

RECOVERY PLAN AMENDMENTS FOR 20 SOUTHWEST SPECIES

The U.S. Fish and Wildlife Service has identified best available information that indicates the need to amend recovery criteria for the below species. Each amendment is recognized as an addendum that supplements the existing recovery plan.

<p>Brady Pincushion Cactus (<i>Pediocactus bradyi</i>) Recovery Plan Original Recovery Plan Approved: March 28, 1985 Page(s) Superseded: 19-34</p>
<p>Endangered Karst Invertebrates (Travis and Williamson Counties, Texas) Recovery Plan Original Recovery Plan Approved: August 25, 1994 Page(s) Superseded: 86-88 Species Included: Bee Creek Cave harvestman (<i>Texella reddelli</i>) Bone Cave harvestman (<i>Texella reyesi</i>) Coffin Cave mold beetle (<i>Batrisodes texanus</i>) Kretschmarr Cave mold beetle (<i>Texamaurops reddelli</i>) Tooth Cave spider (<i>Tayshaneta=Neoleptoneta myopica</i>) Tooth Cave ground beetle (<i>Rhadine persephone</i>) Tooth Cave pseudoscorpion (<i>Tartarocreagris texana</i>)</p>
<p>Holy Ghost Ipomopsis (<i>Ipomopsis sancti-spiritus</i>) Recovery Plan Original Recovery Plan Approved: September 26, 2002 Page(s) Superseded: 18-21</p>
<p>Knowlton Cactus (<i>Pediocactus knowltonii</i>) Recovery Plan Original Recovery Plan Approved: March 29, 1985 Page(s) Superseded: 16</p>
<p>Kuenzler Hedgehog Cactus (<i>Echinocerus fendleri</i> var. <i>kuenzleri</i>) Recovery Plan Original Recovery Plan Approved: March 28, 1985 Page(s) Superseded: 13</p>
<p>Sacramento Prickly Poppy (<i>Argemone pleicantha</i> ssp. <i>pinnatisecta</i>) Recovery Plan Original Recovery Plan Approved: August 31, 1994 Page(s) Superseded: 16-17</p>
<p>Siler Pincushion Cactus (<i>Pediocactus sileri</i>) Recovery Plan Original Recovery Plan Approved: April 14, 1986 Page(s) Superseded: 19-41</p>
<p>Sneed and Lee Pincushion Cacti Recovery Plan Original Recovery Plan Approved: March 21, 1986 Page(s) Superseded: 19 Species Included: Sneed pincushion cactus (<i>Coryphantha sneedii</i> var. <i>sneedii</i>) Lee pincushion cactus (<i>Coryphantha sneedii</i> var. <i>leei</i>)</p>
<p>Socorro Isopod (<i>Thermosphaeroma thermophilum</i>) Recovery Plan Original Recovery Plan Approved: February 16, 1982 Page(s) Superseded: 6-7, 10-11, 13</p>

Star Cactus (*Astrophytum asterias*) Recovery Plan

Original Recovery Plan Approved: August 26, 2003

Page(s) Superseded: 11-14

Tobusch Fishhook Cactus (*Ancistrocactus tobuschii*) Recovery Plan

Original Recovery Plan Approved: March 18, 1987

Page(s) Superseded: iii, 14-15

Zapata Bladderpod (*Lesquerella thamnophila*) Recovery Plan

Original Recovery Plan Approved: July 14, 2004

Page(s) Superseded: 9-11

Zuni Fleabane (*Erigeron rhizomatus*) Recovery Plan

Original Recovery Plan Approved: September 30, 1988

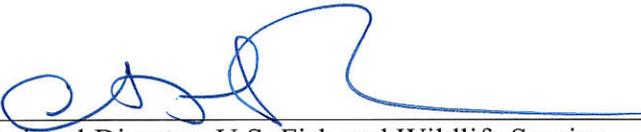
Page(s) Superseded: 14

For

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

August 2019

Approved:


Regional Director, U.S. Fish and Wildlife Service

Date:

8/28/19

Recovery Plan for *Echinocerus fendleri* var. *kuenzleri* (Kuenzler Hedgehog Cactus)

Original Approved: March 28, 1985

Original Prepared by: Reggie Fletcher, U.S Department of Agriculture

AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for this species since the Kuenzler Hedgehog Cactus (*Echinocerus fendleri* var. *kuenzleri*) 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 13 (U.S. Fish and Wildlife Service (Service) 1985: 13).

**For
U.S. Fish and Wildlife Service
Southwest Region
Albuquerque, NM 87103**

August 2019

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 collectively developed and reviewed by species experts that included biologists and botanists from the Bureau of Land Management (BLM), Natural Heritage New Mexico, New Mexico Energy, Minerals and Natural Resources Department, New Mexico State Land Office, U.S. Forest Service (Forest Service), and the Service. These individuals and entities comprise the Species Working Group. 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

The 1985 Recovery Plan was developed according to guidance at the time, which included biological factors, conservation measures, and threats. However, the 1985 Recovery Plan does not include delisting criteria and does not conform to all current standards and guidance for recovery planning (Service 1985: entire).

Synthesis

In 2017, we completed a Species Status Assessment for Kuenzler hedgehog cactus (Service 2017: entire). We determined that Kuenzler hedgehog cactus has good current and future viability (Service 2017: 28–43). We identified three populations: North Sacramento Mountains, South Sacramento Mountains, and Guadalupe Mountains. Within these populations most individuals occur at three core sites (Fort Stanton, Elk, and Texas Hills). The current overall condition of the North Sacramento Mountains population is high, and moderate for the South Sacramento Mountains and Guadalupe Mountains populations (Service 2017: 27). We believe that the three populations have a sufficient number of individuals, are broadly distributed across their ranges, with adequate connectivity to have a low risk of extinction at the current time (Service 2017: 30). Based on this assessment we reclassified Kuenzler hedgehog cactus from endangered to threatened (Service 2018: entire).

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 no longer meets the definition of an endangered or threatened species and 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 abolish the downlisting criteria included in the 1985 Recovery Plan (Service 1985: 13) and introduce delisting criteria for the Kuenzler hedgehog cactus as follows:

Downlisting Recovery Criteria

Current recovery criteria

The objective of this recovery plan is to protect and manage Kuenzler hedgehog cactus in order to secure and maintain a wild population level of 5,000 individual plants for a period of 5 consecutive years. Once this is accomplished, downlisting to threatened status can be considered. The major strategy for achieving this objective is the establishment of a comprehensive trade management plan for all cacti and the establishment and implementation of Service policy regarding commercial, artificial propagation for cacti used in trade.

The downlisting of Kuenzler hedgehog cactus is dependent upon the establishment of more than one self-sustaining population and removal of the collecting pressure which can be facilitated by the introduction of 10,000 artificially propagated plants into the commercial market. If Service policy has not been set by January 1986, or if Service policy does not allow for the provision of artificially propagated plants into the commercial market, then less cost-effective strategies may have to be implemented, i.e., permanent, onsite law enforcement personnel will have to be provided or other measures will be identified and considered.

These criteria would include the management of the habitat and the establishment of a program to curtail collecting through enforcement and through a commercial artificial propagation program.

Because of the small range and naturally limited habitat of this cactus, a review of its status will be made once downlisting criteria have been met, to determine delisting requirements (Service 1985: iii).

Amended recovery criteria

The criteria for downlisting Kuenzler hedgehog cactus are abolished as the species has been reclassified to threatened status.

Delisting Recovery Criteria

Current recovery criteria

None

Amended recovery criteria

The Kuenzler hedgehog cactus will be considered for delisting when:

Delisting Criterion 1: Resiliency

1. Demonstrate a stable or increasing trend in abundance for the Fort Stanton, Elk, and Texas Hills subpopulations over a 20-year period.

Justification: This criterion addresses stochastic threats like wildfire and climate change that may affect population demographics over long time periods. This will be based on periodic demographic trend monitoring and analysis implemented under the recovery actions.

The Fort Stanton, Elk, and Texas Hills subpopulations are core sites that include the majority of known individuals and represent the geographical, morphological, and genetically diverse range of Kuenzler hedgehog cactus. Species persistence depends on stable or increasing demographic trends with recruitment of new individuals equaling or exceeding mortality. Trend monitoring would be based on standardized, statistically rigorous, long term monitoring protocols developed by the Species Working Group in consultation with statistics experts. Twenty years provides an appropriate amount of time to observe the populations' demographic performance for several reasons. First, a 20-year window is equivalent to approximately two generations of Kuenzler hedgehog cactus, grounding the criteria in a biologically relevant timeframe. Observing the populations for longer than a single generation will provide assurance that population metrics such as reproduction and mortality rates are fluctuating within expected levels and that the populations are performing such that recovered status is likely to be maintained after delisting. We expect population trends to be stable or growing as populations progress toward recovery, although population declines could occur for one or a few years during the 20-year period.

Delisting Criterion 2: Redundancy

2. Maintain a minimum of three geographically separated core sites over a 20-year period.

Justification: The redundancy criteria addresses the catastrophic threats to the species such as climate change, fire, and parasitism. Fort Stanton, Elk, and Texas Hills are core sites because as they include the majority of known individuals and represent the geographical, morphological, and genetically diverse range of Kuenzler hedgehog cactus.

Delisting Criterion 3: Representation

- 3a. Maintain genetic diversity within all core sites as measured by the fixation indices inbreeding coefficient (F_{IS}) at or within one standard deviation of the F_{IS} of a closely related species with similar reproductive strategies and demonstrated acceptable viability.
- 3b. Maintain presence in 80 percent of all existing subpopulations (Element Occurrences) outside of the core sites over a 20-year period, with any subpopulation extirpations compensated by a newly identified or colonized subpopulation.

Justification: Genetic makeup of the species is important to long-term viability. Genetic diversity is often correlated with plant fitness, and more genetically diverse populations are also more fit. Based on current and future genetic studies we will be able to determine the genetic diversity of the species. We are most concerned with pollination as Kuenzler hedgehog cactus is an outcrossing species that is pollinated by bees. The degree of genetic diversity within core sites is important for several reasons. First, diversity within and among populations should confer populations, and the species, greater resistance to pathogens and parasites, and greater adaptability to environmental stochasticity (random variations, such as annual rainfall and temperature patterns) and environmental changes. Second, adequate genetic diversity enables continuing reproductive success and gene flow within and among core sites and other subpopulations is essential for maintenance of genetic diversity and adaptive capacity over time. The metric used to measure genetic diversity may be reevaluated by the Species Working Group as new strategies and technologies become available.

The remaining parts of the population are broken up into small groups of individuals. We manage the data on the Kuenzler hedgehog cactus population through Element Occurrences that are groups of individuals in discrete areas that are in close proximity (NatureServe 2002: 13). We used the Element Occurrences to characterize the scattered individuals outside the core sites that comprise the occupied range and identified them as subpopulations. These subpopulations provide connectivity and increase genetic diversity across the range of environmental conditions occupied. We consider a population to have good representation when it demonstrates a stable or increasing trend in occurrence for 80 percent of subpopulations outside of the core sites over a 20-year timeframe. Eighty percent of subpopulations was estimated by the Species Working Group to be sufficient to maintain representation throughout the species range. We estimate that a 20-year period will include one catastrophe event (i.e., prolonged drought or wildfire), allowing us to ensure that the subpopulations are able to rebound following such an event.

Delisting Criterion 4: Adequate Regulatory Mechanisms

4. Develop and implement a Habitat Management Plan for Kuenzler hedgehog cactus conservation.

Justification: The Habitat Management Plan (HMP) will address all five listing factors on the lands it covers. Thresholds of acceptable declines may be discussed during the HMP process that would trigger management decisions. The HMP will help reduce the risk of destruction or modification of habitat, such as road construction and development. This plan will keep the species considered in decision-making and avoid future threats of extinction. Threats, such as fire and overgrazing, will be addressed through the HMP. Each major land management agency should be a party to the HMP. The HMP will be rangewide but will have site-specific measures that can be implemented as appropriate on lands within each agency's jurisdiction. The HMP should be incorporated into agency land management plans. By incorporation into agency management plans adequate protection is ensured that Kuenzler hedgehog cactus will persist post-delisting.

Delisting Criterion 5

5. 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, such as delisting, 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 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 address all threats, which have been lessened since the populations are stable or increasing. Otherwise, the decreasing populations would be caused by a known threat. 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 wildfire that will continue to exist in a natural environment.

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

Resiliency

Resiliency ensures that populations are sufficiently large to withstand stochastic events. No loss of the three core sites (Fort Stanton, Elk, and Texas Hills), and stable or increasing trends in abundance, will allow for recovery. In order to have a stable, persistent population, it is necessary to have at least a certain number of plants at all life stages in that population, including

seeds in a seed bank, seedlings, and mature plants. If there is an increasing trend it would follow that mature plants are setting and producing sufficient seeds; there is an adequate, viable seed bank; conditions exist such that germination is effective; and the habitat needs of the juveniles are being provided. At this level of resiliency, the identified threats have been ameliorated to the extent that the population is secure from random population fluctuations, and mortality rates are sufficiently low to allow for stable, long-term persistence of the populations.

Redundancy

Redundancy provides for security against extinction from catastrophic events that could impact a single core site by ensuring that one or more additional core sites (Fort Stanton, Elk, and Texas Hills) persist. No loss of the three core sites will provide for redundancy. A redundant population is one with sufficient genetic and ecological representation to ensure resiliency.

Representation

Representation involves conserving the breadth of the genetic makeup of the species to conserve its adaptive capabilities. While having Kuenzler hedgehog cactus across large portions of their range ensures ecological representation, genetic diversity ensures genetic representation. Representation ensures that small population size and genetic threats have been ameliorated. Maintaining the genetic differences among subpopulations as their potential genetic and life history attributes may buffer the species' response to environmental changes over time. Species that are well distributed across their range are considered less susceptible to extinction and more likely to be viable than species confined to a small portion of their range (Carroll et al. 2010: entire; Redford et al. 2011: entire).

Based on the best available information that includes the input and data from species experts during our recovery criteria review, these amended recovery criteria provide quantifiable measures for identifying and implementing recovery actions, a means to measure progress towards recovery, and the ability to recognize when recovery will be achieved.

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS

Not Applicable

COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS

Not Applicable

LITERATURE CITED

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

Summary of Public Comments

The Service published a notice of availability in the *Federal Register* on January 31, 2019 (84 FR 790-795) to announce that the amendment for the Kuenzler Hedgehog Cactus (*Echinocerus fendleri* var. *kuenzleri*) Recovery Plan (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 Recovery Plan amendment was also posted on the Service's Species Profile website (<https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=Q1VW>).

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 January 30, 2019, (2) sending specific notifications to Congressional contacts in Districts (include appropriate Districts, consult the corresponding Outreach Plan or contact your Regional Public Affairs Officer for more information), 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.

The Service received four responses to the request for public comment. These were from the U.S. Bureau of Land Management; the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), the Center for Biological Diversity, and the Energy and Wildlife Action Coalition.

Public comments ranged from providing minor editorial suggestions to specific recommendations on the amendment 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. In general, these comments did not lead to significant changes in the draft 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.

Comment (1): Concern that, “criteria are being added in the absence of any scientific peer review and that this will lead to a failure on the Service’s part to follow the best-available science.”

Response: Peer review was conducted following the publication of the Notice of Availability, and in accordance with the requirements of the Endangered Species Act (Act). Below we provide a detailed summary of peer review comments and our responses, where appropriate.

Comment (2): Concern that, “the decision to update recovery criteria for these 42 species as a group is indicative of the Service moving away from utilizing recovery teams and outside scientific expertise.”

Response: Section 4 of the Act provides the Service with the authority and discretion to appoint recovery teams for the purpose of developing and implementing recovery plans. The current effort to update recovery plans with quantitative recovery criteria for what constitutes a recovered species is not indicative of the future need for, and does not preclude the future utilization of, recovery teams to complete recovery planning needs for listed species.

Comment (3): New and significant information has been developed in the years since the existing Recovery Plan was adopted. Updating this plan can serve to better inform the Service, the regulated community, and Federal, State, and local resource agencies.

Response: A recovery plan should be a living document, reflecting meaningful change when new substantive information becomes available. Keeping a recovery plan current increases its usefulness in recovering a species by ensuring that the species benefits through timely, partner-coordinated implementation based on the best available information.

Comment (4): The Service should consider whether the updated recovery criteria would be less burdensome on Federal agencies and the regulated community than the existing criteria.

Response: Recovery plans are guidance documents that outline how best to help listed species achieve recovery, but they are not regulatory documents. Recovery plans are intended to establish goals for long-term conservation of listed species and define criteria that are designed to indicate when the threats facing a species have been removed or reduced to such an extent that the species may no longer need the protections of the Act.

Recovery criteria are achieved through the funding and implementation of recovery actions by both the Service and our partners. In addition to the existing recovery actions included in each of these recovery plans, the amendments address the need for any new, site-specific recovery actions triggered by the modification of recovery criteria, along with the costs, timing, and priority of any such additional actions. Because recovery plans are not regulatory documents, identification of an action to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in a recovery plan should be construed as a commitment or requirement that any Federal agency obligate or provide funds.

Comment (5): The Service should consider whether the recovery criteria are achievable, because including unattainable recovery criteria could render such plans meaningless, or impede other processes under the Act.

Response: The National Marine Fisheries Service and U.S. Fish and Wildlife Service Interim Endangered and Threatened Species Recovery Plan Guidance (2010) emphasizes the development of recovery criteria that are specific, measurable, achievable, realistic, and time-referenced (SMART). The achievable component of SMART criteria implies that the authority, funding, and staffing needed to meet recovery criteria are feasible, even if not always likely.

In developing recovery criteria specifically, we attempt to establish criteria that are both scientifically defensible and achievable to the greatest extent possible. At times, however, the feasibility of achieving certain criteria can be, or appear to be, constrained by the particular, difficult circumstances that face a species. Even in such cases, criteria serve to guide recovery actions and priorities for the species. Furthermore, as recovery progresses, periodic reevaluation of the species status through the 5-year review process may reveal that the barriers to achieving certain criteria have been removed or that circumstances or our understanding of the species have evolved. In that event, the Service can revise recovery criteria to ensure that they reflect the strategy most likely to succeed in the goal of recovery.

Comment (6): The Service should consider conservation efforts that have been put into place for the listed species since the previous iteration of the recovery plan, especially where the Service has supported conservation efforts, in formulating recovery criteria that will be established or amended by the revised draft plan.

Response: While section 4 of the Act directs the Service to specifically develop and implement recovery plans, several other sections of the Act and associated programs and activities also provide important opportunities to promote recovery. Information from these programs and activities about the biological needs of the species can inform recovery planning (including the formulation or revision of recovery criteria) and implementation. These conservation efforts have been considered during the development of this and other recovery plans.

Comment (7): The Service should determine whether ongoing species conservation efforts beneficially address one or more of the listing factors set forth in the Act implementing regulations addressing species listings and designation of critical habitat.

Response: All Service decisions that affect the listed status or critical habitat designation of a particular species, including our 5-year review of each listed species, are made by analyzing the five factors described in section 4 of the Act. Such an analysis necessarily includes an assessment of any conservation efforts or other actions that may mitigate or reduce impacts on the species. While our objective with this particular effort was to establish objective, measurable criteria for delisting, conservation actions play a crucial role in determining if and when those criteria have been satisfied.

Comment (8): The Service should be mindful of the impacts that recovery plan criteria can have on the section 7 process of the Act for the regulated community, because the Service and other Federal resource agencies sometimes request that recovery criteria be addressed in biological assessments and other planning processes under the Act addressing listed species.

Response: Recovery plans can both inform, and be informed by section 7 processes of the Act. When revising a recovery plan, existing section 7 consultations may provide helpful information on: recent threats and mechanisms to avoid, minimize, or compensate for impacts associated with those threats; a summarized status of the species; and indication of who important partners may be. Section 7 consultations can inform the need for revised recovery actions, recovery implementation schedule activities, recovery criteria, or species status assessments to provide more comprehensive recovery planning while the species remains listed.

Comment (9): The Service should include the full panoply of current information available for the species in all revised draft recovery plans.

Response: Our recovery planning guidance recommends that recovery planning be supported by compilation of available information that supports the best possible scientific understanding of the species. Although it is not necessary to exhaustively include all current information within the text of the recovery plan, to the extent that this information is specifically relevant and useful to recovery, the recovery plan may summarize such material or incorporate it by reference. Supporting biological information may also be included within a species status assessment or biological report separate from the recovery plan document itself.

Comment (10): The Service should consider whether the existing recovery plan should be revised or replaced in its entirety rather than amended in part.

Response: Under guidance established in 2010, partial revisions allow the Service to efficiently and effectively update recovery plans with the latest science and information when a recovery plan may not warrant the time or resources required to undertake a full revision of the plan. To further gauge whether we had assembled, considered, and incorporated the best available scientific and commercial information into this recovery plan revision, we solicited submission of any information, during the public comment period, that would enhance the necessary understanding of the species' biology and threats, and recovery needs and related implementation issues or concerns. We believe the recovery plan amendment, which targets updating recovery criteria, is appropriate for the species. However, we will also continue to evaluate the accuracy and usefulness of the existing recovery plan with respect to current information and status of conservation actions, and may pursue a full revision of the plan in the future, if appropriate.

Comment (11): Delisting Criterion 4 should include “thresholds of acceptable declines of cactus and management actions to be implemented once this threshold is reached.”

Response: The quantitative recovery criteria is based on best available science using Resiliency, Redundancy, and Representation (3 R's). The 3 R's method looks at the species abundance across the range of the species and whether it can withstand environmental stochasticity. Distribution is another component that is considered to see if sub-populations are geographically separated and can withstand catastrophic events. The species diversity of being geographically separated may have adaptive characteristics that will help a species persist into the future. The nature of the 3 R's method takes into account species loss by means of environmental stochasticity and catastrophic events. The comment was made under the Adequate Regulatory Mechanism (Delisting Criterion 4). The Habitat Management Plan will be disseminated to the plant working group members for input before finalization. Therefore, this comment may be considered at a later date when the comment is more appropriate and can be discussed at length. Nevertheless, this comment was mentioned briefly in the justification portion of Delisting Criterion 4.

Comment (12): Recommends replacing the term “abundance” with “stable demographic structure.” Abundance is an unreliable (and expensive) indicator of resiliency. See

Development of Protocols To Inventory or Monitor Wildlife, Fish, or Rare Plants (USDA/USFS, June 2006, pg. 3-5-3-6) for a comparison of, and recommendations about, these monitoring indicators.

Response: The quantitative recovery criteria is based on best available science using Resiliency, Redundancy, and Representation (3 R's). The 3 R's method looks at the species abundance across the range of the species and whether it can withstand environmental stochasticity. Distribution is another component that is considered to see if sub-populations are geographically separated and can withstand catastrophic events. The species diversity of being geographically separated may have adaptive characteristics that will help a species persist into the future. Resiliency refers to the population size necessary to endure stochastic environmental variation (Shaffer and Stein 2000:308-310). Abundance is well-documented in the literature as a measure of resiliency (Shaffer and Stein 2000, Walpes et al. 2013, Wolf et al. 2015). The 3 R's is the "best available science" that the Service uses in Species Status Assessments and the 3 R's have been defined (Carroll et al. 2010, Wolf et al. 2015).

The citation indicated in the comment is specific to the USDA/USFS, not the U.S. Fish and Wildlife Service. The recovery criteria creates a framework of what is needed for the species recovery. Different agencies may approach monitoring differently, due to numerous reasons, and should not be held to one method only. Consultation will still be necessary for this species by all appropriate agencies. Finally, the Service relies on the term abundance because it is readily understood by the non-technical members of the public.

Summary of Peer Review Comments

We solicited independent peer review during the development of the final draft revision in accordance with the requirements of the Act from local, State, and Federal agencies; academic and scientific groups and individuals; and any other party that may have possessed pertinent information. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge related to Kuenzler Hedgehog Cactus (*Echinocereus fendleri* var. *kuenzleri*), scientific area or management of habitat of species under consideration, plant conservation biology, botany, genetics, threats facing this species, and recovery methods. 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 five peer reviewers. We received comments from one peer reviewer (EMNRD). In general, the draft amendment was well-received and garnered positive comments that did not lead to significant changes in the draft amendment. We thank the reviewer for providing review and comment.