation in precipitation patterns could pose a significant challenge to species recovery. In order to ameliorate this risk, a minimum of one climate refugia population will need to be established outside of the current range, wholly separate geographically. This population should be established at a site where the threat of long-term drought will be diminished significantly but where the ecological envelope and site specific habitat characteristics of the current populations can be replicated. Expert elicitation and modeling efforts should provide a reasonable degree of certainty in order to maximize the resiliency of this population (Keppel et al. 2012: entire). By establishing a climate refugia population, redundancy be bolstered, along with representation as the population will most likely be located in a different ecological setting and regional landscape.

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS

Not Applicable

COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS

Not Applicable

LITERATURE CITED

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