

RECOVERY PLAN AMENDMENTS FOR ELEVEN SOUTHWEST SPECIES

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

<p>Black Lace Cactus (<i>Echinocereus reichenbachii</i> var. <i>albertii</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: March 18, 1987</p> <p>Page(s) Superseded: 24</p>
<p>Little Colorado Spinedace (<i>Lepidomeda vittata</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: January 9, 1998</p> <p>Page(s) Superseded: 8</p>
<p>Loach Minnow (<i>Tiaroga cobitis</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: September 30, 1991</p> <p>Page(s) Superseded: 20-22</p>
<p>Masked Bobwhite (<i>Colinus virginianus ridgwayi</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: April 21, 1995</p> <p>Page(s) Superseded: 37</p>
<p>Mexican Long-Nosed Bat (<i>Leptonycteris nivalis</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: September 8, 1994</p> <p>Page(s) Superseded: 33-35</p>
<p>Navajo Sedge (<i>Carex specuicola</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: September 24, 1987</p> <p>Page(s) Superseded: 10</p>
<p>Nichol's Turk's Head Cactus (<i>Echinocactus horizonthalonius</i> var. <i>nicholii</i>) Recovery Plan</p> <p>Original Recovery Plan Approved: April 14, 1986</p> <p>Page(s) Superseded: None</p>
<p>San Marcos & Comal Springs & Associated Aquatic Ecosystems (Revised) Recovery Plan</p> <p>Original Recovery Plan Approved: February 14, 1996</p> <p>Page(s) Superseded: 54-57</p> <p>Species Included: Texas wild-rice (<i>Zizania texana</i>) fountain darter (<i>Etheostoma fonticola</i>) Texas blind salamander (<i>Typhlomolge rathbuni</i>)</p>

Sonora[n] Tiger Salamander (*Ambystoma tigrinum stebbinsi*) Recovery Plan

Original Recovery Plan Approved: September 24, 2002

Page(s) Superseded: 13

Spikedace (*Meda fulgida*) Recovery Plan

Original Recovery Plan Approved: September 30, 1991

Page(s) Superseded: 19-22

Texas Poppy Mallow (*Callirhoe scabriuscula*) Recovery Plan

Original Recovery Plan Approved: March 29, 1985

Page(s) Superseded: 11

For

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

December 2019

Approved:



Regional Director, U.S. Fish and Wildlife Service

Date:

DEC 06 2019

Recovery Plan for *Carex specuicola* (Navajo sedge)
https://ecos.fws.gov/docs/recovery_plan/870924.pdf

Original Approved: September 24, 1987

Original Prepared by: Donna E. House, Navajo Natural Heritage Program, Window Rock, Arizona

AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for *Carex specuicola* (Navajo sedge) since completion of the original recovery plan. In this proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and the rationale supporting the proposed modification of the original Navajo Sedge Recovery Plan (Recovery Plan). The proposed modification is shown as an addendum that supplements the Recovery Plan.

**For
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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 the plan is out of date or its usefulness is limited, and therefore warrants modification. Keeping recovery plans current ensures the species benefits through timely, partner-coordinated implementation based on best available information. The need for, and extent of, plan modification varies 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 involvement of stakeholders.

An amendment involves a substantial rewrite of part of a recovery plan that changes any of its statutory elements. 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 is identified such as population-level threats to the species or previously unknown life history traits 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 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 and/or prioritized 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

To develop recovery criteria, our primary information source was the Navajo Sedge 5-YR Status Review (U.S. Fish and Wildlife Service [Service] 2014), and existing quantifiable recovery criteria for other listed plant species with similar life histories. We met with Navajo sedge experts, including the past and current botanists of the Navajo Natural Heritage Program (NNHP). We also reviewed recovery actions our partners have taken since development of the Recovery Plan. In addition, we plan to conduct peer review of this amendment concurrent with publication of a Notice of Availability for the draft amendment in the *Federal Register*.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires 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 (*Fund for Animals v. Babbitt*, 903 F. Supp. 96 [D.D.C. 1995]) and a Government Accountability Audit (GAO 2006) have also affirmed the need to frame recovery criteria in terms of threats assessed under the five threat factors (ESA 4(a)(1)).

Recovery Criteria

We did not include delisting criteria in the original Recovery Plan due to our limited knowledge of this species habitat and abundance at that time (Service 1987, p 10). While the Recovery Plan does not contain recovery criteria, per se, it does identify several recovery actions for the purpose of protecting Navajo sedge and gathering information to “quantify habitat and abundance” in the manner needed to establish delisting criteria (Service 1987, p 10).

Synthesis

Population information

New information about the Navajo sedge that has become available since completion of the 1987 Recovery Plan is largely summarized in the 5-Year Status Review (Service 2014) and supplemented by more recent reports cited herein. At the time of listing, we knew of Navajo sedge at three springs in a mile (1.6 kilometer [km]) span, made up of what we thought was about 700 individuals (Service 1987); we now consider these sites to be one population or “element occurrence record” (EOR) (NNHP 2004). Today, we know of 160 sites, in 64 EORs, across the range of the species in Arizona and Utah (Rink 2018), spanning an area of about 120 miles (190 km) by 110 miles (175 km). Each of these EORs is made up of one to nine hanging gardens (Rink 2018). We originally thought Navajo sedge was only associated with seeps in Navajo sandstone, but we now know it occurs in association with Cedar Mesa, De Chelly, Kayenta, and Wingate geologic formations.

Navajo sedge habitat is a “hanging garden”, a cliff-associated spring or seep with a plant community. An EOR is one or more hanging gardens, or sites, in one drainage within 1 km of each other. Element occurrence records have been used by the NNHP to document Navajo sedge

sites since the 1980's and provide a consistent tool to evaluate the status of Navajo sedge. Rink (2018) questions equating a "population" with an EOR, contending we don't yet know how to define a Navajo sedge population due to its rhizomatous nature, which may result in a given hanging garden being comprised of one individual, and our lack of understanding of the role of sexual reproduction in population dynamics. However, because use of the EOR is well established for both for Navajo sedge and many species (NatureServe 2002), we use it for our purposes herein.

Range-wide, Navajo sedge occurs on lands managed mainly by the Navajo Nation, and also the National Park Service (NPS), Hopi Tribe, and Bureau of Land Management (NNHP 2012, Hopi Tribe 2012, NPS 2013, Rink and Hazelton 2014), in nine watersheds.

On the Navajo Nation, which has the most extensive, long-term information, there are 54 EORs. As of 2012, the NNHP had population size data on 33 of these as follows: five had been estimated to have "thousands" of plants, while the rest were evenly split between those with less than 100 plants and those with 100 to 1,000 plants (NNHP 2012). It is important to note that with rhizomatous perennials, such as Navajo sedge, counting "plants" is not a reliable measure of population density but does provide one criterion to assessing the status of the site. Natural Heritage element occurrence ranks (EO ranks) are used to categorize the viability of populations for the medium to long term. The ranking system utilizes all available information on the size and condition of the population, as well as the condition of the surrounding landscape, to assess the likelihood that the population will persist in a similar or improved state for 20 to 30 years (NNHP 2012). Occurrences with relatively less impacts would generally be ranked as fair or better viability, and those with significant degradation would be ranked as poor viability (NatureServe 2002). Of 32 EORs with enough status information, the NNHP assigned 16 an EO rank of good or excellent viability. The rest were of fair viability. The NNHP did not assign a rank of poor viability to any EORs.

We believe the difference in number of sites between 1985 and now is likely largely due to survey effort, not a change in abundance, as only a small part of the range of Navajo sedge had been surveyed by 1985, and dispersal events for this species are probably rare (Rink 2018). Rink (2018) states that the historical range and distribution must be nearly what it is today because there is no evidence to the contrary. We have reasonably well documented data for extirpation at one Navajo sedge site, and Rink hypothesizes that dispersal took place at six sites in the last 25 years of surveys (Rink 2017; 2018). Despite considerable survey effort, much of the area where suitable Navajo sedge habitat occurs remains un-surveyed due to a canyon-land terrain that limits both access to the area and into suitable sites, often on tall sheer cliff faces. Rink (2018) estimates roughly 11 to 13% of areas within the range of Navajo sedge that may have suitable habitat have been surveyed for the species, but we do not know the extent of suitable habitat within that area.

Threats

Navajo sedge was listed based on the threats of habitat modification as a result of water development for livestock and heavy livestock trampling and grazing, the lack of protective Federal and State regulations, and the limited distribution and small number of populations (50 FR 19370). Navajo sedge is much more widely distributed and the number of sites is far higher

than was known at the time of listing, and so we now believe that the original listing factors may only pose an acute impact to a limited number of individual sites. For example, damage by livestock has been noted at 6 of the 42 EOs on the Navajo Nation, and there is no record of a population becoming extirpated due to grazing or trampling (NNHP 2012). However, as will be discussed below, there is reason to analyze new information about long-term drought as a result of climate change and its potential impact to the species.

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 that 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 endangered or threatened 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*.

We establish delisting criteria for Navajo sedge, to augment the 1987 Recovery Plan, as follows:

Delisting Recovery Criteria

We will consider Navajo sedge for delisting when:

1. We can demonstrate the persistence of the species over time and across its range, as indicated by maintaining presence at 90% of known EORS for at least 15 years. This will be done through presence/absence surveys, with EORS being visited in a phased approach (e.g., several per year) within a time frame that may start retroactively beginning in 2011. Information such as viability may be a consideration in determining presence/absence. An EOR is defined as a “hanging

garden” (an assemblage of plants including Navajo sedge on a cliff) or a closely spaced group of hanging gardens in the same canyon within 1 kilometer of each other

Justification: The residence time for the water in the small, perched aquifers that supply Navajo sedge sites may be a few decades at the most (Rink 2018). Given that the current drought has lasted 20 years (U.S. Drought Monitor), the effects of continued drought, if realized, should be evident now or in the near future (i.e. about 15 years). If, in 15 years, conditions such as mean annual temperature or winter precipitation indicate seeps may dry, then this monitoring period will be extended. The retroactive limit of 2011 is based on work by Hazelton and Rink, and others, since that time to re-visit all known sites and survey for new sites (Rink and Hazelton 2014). In addition to re-documenting the existing of the species at a site, it is important to consider conditions at the site. One method of assessing site condition is the Natural Heritage methodology to rank EORs. For example, an EO rank of D means poor viability and would indicate the site may not be considered persistent. This criterion supports redundancy, the ability of the species to withstand catastrophic events, through the maintenance of multiple populations of the species over the landscape in different hydrologic settings. Stability in the number of sites over the given time-period should indicate that the populations are resilient to stochastic events and other stressors.

2. We can demonstrate long-term habitat stability, through monitoring and, if appropriate, modeling of hydrology.

a. Monitoring would be conducted for at least 15 years on plots located in at least 13 sites, representing a range of environmental characteristics (geology, moisture, stressors), plant cover and composition, and broad geographic distribution. Each site would be visited annually at the same time of year and time of day. Visitation frequency may be adjusted semi-annually if supported by an analysis of initial findings. Monitoring protocol will follow Rink and Hazelton (2014) or a similarly rigorous methodology that documents both the extent of Navajo sedge and moisture in the hanging garden.

b. Modelling could involve the use of both hydro-geologic and climate change models to evaluate long-term effects of climate on the aquifers upon which Navajo sedge appears to rely.

Justification: Rink and Hazelton (2014) established monitoring plots at nine sites on the Navajo Nation, meeting the stated specifications. These sites do not extend across the entire range of the species, but do have broad geographic distribution, covering the entire range of the species from east to west and the portion of the range with most of the EORs. Additional sites in the northern part of the species distribution will ensure more complete representation and more likely capture climatic differences. Water, a direct indication of hydrology, can be a very challenging feature of hanging gardens to meaningfully document. Water flow may only be present as moist soil or rock, or may not be discernable at all, presumably as a result of total use by the hanging garden community or because flow has actually stopped, either temporarily or permanently. Therefore, it is also critical to record an accurate measure of Navajo sedge extent at the site, which may be used as a surrogate to indicate hydrology. We believe that if the extent of the species remains the same over time, the hydrology, and therefore habitat, is also stable. Fifteen years of monitoring will allow for changes in hydrology to be detected if less recharge to the relatively small, perched aquifers that supply hanging gardens occurs due to drought. Demonstration of hydrologic stability over this time-period may imply that the current drought is not an immediate

or significant threat to Navajo sedge. As mentioned above, if, in 15 years, conditions, such as mean annual temperature or precipitation, indicate seeps may dry, then this monitoring period will be extended.

Currently, hydrologic modeling of the aquifers upon which Navajo sedge relies is thought to be highly problematic due to the small size of the aquifers and potentially confounding local factors. And monitoring may not be necessary if monitoring can produce all the necessary data. However, we do not wish to foreclose options that a future modelling technology may allow.

Rationale for Amended Recovery Criteria

Developing quantifiable criteria for the recovery of Navajo sedge is complicated by our increased understanding of the species from when it was listed to now. None of the factors originally described in the listing determination for Navajo sedge presented nor do they now present a threat to the species, though they have and may continue to result in localized impacts.

Only one of the five listing factors (E: other natural or manmade factors) is currently relevant to the viability of Navajo sedge. Drought and climate change, through influencing temperature and precipitation, could diminish recharge of the perched aquifers upon which Navajo sedge depends. This, in turn, could impact the long-term survival of Navajo sedge. A hydrogeologic model developed by Rink (2018) suggests waters supporting hanging gardens with Navajo sedge are young and not likely stable under conditions of long-term drought. However, we have no information to suggest the current multidecadal drought is having a significant effect on the species; we suspect only one site of drying, resulting in the loss of Navajo sedge. Despite this uncertainty, maintaining as many sites as possible in different geographic and hydrologic settings throughout the range of Navajo sedge may safeguard the species ability to withstand the impacts of this potential threat.

Although we do not find evidence for grazing to be a threat to the species, we recognize the effects that grazing and related trampling has had at various sites and may have in the future. Therefore, it is included in the monitoring protocol, which should allow us to more definitively characterize the extent or those effects, and to fully assess the viability of livestock-accessible populations.

The Service uses the concepts of resilience, redundancy, and representation (“3Rs”) to identify the conditions needed for species viability. Below, we discuss the relevance of the 3Rs, which when combined with the explanation above, provide for a complete rationale for the criteria.

Resilience refers to the population size necessary to endure stochastic environmental variation or disturbances such as random fluctuations in germination rates (demographic stochasticity), variations in rainfall (environmental stochasticity), or the effects of anthropogenic activities. We know little about the population numbers needed to achieve resiliency for Navajo sedge, however, in general having more sites will provide greater resiliency. Although climate change models predict a drying trend and a shift in precipitation from winter to summer, precipitation patterns in the southwest are typically very spotty. Having EORs spread across the landscape will increase the chance that some receive adequate precipitation.

Redundancy is the ability of a species to withstand catastrophic events. Redundancy is met by having multiple sites distributed broadly across the species' range. Because these sites are geographically or ecologically independent, plants at sites are less likely to be simultaneously affected by catastrophic events. Therefore, the species is more likely to withstand these events.

Representation is the ability of a species to adapt to changing environmental conditions. Representation can be achieved by maintaining the numbers and geographic distribution of a species throughout its historical range. We have no genetic information about Navajo sedge, but surmise it probably lacks genetic diversity, and does not likely experience much genetic drift. It seems likely that entire sites are often occupied by just a single genet/ramet (i.e., genetically identical group of plants) and that cross-pollination between sites is an uncommon event (Rink 2018). Given these uncertainties about population dynamics, there is some question about how to define a population at this time. However, conserving geographically distinct groups should conserve the breadth of the genetic makeup of the species to conserve its adaptive capabilities. Conversely, genetic stability could be an attribute that is positively correlated with viability for species with narrow habitat requirements (Rink 2018).

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS

Not applicable.

COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS

Not applicable.

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

Summary of Public Comments

We published a notice of availability in the *Federal Register* on August 6, 2019 (84 FR 38288-38291) to announce that the draft amendment for the Navajo sedge (*Carex specuicola*) 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/ecp0/profile/speciesProfile?sId=8579>>.

We did not receive any responses to the request for public comments.

Summary of Peer and Partner Review Comments

In accordance with the requirements of the Act, we solicited independent peer of the draft amendment from qualified representatives from the following: National Park Service, Navajo Nation, New Mexico Energy Minerals and Natural Resources Department – Forestry Division, and a private company, Far Out Botany. Criteria used for selecting peer reviewers included their demonstrated expertise and specialized knowledge related to Navajo sedge, plant conservation biology, botany. 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/partner agencies. We received comments from four peer reviewers/partner reviewers.

Peer reviewers that responded included representatives from one tribe (Navajo Nation), state agency (New Mexico Forestry), one Federal agency (National Park Service) and a private company (Far Out Botany). In general, the draft amendment was well-received by the peer reviewers, garnering both positive comments and constructive criticism.

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 and partner reviewers with our responses; however, we addressed many of 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.

Peer Review Comment (1): The commenter stated that the effects of grazing remains a threat to Navajo sedge. Eighty-three percent of surveyed sites on the Navajo Nation were accessible to livestock (NNHP 2004). Hence there is a potential for significant impacts, especially since Navajo sedge is palatable and grazing is unregulated.

Response: Reliably identifying and assessing the condition of Navajo sedge requires surveyor access by foot, this means access by livestock is more likely possible, skewing the reported proportion of sites accessible to livestock. Many known sites require access by rappelling, which has only been used a few times. Multiple surveyors think the proportion of all Navajo sedge sites accessible to livestock is far less than reported (NNHP 2014, Rink 2018). Although, grazing was identified as a threat, upon listing we also noted that early reports found healthy plants with good vigor and good overall reproductive success at sites where there was grazing (USFWS 2014). The rhizomatous nature of this species may make it resilient to limited grazing. There are examples of Navajo sedge rebounding from heavy grazing but no evidence of extirpation due to grazing. Only one site is suspected of extirpation, which was due to drying, not grazing.

Peer Review Comment (2): The commenter stated that determining hydrologic stability based on trends in water discharge in hanging gardens is problematic given the limited amount of water often present.

Response: We agree this will be challenging, however it is important to assess Navajo sedge habitat in order to understand its viability. Rink and Hazelton (2014) include a simple descriptive technique to record moisture in a hanging garden, and there are a variety of scales that could be used to describe discharge. Delisting Criterion 2 also explains that vegetation, abundance and/or composition, can also be used as a proxy to understand hydrology, and modeling is also identified as a possible tool. As technology advances and techniques are refined, it is out hope that a more robust methodology to determine hydrologic stability will be developed.

Peer Review Comment (3): The commenter stated that a ten-year period of monitoring is too short.

Response: We have lengthened the monitoring period to a minimum of 15 years. We think this is adequate to determine whether drought is a threat to the species, given the 20-year length of the current, ongoing drought and the limited residence time of water in the small perched aquifers that support hanging gardens in which Navajo sedge resides. It should be noted that the monitoring plots recommended for use were established in 2013 and 2014. While the data originally collected does not fall within the recommended 3 to 5 year interval, it will nonetheless provide a valuable point of reference. Furthermore, 15 years is a minimum; if a trend is inconclusive or there is any indication of a decline, then more monitoring is warranted.