

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

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

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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 A review of the recovery plan and its implementation may show that the plan is out of date or its usefulness is limited, and therefore warrants modification. Keeping recovery plans current ensures that the species benefit through timely, partner-coordinated implementation based on the best available information. The need for, and extent of, plan modification will vary considerably among plans. Maintaining a useful and current recovery plan depends on the scope and complexity of the initial plan, the structure of the document, and the involvement of stakeholders.

An amendment involves a substantial rewrite of a portion of a recovery plan that changes any of the statutory elements. The need for an amendment may be triggered when, among other possibilities: (1) the current recovery plan is out of compliance with regard to statutory requirements; (2) new information has been identified such as population-level threats to the species or previously unknown life history traits that necessitates new or refined recovery actions 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 help develop these recovery criteria, our primary information source was the Navajo sedge five-year 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 botanist of the Navajo Natural Heritage Program (NNHP). We also reviewed the recovery actions our partners have taken since the development of the original 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

At the time of listing, we knew of Navajo sedge at three springs in a mile 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 by 110 miles. 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 formations.

Rink (2018) questions equating a “population” with an EOR (defined as one or more sites in one drainage and within 1 km of each other). He also contends we do not yet know how to define a population. However, EORs 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.

Range-wide, Navajo sedge occurs on lands managed by the Navajo Nation, 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 “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). Of 32 EORs with enough status information, the NNHP assigned 16 a rank of good or excellent viability. The rest were of fair viability, indicating some reason for concern. The NNHP did not assign a rank of poor viability to any EORs. The rank is the likelihood that the population will persist in a similar or improved state for 20 to 30 years.

We believe that the difference in number of sites between 1985 and now is likely 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). We have reasonably well documented data for extirpation at one Navajo sedge site, and some evidence for dispersal at six (Rink 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. Within the known range of the species, Rink (2018) extrapolates there may be as many as 1,200 Navajo sedge sites.

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 more widely distributed and the number of sites is far higher than 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. 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 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*.

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

Delisting Recovery Criteria

We will consider Navajo sedge for delisting when:

1. We can demonstrate that populations are stable or increasing for at least 10 consecutive years, as indicated by monitoring at least 25 percent of sites per watershed, by an estimate of area covered by Navajo sedge (which may include other species mixed in) and/or the number of stems. The 10-year period may start retroactively. A stable population could include up to 20 percent of sites showing a decrease in cover or number by 20 percent. We expect up to 10 percent of sites may not be found in subsequent visits, which should not affect the results. A site is defined as a “hanging garden” (an assemblage of plants including Navajo sedge on a cliff) or a group of hanging gardens, that is supported by a seep or a spring associated with a single aquifer.

Justification: The residence time for the water in the small perched aquifers that supply Navajo sedge sites is likely at the most a few decades (Rink 2018). Given that we are in the midst of a 20-year drought, the effects of continued drought, if realized, should be currently evident. Sampling a modest portion of sites within each watershed, with an emphasis on those watersheds where we know the species to be more abundant, should provide a representative indication of population stability. Based on sites that surveyors have revisited multiple times, abundance has fluctuated significantly without apparent overall trends. Therefore, it is safe to assume that such fluctuations, within reason, will continue. Measuring Navajo sedge cover can be a more accurate and efficient way to assess the species condition at a site, particularly for large gardens. The number of stems does not correspond to individual plants, but has been used for many of the early NNHP surveys and can provide a basis for comparison. 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. Stable or increasing population growth rates over that time period should indicate that the populations are resilient to stochastic events and other stressors. Past experience has demonstrated the difficulty of re-locating sites and so we should expect a “fail to find” rate of up to 10 percent, which we have built into the total number of sites we need as a representation of the species.

2. We can demonstrate the long-term hydrologic stability of habitat, through either monitoring or modeling.

a. Monitoring would involve plots located in at least 9 sites from at least 5 different watersheds with data collected at least twice, including when the plots were established, for at least 10 years. The sites would represent a range of environmental characteristics (moisture, aspect), plant cover, and broad geographic distribution.

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 nine sites on the Navajo Nation, meeting the stated specifications. Although these sites do not extend across the entire range of the species, they 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 populations, and representing most watersheds where Navajo sedge occurs on the Navajo Nation. Given the lack of documented threats to the species throughout its range, this distribution of monitoring sites should be adequate. Ten years of monitoring will allow for changes in seepage and/or vegetation composition to be detected as a result of less recharge to the relatively small, perched aquifers that supply hanging gardens. Demonstration of hydrologic stability over this time period implies that prolonged drought is not an immediate or significant threat to Navajo sedge.

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 may result in localized impacts at a few sites.

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 affect recharge of the perched aquifers upon which Navajo sedge depends. This, in turn, could impact the long-term survival of Navajo sedge. Paleoclimate evidence suggests Navajo sedge was resilient to multidecadal-length droughts (Rink 2018 and in spite of the current multidecadal drought, we suspect only one site of drying, resulting in the loss of Navajo sedge.). However, 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. 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.

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 populations 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). We also do not know 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.

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS

Not applicable.

COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS

Not applicable.

LITERATURE CITED

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