

## 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><b>Brady Pincushion Cactus (<i>Pediocactus bradyi</i>) Recovery Plan</b> Original Recovery Plan Approved: March 28, 1985 Page(s) Superseded: 19-34</p>
<p><b>Endangered Karst Invertebrates (Travis and Williamson Counties, Texas) Recovery Plan</b> Original Recovery Plan Approved: August 25, 1994 Page(s) Superseded: 86-88 Species Included: Bee Creek Cave harvestman (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><b>Holy Ghost Ipomopsis (<i>Ipomopsis sancti-spiritus</i>) Recovery Plan</b> Original Recovery Plan Approved: September 26, 2002 Page(s) Superseded: 18-21</p>
<p><b>Knowlton Cactus (<i>Pediocactus knowltonii</i>) Recovery Plan</b> Original Recovery Plan Approved: March 29, 1985 Page(s) Superseded: 16</p>
<p><b>Kuenzler Hedgehog Cactus (<i>Echinocerus fendleri</i> var. <i>kuenzleri</i>) Recovery Plan</b> Original Recovery Plan Approved: March 28, 1985 Page(s) Superseded: 13</p>
<p><b>Sacramento Prickly Poppy (<i>Argemone pleicantha</i> ssp. <i>pinnatisecta</i>) Recovery Plan</b> Original Recovery Plan Approved: August 31, 1994 Page(s) Superseded: 16-17</p>
<p><b>Siler Pincushion Cactus (<i>Pediocactus sileri</i>) Recovery Plan</b> Original Recovery Plan Approved: April 14, 1986 Page(s) Superseded: 19-41</p>
<p><b>Sneed and Lee Pincushion Cacti Recovery Plan</b> Original Recovery Plan Approved: March 21, 1986 Page(s) Superseded: 19 Species Included: Sneed pincushion cactus (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><b>Socorro Isopod (<i>Thermosphaeroma thermophilum</i>) Recovery Plan</b> Original Recovery Plan Approved: February 16, 1982 Page(s) Superseded: 6-7, 10-11, 13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Page(s) Superseded: 11-14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

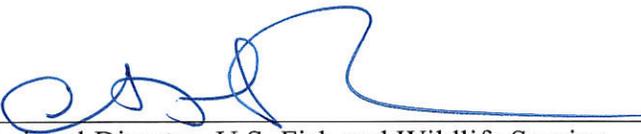
Page(s) Superseded: 14

**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 *PEDIOCACTUS BRADYI* (Brady Pincushion Cactus)**

**Original Approved: March 28, 1985**

**Original Prepared by: Barbara G. Phillips, Arthur M. Phillips, III, and Mary Butterwick**

### **DRAFT AMENDMENT**

We have identified information that indicates the need to amend the recovery criteria for this species. 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, and document the completion of recovery actions that have met the delisting criteria. We present the proposed modification as an appendix that supplements the Brady Pincushion Cactus (*Pediocactus bradyi*) Recovery Plan (Recovery Plan), superseding pages 19-34 of the Recovery Plan.

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

**August 2019**

### **BACKGROUND INFORMATION**

We should consult recovery plans frequently, use them to initiate recovery activities, and update recovery plans 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. We may amend a recovery plan when, among other possibilities: (1) the current recovery plan is out of compliance with regard to statutory requirements; (2) new information has been identified that necessitates new or refined recovery actions and/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 the recovery plan needs significant plan improvements, 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) emphasizing refined and/or prioritized recovery actions, (2) refining recovery criteria, or (3) adding a species to a multispecies or ecosystem plan. Therefore, we can use the amendment process to balance resources spent on modifying a recovery plan against those spent on managing implementation of ongoing recovery actions.

In this amendment, we are adding delisting criteria for Brady pincushion cactus, as well as defining what constitutes a population and what constitutes disturbance to habitat. We did not incorporate delisting criteria into the original Recovery Plan due to a lack of census data for the plant at the time we signed the 1985 Recovery Plan. Quantifiable delisting criteria are necessary to determine when we have met the recovery goals for Brady pincushion cactus and can consider delisting the species. In previous documents, including the listing rule (44 FR 61784) and the 1985 Recovery Plan (USFWS 1985), we did not define populations or what constitutes habitat disturbance.

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

We looked at existing quantifiable recovery criteria for similar species in similar habitats to help develop these recovery criteria. We analyzed what recovery actions our partners have taken since the development of the original plan. We also analyzed long-term monitoring data provided by the Arizona Strip BLM office and Navajo Nation Navajo Natural Heritage Program, as well as monitoring data the U.S. Geological Survey (USGS) in Henderson, Nevada compiled and synthesized (Shryock *et. al.* 2014). Additionally, we analyzed survey data and propagations studies conducted by The Arboretum at Flagstaff (Haskins and Murray 2017).

Our analysis of the 1985 Recovery Plan (USFWS 1985) and the listing rule (44 FR 61784) indicated that neither population nor habitat disturbance were defined for this species. For this amendment and managing for the Brady pincushion cactus into the future, we are using NatureServe guidelines for delimiting plant populations (NatureServe 2004) based on the proximity of each location to one another. We considered locations within two kilometer (km) of each other and suitable habitat in between them to be a single population due to the presence of stable, contiguous, and suitable habitat, as defined in the 1985 Recovery Plan, between each location. Plant locations that were greater than two km from each other with persistently unsuitable habitat in between them, we considered separate populations (NatureServe 2004). Based on these criteria, we know of seven populations of Brady pincushion cactus on public lands and three populations on the Navajo Nation (ten total populations). We define disturbance as the short-term modification of limestone soils overlaid on shale and sandstone outcrops, biological crust, and modification of the microwatersheds (Wallace and Romney 1981, Belnap 2002), which negatively effects soil structure, leading to the loss of individuals, the seedbank, and the successful re-establishment of Brady pincushion cactus.

The downlisting criteria in the existing Recovery Plan include a quantifiable criterion of having permanent protection of 75 percent of the known habitat according to the steps outlined in the plan. It is not clear if this refers to permanent protection of 75 percent of all known habitat or permanent protection of 75 percent of the habitat for each population. We are assuming that this refers to permanent protection of 75 percent of all known habitat.

## **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 delisting factors.

### **Recovery Criteria**

The prime objective of the Recovery Plan is to reduce taking from the wild and to manage and protect the essential habitat of Brady pincushion cactus so that we can sustain populations at a level where we can remove the species from the Federal Endangered Species List.

The criterion for downlisting to threatened status is permanent protection of 75 percent of the known habitat according to the steps outlined in this plan.

### **Synthesis**

Our partners have implemented or continue to implement many of the actions described in the step-down outline and narrative on pages 19-34 of the 1985 Recovery Plan. Since the finalization of the Recovery Plan, partners have located a previously unknown population of Brady pincushion cactus in previously unsurveyed but known suitable habitat. In addition, DOI removed from mineral exploration over one million acres of land surrounding the Grand Canyon watershed in a 2012 Secretarial Order (DOI 2012), thus removing one of the main threats to the cactus. The Bureau of Land Management (BLM) designated Areas of Critical Environmental Concern (ACEC) around all populations of Brady pincushion cactus, thus offering increased management and protections from other threats, such as off-highway vehicle (OHV) use. The USGS in Henderson, Nevada and Arizona Strip BLM compiled 22 years’ worth of monitoring and demographic data gathered by the Arizona Strip BLM (Shryock *et. al.* 2014). Shryock *et al.* (2014) used these data to look at the long-term vulnerability of Brady pincushion cactus to estimate the species’ sensitivity to variable climates resulting from future climate change. Haskins and Murray (2017) conducted surveys of suitable habitat on BLM land and collected seeds for propagation studies in order to determine the efficacy of growing cacti in a greenhouse to supplement wild populations. Those surveys identified a new location of Brady pincushion cactus southwest of the southern-most known location along Marble Canyon on BLM-administered lands (Haskins and Murray 2017). It is possible that the downlisting criterion to protect 75 percent of the habitat may already be complete; however, further analysis is required. Similarly, many recovery actions in the step-down outline have been addressed. There is a need to complete recovery actions still in process, such as studies initiated in the last few years.

## **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 species is no longer at risk of extinction 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 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, Tribes, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

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

### **Downlisting Recovery Criteria**

As described above, the criterion for downlisting to threatened status is permanent protection of 75 percent of the known habitat according to the recommendations in this plan. The Recovery Plan does not clearly define what habitat is included in the permanent protection; however we interpret the permanent protection to include all known habitat across the range of Brady pincushion cactus and not just the habitat associated with each population. We are amending the downlisting criterion which will supersede that included in the Brady Pincushion Cactus (*Pediocactus bradyi*) Recovery Plan, as follows:

Brady pincushion cactus will be considered for downlisting when:

1. A minimum of 75 percent of Brady pincushion cactus habitat area has been permanently protected, including the populations with the highest plant abundance and the species’ genetic diversity.

Justification: The primary threat to Brady pincushion cactus is the loss of habitat, mostly associated with mining activities. Currently, the BLM has designated most, if not all, of the habitat on BLM-administered lands as an ACEC, providing extra management protections to the cactus and its habitat in perpetuity. These management protections should reduce, if not eliminate the effects associated with mining activity, OHV use, and recreational activities in Brady pincushion habitat. Additionally, the Navajo Nation is located in Area 1, which has been designated as “Highly Sensitive” in their Biological Resource Land Use Clearance Policies and Procedures (RCP). Generally, the Navajo

Nation Heritage Program will not allow development of any kind within Area 1 unless it is not in sensitive species habitat or is in a previously disturbed area.

### **Delisting Recovery Criteria**

We establish delisting criteria to be included in the Brady Pincushion Cactus (*Pediocactus bradyi*) Recovery Plan as follows:

Brady pincushion cactus will be considered for delisting when:

1. All known populations are maintained at a level that demonstrates stable or increasing plant abundance and maintain the current distribution of locations within each population. Plant abundance (measured by the number of plants) may fluctuate within locations and populations, but the defined populations should be stable or increasing over a consecutive 15-year period.

Justification: A population is defined as groupings of plants within 2 km of each other within areas of suitable habitat. Suitable habitat is defined in the 1985 Recovery Plan. Working in partnership with the BLM and Navajo Nation, long-term management agreements, management plans, land designations, and other potential methods will ensure that all known populations of cacti have stable or increasing plant numbers.

All large populations should be monitored annually in order to establish a trend and determine whether or not cactus populations are stable or increasing in order to delist the species. Populations should be stable or increasing over a 15-year period beginning with the implementation of the Recovery Plan and implementation of monitoring that establishes initial population size.

A monitoring plan is required to detect population trends for this species. The monitoring plan should provide information regarding both plant abundance and population trend as well as habitat conditions, including habitat response to disturbance activities such as OHV activity, livestock use of the area, recreational use of the area. Monitoring protocols should include standardized monitoring plots across an area sufficient to detect population trends. Monitoring should be conducted while the species is flowering (late March/early April), which makes individuals easier to identify. Additionally, monitoring should include methods that will determine seedling survivorship. We should use results from past monitoring efforts to improve monitoring protocols with the aim of facilitating consistency of data collection and analysis on a rangewide basis. Plant abundance and trend will help determine if the populations are remaining stable or increasing as monitoring continues over time.

2. No more than 10 percent of the Moenkopi shale and sandstone habitat (as defined in the Recovery Plan and final rule to list the species: 44 FR 61784) within each of the populations is disturbed over a consecutive 15-year period. This disturbance should occur outside of the habitat that occurs within the 75 percent permanent protection area and be of short-term duration such that habitat restoration is achievable, including formation of biological crusts.

Justification: The primary threat to Brady pincushion cactus is the loss of habitat, mostly associated with mining activities. Surveys have located the cactus only in Kaibab limestone chips overlying soil derived from Moenkopi shale and sandstone outcrops in northern Coconino County, Arizona. Preserving and enhancing these soils and habitat in this area is essential to the conservation of this species. Working in partnership with the BLM, we recommend using BLM's administrative processes to amend ACEC plans to provide adequate protection to cactus habitat in perpetuity from threats including, but not limited to, mining activity and OHV activity. ACECs provide special management for habitats and the plants and wildlife within them. Working with the Navajo Nation to develop a habitat management plan and implement their existing RCP planning tool will reduce threats to populations on tribal lands. All management plans should include an educational component to help members of the public understand the importance of minimizing adverse effects to the cactus and its habitat, especially in high-use recreational areas.

Disturbance is defined as short-term modification of the limestone soils overlaid on shale and sandstone outcrops, biological crust, and microwatersheds (Wallace and Romney 1981, Belnap 2002), which negatively effects the soil structure, leading to the loss of individual plants, the seedbank, and successful re-establishment of the species. This short-term habitat modification will occur in a manner that restoration will be achievable naturally, or with minimal human involvement. Human involvement includes, but is not limited to, revegetation with local native vegetation and blocking access to disturbed areas to allow them to revegetate and establish the proper soil conditions. This disturbance and subsequent restoration should also ensure that within each population, the number of plants is maintained.

Habitat disturbance should occur outside of the area of 75 percent of the habitat that has been designated for permanent protection. For a location to continue to count as Brady pincushion cactus habitat, the responsible land manager must reclaim any disturbed site through: 1) the collection and planting of cacti and associated native plant seeds and plants in disturbed areas using habitat restoration techniques appropriate for the species and soil types, 2) transplanting, following tested protocols, of cactus individuals that cannot be avoided by disturbance, 3) collection of cactus seed, using approved techniques, to be saved for conservation in a designated seed storage facility, and 4) monitoring for 15 consecutive years to ensure populations are established and stable or increasing in size.

#### **ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS**

No additional site-specific recovery actions are necessary for this species.

#### **COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS**

No additional site-specific recovery actions are necessary for this species.

## LITERATURE CITED

- Belnap, J. 2002. Impacts of off-road vehicles on nitrogen cycles in biological soil crusts: resistance in different U.S. deserts. *Journal of Arid Environments* 52: 155-165.
- Department of Interior (DOI). 2012. Record of Decision Northern Arizona Withdrawal Mohave and Coconino Counties. Signed January 9, 2012. 24pp.
- Haskins, K.E, and S. Murray. 2017. Conservation of a rare cactus (*Pediocactus bradyi*) through surveying and seed collection. The Arboretum at Flagstaff. 12pp.
- NatureServe. 2004. A habitat-based strategy for delimiting plant element occurrences: guidance from the 2004 working group. October 2004. 15pp.
- Shryock, D.F., T.C. Esque, and L. Hughes. 2014. Population viability of *Pediocactus bradyi* (Cactaceae) in a changing climate. *American Journal of Botany* 101(11): 1944-1953.
- Wallace, A. and E.M. Romney. 1981. The role of pioneer species in revegetation of disturbed desert areas. *Great Basin Naturalist Memoirs* 4: 31-33.
- Wolf, S., B. Hartl, C. Carrol, M.C. Neel, and D.N. Greenwald. 2015. Beyond PVA: why recovery under the Endangered Species Act is more than population viability. *BioScience* 65:200-207

## 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 draft amendment for the Brady Pincushion Cactus (*Pediocactus bradyi*) 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 amendment. We also posted an electronic version of the draft amendment on the Service’s Species Profile website ([Brady Pincushion Cactus Revision](#)).

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 included comments from interested non-governmental organizations (the Center for Biological Diversity and the Energy and Wildlife Action Coalition); the New Mexico Energy, Minerals, and Natural Resources Department; and the Navajo Nation.

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 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):* Two commenters are concerned that Criterion 2 needs more justification. They are concerned that there needs to be stronger justification for the 20 percent cap on disturbance to occupied habitat, especially in relation to the permanent protection of 75 percent of habitat for this species. The commenters are also concerned that biological crusts will not reform and cacti will not recolonize within 10 years.

*Response:* We received similar comments from peer reviewers regarding the biological crusts and ability of plants to recolonize. We lowered the disturbance cap to two percent, based on the limited range and limited suitable habitat of the cactus. We also clarified that all disturbance should be short-term and outside of the 75 percent of permanently protected habitat and we included in the discussion of habitat restoration the formation of biological crusts since they are a key component of suitable habitat for this species.

*Comment (12):* The Navajo Nation Department of Fish and Wildlife provided extensive population and monitoring data for us to use in the Recovery Plan amendment, as well as technical edits to more accurately portray population status on Tribal lands.

*Response:* We coordinated with the Navajo Nation Department of Fish and Wildlife concurrent with the public comment period for this draft amendment. We received valuable population data and have incorporated this new information into the final recovery plan amendment.

*Comment (13):* The commenter is concerned that we did not coordinate with the Navajo Nation Department of Fish and Wildlife to obtain population and monitoring data for this species.

*Response:* See response to Comment 12 above. We appreciate the valuable information provided during the public comment period and will continue to coordinate with the Navajo Nation Department of Fish and Wildlife on recovery of this species.

*Comment (14):* The commenter is concerned that we have not provided recovery criteria to address new threats identified since the plant was listed.

*Response:* We have analyzed threats and determined that the existing and amended recovery criteria address known threats. Developing recovery criteria to address climate change is difficult, given the relative uncertainty of climate change predictions and the species' reaction to those potential changes. We have developed the amended recovery criteria to promote the species' resiliency to future climate changes. Herbivory by native rodents and lagomorphs is a natural occurrence that, alone, is not a significant threat to the species and, therefore, difficult to address through a recovery plan. Similar to climate change, we have developed the amended recovery criteria to promote the species' resiliency to native herbivory. We will address any effects associated with the proposed Lake Powell Pipeline through section 7 consultation with the action agency. Furthermore, the existing and amended criteria are intended to address threats to habitat loss from projects such as this.

*Comment (15):* The commenter suggests having a recovery criterion that includes 20 years of standardized population trend monitoring, showing a stable or increasing trends in all populations.

*Response:* Our recovery criterion 1 in the draft amendment requires a stable or increasing trend within each population; however, we clarified the number of populations. We looked at the current science, as well as input from our peer reviewers, to determine the appropriate length of time to monitor trends. We will implement standardized monitoring beginning with finalization of this amendment to meet the criterion. We have included standardized monitoring in the implementing actions; therefore, we are not including it as a criterion.

*Comment (16):* The commenter suggests that monitoring and management plans should be recovery criteria rather than recovery actions.

*Response:* Development and implementation of management plans and standardized monitoring would be implemented in order to guide management actions and document that the criteria are being met. We have included standardized monitoring and management plan development in the implementing actions to help achieve the recovery criteria; therefore, we are not including them as criteria.

*Comment (17):* The commenter is concerned that the amended recovery criteria do not address the conservation principles of representation, resiliency, and redundancy according to Wolf *et al.* (2015).

*Response:* We used Wolf *et al.* (2015) as a main resource for developing the amended recovery criteria addressing the conservation principles of representation, resiliency, and redundancy.

*Comment (18):* The commenter suggested that we convene a team of rare plant specialists and Service species leads to develop recovery criteria.

*Response:* We worked with rare plant specialists and the Service lead for this plant in the Utah Ecological Service Office. Due to the aggressive timeline we had to work on these amendments, convening an entire team was not feasible; however, we have been discussing the criteria and process with plant specialists since we made the draft amendments public.

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

In accordance with the requirements of the Act, we solicited independent peer review of the draft amendment from ecologists with the United States Geological Survey (USGS) who have knowledge of the desert ecosystem that Brady pincushion cactus inhabits. Peer review was conducted concurrent with the *Federal Register* publication. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge related to cacti within the *Pediocactus* genus, desert ecology, management of ecosystem/habitat, and plant conservation biology. 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 three peer reviewers and we received comments from all three. As previously stated, all peer reviewers are representatives from the USGS. In general, peer reviewers provided positive comments on the proposed Recovery Plan amendment. All reviewers provided additional specific information, including citations; we thank the reviewers for these data and we have added the information where appropriate.

We considered all substantive comments, and to the extent appropriate, we incorporated the applicable information or suggested changes into the final Recovery Plan amendment. Below, we provide a summary of specific comments received from peer reviewers with our responses; however, we addressed many of the reviewers' specific critiques and incorporated their suggestions as changes to the final amendment. 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 Recovery Plan amendment.

*Peer Review Comment (1):* The peer reviewers provided technical edits and clarification to background information regarding past monitoring data collection.

*Response:* We have incorporated those edits as appropriate.

*Peer Review Comment (2):* The peer reviewers suggested clarification of what defines suitable habitat for the species.

*Response:* We clarified what suitable habitat is for this species by using the habitat definitions in the 1985 Recovery Plan and the original listing rule (44 FR 61784).

*Peer Review Comment (3):* The peer reviewers suggested clarification of what defines disturbance related to habitat for the species.

*Response:* We clarified how we are defining disturbance of suitable habitat for this species. We included more information regarding habitat disturbance after conducting a more detailed literature search on habitat disturbance in desert ecosystems.

*Peer Review Comment (4):* The peer reviewers suggested clarification of how we are defining permanent protection of 75 percent of the species' known habitat.

*Response:* The 1985 Recovery Plan does not clarify whether the protection of 75 percent of the species' known habitat includes all known habitat across its range or just the habitat of each population. We clarified the definition based on our interpretation of the 1985 Recovery Plan to include all known habitat across the range of Brady pincushion cactus.

*Peer Review Comment (5):* The peer reviewers suggested that a consecutive 10-year period might not be long enough to detect population stability trends for this slow-growing species. The commenter provided data for a similar species indicating that 15 consecutive years is better for determining a stable or increasing population.

*Response:* We reviewed the data provided in Shryock *et al.* (2014) and adjusted our timeframe to 15 years to better detect population trends.

*Peer Review Comment (6):* The peer reviewers suggested ideas and methods to ensure reliable and quantifiable measures for the Implementing Actions for Recovery Criteria for both downlisting and delisting the species.

*Response:* These suggestions are greatly appreciated and will be beneficial when we convene a recovery team or panel of experts to determine how best to implement the recovery actions necessary to achieve recovery of this species.

*Peer Review Comment (7):* A peer reviewer suggested that a demographic and population change analysis be conducted using existing data from long-term monitoring plots. The peer reviewer also suggested using these data to determine stable or increasing plant abundance.

*Response:* We will work with the peer reviewers to develop and conduct this analysis for the long-term demographics of this species. This is an important action item to implement upon development of the recovery criteria.