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.

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Page(s) Superseded:	19-34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Page(s) Superseded:	86-88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Page(s) Superseded:	18-21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Page(s) Superseded:	16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Page(s) Superseded:	13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Page(s) Superseded:	16-17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Page(s) Superseded:	19-41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Page(s) Superseded:	19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Page(s) Superseded:	6-7, 10-11, 13

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Page(s) Superseded:	11-14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Page(s) Superseded:	iii, 14-15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Page(s) Superseded:	9-11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 *Sclerocactus brevihamatus* ssp. *tobuschii* (W.T. Marshall) N.P. Taylor (Tobusch Fishhook Cactus).

Final Amendment 1

Superseding only Part II, pages 14-15 of the recovery plan.

U.S. Fish and Wildlife Service
Region 2
Albuquerque, New Mexico
August 2019

I. Background Information.

a. Summary of prior actions.

Listing:	44 FR 64736.
Date:	November 7, 1979.
Listed entity:	Tobusch fishhook cactus (*Ancistrocactus tobuschii*).
Listed status:	Endangered.
Recovery Plan:	U.S. Fish and Wildlife Service (USFWS) 1987.
Prepared by:	Tony Keeney.
Approved:	March 18, 1987.
Five-year review(s):	USFWS 2010.
Species Status Assessment:	USFWS 2017.
Reclassified to threatened:	83 FR 22392.
Final reclassification rule:	May 15, 2018.

b. Reason for amendment.

Section 4(f)(1)(B)(ii) of the Endangered Species Act (ESA) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) also have affirmed the need to frame recovery criteria in terms of threats assessed under the five listing factors.

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted (reclassified) to threatened, or that the species is no longer at risk of extinction and may be delisted (removed from the Federal Lists of Endangered and Threatened Wildlife and Plants). The term "threatened species" means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The term "endangered species" means any species (species, sub-species, or distinct population segment) that is in danger of extinction throughout all or a significant portion of its range.

The original recovery plan has only one downlisting criterion and no delisting criteria (USFWS 1987, pp. iii, 14-15):

> "The criteria for downlisting Tobusch fishhook cactus to threatened will be to establish at least four safe sites that contain at least 3,000 plants each. Delisting criteria have not yet been established. The implementation of studies in this recovery plan will provide the necessary data from which quantified delisting criteria can be established." (P. iii).
>
> "When the number of plants at four safe site reaches 3,000 each it will be possible to downlist the species to threatened. It is believed this number of plants located in safe sites will preserve the species' genetic diversity and provide an adequate buffer against extinction in the event some natural disaster reduces one or more of the populations to much lower numbers. These figures may be revised later when additional information becomes available…When downlisting is accomplished this plan will be re-evaluated to determine delisting criteria." (Pp. 14-15).

The 5-year review recommended revising the recovery plan to include both downlisting and delisting criteria that address the recovery objectives and known threats, comply with updated recovery planning guidance, and incorporate new information on the species (USFWS 2010, p. 43). The 5-year review also recommended that the species be reclassified as threatened, due to the greater known range and currently stable population (USFWS 2010, pp. 40-41). The Service reclassified Tobusch fishhook cactus to threatened on May 15, 2018; consequently, downlisting criteria are no longer needed. This amendment to the recovery plan establishes specific, measurable criteria for delisting that address the recovery objectives and known threats, comply with updated recovery planning guidance, and incorporate new information on the species.

II. Methods used to revise the recovery criteria.

The revised criteria are based on the recommendations and new information summarized in the 5-year review (USFWS 2010), a Species Status Assessment (SSA; USFWS 2017), and the final rule to reclassify Tobusch fishhook cactus to threatened. The draft SSA and the draft reclassification rule were both peer-reviewed, and the final documents were revised to incorporate many of the recommendations of the expert peer reviewers.

We have not appointed a recovery team for Tobusch fishhook cactus, but have requested information individually from botanists at Texas Parks and Wildlife Department (TPWD), The Nature Conservancy (TNC), and academic institutions. Additionally, the rationale for establishing delisting criteria was developed through recommendations of the South Texas Plant Recovery Team for revising recovery criteria of several other listed plants in South Texas. The appointed members of this team include representatives from TPWD, TNC, the University of Texas Rio Grande Valley, Sul Ross State University, USDA Natural Resources Conservation Service, Texas A&M-Kingsville, Lower Rio Grande Valley NWR, and private landowners.

III. Rationale for establishing the recovery criteria.

USFWS bases assessments of species viability, defined as the likelihood of persistence over the long term, on analyses of the species' resilience, redundancy, and representation. Resilience refers to the population size necessary to endure stochastic environmental variation (Shaffer and Stein 2000, pp. 308-310). Redundancy refers to the number and geographic distribution of populations or sites necessary to endure catastrophic events (Shaffer and Stein 2000, pp. 308-310). Representation refers to the extent of genetic and ecological diversity, both within and among populations, necessary to conserve long-term adaptive capability (Shaffer and Stein 2000, pp. 307-308).

We conducted an SSA (USFWS 2017) to document and evaluate new information on the subspecies. The SSA based assessments of population resilience and redundancy on an estimate of the subspecies' minimum viable population sizes and the number and geographic distribution of its populations, respectively. The assessment of the subspecies' representation considered both the distribution of its populations and on the extent of genetic variation between and within populations. The evaluation of viability also considered the abatement of threats through the conservation and protection of populations and habitats. Although the original downlisting criterion had not been met, we determined that the criterion was unattainable or unsustainable due to the vulnerability of larger populations to insect parasites (USFWS 2017, pp. 31, 40, 51). The SSA concluded that Tobusch fishhook cactus currently has multiple resilient populations, and that it possesses sufficient genetic diversity to conserve long-term adaptive capability (USFWS 2017, pp. 51-52); however, the subspecies still faces significant threats from changes in vegetation and wildfire frequency, insect parasites, and the potential effects of climate changes (USFWS 2017, pp. 45-46). On this basis, the Service reclassified Tobusch fishhook cactus to threatened on May 15, 2018.

In this amendment, we base the delisting criteria (for removal from the list of threatened and endangered species) on sustaining or improving the current status long enough to demonstrate that Tobusch fishhook cactus is no longer likely to become endangered in the foreseeable future. This requires defining the current status in specific, measurable terms, and on defining a period of monitoring needed to detect demographic trends and responses to climate changes.

Our analysis of survey data (USFWS 2017, Appendix B) indicates that a total of 3,836 Tobusch fishhook cactus individuals have been documented at 10 protected natural areas (USFWS 2017, Table B11, p. B-20); this total includes both mature and immature individuals. The maximum numbers detected at each site ranged from 17 to 1,090. However, several large populations have been decimated by insect parasites, including a species of weevil (*Gerstaeckeria sp. nov*.) and cactus longhorn beetles (*Moneilema spp*.). Periodic outbreaks of insect parasitism appear to be an unavoidable natural cycle, and large cactus populations would eventually host very large parasite populations, leading to their collapse. For this reason, the most appropriate conservation strategy is to protect large numbers of small, widely-spaced populations, rather than fewer large populations that are more vulnerable to parasites (USFWS 2017, pp. 27-28, 35-36, 39-40).
The metric for resilience is minimum viable population size (MVP), the smallest population size that has a high probability of surviving a prescribed period of time. Poole and Birnbaum (2003) used the method of Pavlik (1996, p. 137) to estimate an MVP level for Tobusch fishhook cactus

of 1,200 individuals. We concur that this is an appropriate criterion for viable population size. However, most seedlings of Tobusch fishhook cactus die before they are able to reproduce and therefore do not contribute to the subspecies' genetic diversity or future viability. Furthermore, population surveys that do not distinguish mature plants from seedlings would appear to fluctuate wildly, depending on how recently seeds had matured and germinated and the proportion of surviving seedlings; this would make it very difficult to judge when the criterion had been met. Therefore, the MVP criterion should be based only on the numbers of mature individuals that have flowered at least once or are judged capable of flowering. Tobusch fishhook cactus reaches a mature reproductive size at a diameter of about 2 centimeters (cm) (USFWS 2017, pp. 8-12); therefore, this criterion should be based on the numbers of individuals equal to or greater than 2 cm in diameter. Complete censuses of all individuals in very large populations would require a prohibitive amount of field work. Consequently, the sizes of large populations may be estimated through statistically valid sampling methods.

The metric of redundancy is the number and distribution of populations. We are not aware of a scientific method to determine the minimum number of populations needed to assure long-term survival of a species; relatively large numbers of protected populations distributed over a wider geographic range confer greater redundancy. The reclassification to the threatened status was based, in part, on the degree of redundancy conferred by populations of the species at 10 protected natural areas (listed in Table B11, USFWS 2017). This criterion of redundancy is similar to the recovery criteria of other highly endemic listed cactus species, such as star cactus (*Astrophytum asterias*) (USFWS 2003). The individual protected sites may not all be large enough to contain the MVP level of 1,200 mature Tobusch fishhook cactus individuals. However, it is possible that the populations documented at each of the 10 protected natural areas are parts of larger metapopulations, and these may include 1,200 or more mature individuals. In this case, the MVP criterion could be attained by combining the numbers found on protected natural areas with those occurring on other properties within the same metapopulation where the subspecies is protected through conservation easements or other forms of permanent conservation. The component properties contributing to a protected metapopulation need not all be adjacent, provided that intact habitat corridors exist between them. These habitat corridors could include publicly-owned watercourses, or could be established through management agreements along highway, railway, or pipeline rights-of-way where no other natural connections exist.

The metric of representation is derived from the geographic distribution of populations as well as the genetic variation within and between populations. Rayamajhi (2015, p. 67) found relatively little genetic differentiation between 9 populations of Tobusch fishhook cactus, regardless of the distance between populations, indicating that gene flow between populations has occurred at least until recently. However, three populations had higher levels of inbreeding that may have been due to their small size and isolation (Rayamajhi 2015, pp. 64, 97). To prevent a decline of the subspecies' ecological and genetic diversity, protected populations should be distributed throughout its geographic range. Geological substrates, soils, precipitation patterns, sunlight intensity, and day length are important factors that influence plant distribution and adaptation. Geological substrates and soils are relatively consistent across the subspecies range. Conversely, precipitation decreases from east to west across the subspecies' range, sunlight intensity increases from north to south, and the differences between summer and winter day lengths

increase from south to north. On this basis, the range of ecological adaptation and genetic variation may be conserved by protecting one or more populations in each of four quadrants of the geographic range (northeast, northwest, southeast, and southwest).

In order to apply the criteria of population size, number, and distribution, it is necessary to delineate populations. However, it is very difficult to delineate Tobusch fishhook cactus populations for several reasons. The populations are not uniformly distributed through habitats, but consist of multiple colonies of varying size clustered around outcrops of limestone (USFWS 2017, pp. 14-17). Due to the influence of insect parasites and the increased vulnerability of larger populations (discussed above), colonies are widely scattered over very large landscapes and occupy only a very small proportion of the potentially suitable habitats. At any one time, some individual colonies are establishing, some are growing, and some are in decline, and few if any attain 1,200 mature individuals. For these reasons, it is more practical to base determinations of MVP and demographic trends on metapopulations consisting of multiple colonies distributed at a landscape geographical scale, rather than on individual colonies.

A metapopulation, as used here, includes all the colonies or populations between which gene flow occurs at least occasionally. Gene flow can occur through pollination or through seed dispersal. The introduced European honey bee (*Apis mellifera*) is an effective pollinator of Tobusch fishhook cactus (Lockwood 1995, pp. 428-430; Langley 2015, pp. 21-23, 29-30). Honey bees have forage ranges that can exceed 9.5 kilometers (km) (5.9 miles (mi) (Beekman and Ratnieks 2000). Although not demonstrated, it is likely that fruits of Tobusch fishhook cactus could be eaten and viable seeds distributed by locally common frugivorous birds, such as the Northern Mockingbird (*Mimus polyglottos*). Biedenweg (1983, p. 158) reports home ranges for the Northern Mockingbird up to 7.9 hectares (19.5 acres); we interpret this to mean that mockingbirds frequently move over 300 meters (984 feet) when feeding, although longer flights must also be possible. Based on the greater of these forage ranges, colonies separated by less than 10 km (6.2 mi) pertain to the same metapopulation, and metapopulations are delineated by gaps greater than this distance.

The protected metapopulations that contribute to fulfilling the delisting criteria must be monitored long enough to detect demographic trends and responses to threats, including the potential threats of climate changes. Plant population sizes in the wild vary in response to variations in rainfall and temperature, parasite and disease populations, and many other factors. Changes in population sizes that occur over one to several generation spans may represent only natural variations rather than longer-term demographic trends. To distinguish longer-term demographic trends from random variations in population sizes, we provisionally estimate that trend detection will require periodic monitoring through at least 5 generation spans. Although Tobusch fishhook cactus individuals can survive for many decades, a generation span is the time required for a newly formed seed to disperse, germinate, grow to a mature size, flower, and disperse new seeds. Based on observed growth rates in the wild, Emmett (1995, pp. 151-152) estimated that individuals reach a reproductive diameter of 2 cm after 9 years. Therefore, the protected metapopulations must be monitored for at least 45 years.

IV. Amended Recovery Criteria.

a. Downlisting Recovery Criteria.

We reclassified Tobusch fishhook cactus to threatened on May 15, 2018 because it has larger, more numerous populations that are much more widely distributed than we previously understood, and therefore the subspecies has greater resilience, redundancy, and representation (83 FR 22397). Therefore, it is no longer necessary to define downlisting criteria.

b. Delisting Recovery Criteria.

1. Populations or portions of metapopulations occur within 10 or more protected natural areas. Protected natural areas include lands owned by federal, state, or local government agencies, or by private landowners, that are legally protected for the purpose of conserving native plants and animals and their habitats. Examples include, but are not limited to, state parks, state natural areas, and state wildlife management areas, conservation easements on private lands, lands owned and managed for conservation by non-profit organizations, and legally-binding long-term management agreements with other public agencies or private landowners. To be considered under this criterion, the potential habitats of Tobusch fishhook cactus must be managed in a manner that promotes the continued survival of the subspecies.

2. The 10 or more protected natural areas described in the previous criterion must conserve the full geographic and ecological range of the subspecies. To meet this criterion, one or more protected natural areas must occur within each of four equal-area quadrants (northeast, northwest, southeast, and southwest) of the subspecies' natural range.

3. Populations or portions of metapopulations within each protected natural area have 1,200 or more mature individuals. This criterion may be met by combining multiple protected areas that occur within the same metapopulation, as defined above.

4. Periodic monitoring indicates that the minimum viable population level of 1,200 mature individuals within each protected natural area has remained stable or has increased over a period of 45 years. Monitoring (censuses) of each protected natural area must be conducted at least once every 5 years. The size of large populations may be estimated through statistically valid sampling methods.

IV. 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 draft amendment for the Tobusch Fishhook Cactus 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. An electronic version of the draft recovery plan amendment was also posted on the Service's Species Profile website (https://ecos.fws.gov/docs/recovery_plan/Draft%20SCLTOB%20Recovery%20Plan%20Amendment_clean.pdf).

We also developed and implemented an outreach plan that included (1) publishing a news release on our national webpage (https://www.fws.gov/news/) on 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 two responses to the request for public comments from 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. 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.

Summary of Peer and Partner Review Comments

In accordance with the requirements of the Act, we solicited independent peer review of the draft amendment from qualified representatives from the following: Angelo State University, Texas Parks and Wildlife Department, University of Texas – Austin, The Nature Conservancy, Texas Tech University, and Sul Ross State University. Peer review was conducted concurrent with the *Federal Register* publication. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge in the ecology, conservation, management, or natural history of *Sclerocactus brevihamatus* ssp. *tobuschii* or other native cactus species of concern in Texas. 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 and one partner agency. We received comments from two peer reviewers and one partner agency reviewer. Peer reviewers that responded included one representative from Texas Tech University and one from The Nature Conservancy. Partner agency reviews included one from Texas Parks and Wildlife Department. In general, the draft amendment was well-received by the peer and partner reviewers and garnered positive comments. The reviewers provided minor edits, comments, and additional specific information, and we have addressed the reviewers' specific critiques and incorporated their suggestions as changes to the final amendment. Such comments did not warrant an explicit response, and as such, are not addressed here. 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.