

**Navajo Sedge  
(*Carex specuicola*)  
5-Year Status Review:  
Summary and Evaluation**



*Photo by: Max Licher*

**U.S. Fish and Wildlife Service  
Arizona Ecological Services Office  
Flagstaff, Arizona  
July 28, 2023**

## 5-YEAR REVIEW

### *Navajo Sedge (Carex specuicola)*

#### 1.0 GENERAL INFORMATION

##### 1.1 Listing History

**Species:** Navajo sedge (*Carex specuicola* Howell)

**Date listed:** May 8, 1985

**FR citation(s):** 50 CFR 19370

**Classification:** Threatened

**Critical habitat/4(d) rule/Experimental population designation/Similarity of appearance listing:** In the final rule listing for Navajo sedge (hereafter, *C. specuicola*), the U.S. Fish and Wildlife Service (Service) designated critical habitat for the species.

##### 1.2 Methodology used to complete the review:

The Service most recently evaluated the biology and status of the *C. specuicola* as part of a status review conducted on August 26, 2014. We examined whether new information was available and whether that new information would alter or affect analyses and conclusions made in the previous status review. Data for this current review were solicited from interested parties through a Federal Register notice announcing the review on January 11, 2023. We also contacted tribes, species experts, and partners to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files.

##### 1.3 FR Notice citation announcing the species is under active review:

88 FR 1602, Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 31 Species in the Southwest, January 11, 2023.

#### 2.0 REVIEW ANALYSIS

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of “endangered species” or “threatened species.” The Act defines an “endangered species” as a species that is “in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The Act requires that we determine whether a species meets the definition of “endangered species” or “threatened species” due to any of the five factors described below.

Section 4(a) of the Act describes five factors that may lead to endangered or threatened status for a species. These include: A) the present or threatened destruction, modification, or curtailment of its habitat or range; B) overutilization for commercial, recreational, scientific,

or educational purposes; C) disease or predation; D) the inadequacy of existing regulatory mechanisms; or E) other natural or manmade factors affecting its continued existence.

The identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an “endangered species” or a “threatened species.” In assessing whether a species meets either definition, we must evaluate all identified threats by considering the expected response of the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species—such as any existing regulatory mechanisms or conservation efforts. The Service recommends whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

## **2.1 Distinct Population Segment (DPS) policy (1996):**

The DPS policy does not apply to *C. specuicola*.

## **2.2 Updated Information and Current Species Status**

### **2.2.1 Biology and Habitat:**

Recent genetic studies suggest dispersal and gene flow across populations of *C. specuicola* at both small and large spatial scales, ranging from less than four to 127 kilometers (Chapin *et al.* 2022). In our 2014, 5-Year Review, we said hanging gardens that *C. specuicola* inhabit may be paleorefugia, with extinction processes being more important than dispersal (Nekola 1999). We also noted there was no documented dispersal and establishment of *C. specuicola* in new sites. Since then, Rink (2017, 2018) provided evidence for dispersal at six sites, noting dispersal events were rare. He also documented extirpation at one site (Rink and Hazelton 2014, Rink 2018). This extirpation to dispersal ratio, based on limited data, indicates hanging gardens may not be paleorefugia for *C. specuicola*. Furthermore, genetic studies of *C. specuicola* now suggest ongoing dispersal, regular colonization, and genetically healthy populations (Chapin *et al.* 2022, Rink and Talkington 2021). This indicates that even if *C. specuicola* is relictual, the species may persist provided habitat is available (Chapin *et al.* 2022).

Because we now have more information about dispersal, Rink and Hazelton (2022) propose developing an additional delisting criterion based on increasing *C. specuicola* abundance, which will be informed by documenting dispersal and colonization. This would involve actively exploring new terrain, hanging gardens, and recording negative results as well as positive results after a thorough search, and then resurveying those sites after some interval to document colonization by *C. specuicola*.

*C. specuicola* are reported using Elemental Occurrences (EOs), with an EO referring to one or more occupied hanging gardens within a single canyon, in a series of alcoves or a single alcove, within one kilometer of each other. While there remains some disagreement among researchers on the use of EOs versus populations or sites (Rink 2018), we use EOs here because surveyors have used them to document *C. specuicola* since 1986 as it provides a standardized, consistent tool to evaluate the status of the species (NatureServe 2004). In 2014, we knew of 57 *C. specuicola* Element Occurrences (EOs). We now know of 65 EOs comprised of 154 sites, which includes more sites at the northern end of the species range in Utah (Hopi Water Resources Program 2012, Rink 2017, Lewinsohn 2023, Rink 2023, Ventrella 2023, Wheeler 2023).

Rink and Hazelton (2014) established nine monitoring plots, with procedures, for *C. specuicola* at nine sites, and recently established five more monitoring plots at new sites (Rink and Hazelton 2022). This brings the total number of monitoring plots in line with our recovery criteria to determine if there is long-term habitat stability (USFWS 2019).

### **2.2.2 Threats Analysis (threats, conservation measures, and regulatory mechanisms):**

At the time we listed *C. specuicola* threats included habitat modification because of water development for livestock and heavy livestock trampling and grazing (Factor A). Livestock-associated water development and livestock grazing or trampling can affect individual gardens but are not a threat across all or a significant portion of the species range (USFWS 2014). However, in 2014 we did not have data to aid in our understanding of the relationship between grazing pressure and *C. specuicola* cover and vigor.

In 2022, Rink and Hazelton (2022) provided data regarding the effects of livestock grazing on *C. specuicola*, suggesting that in the long term, *C. specuicola* is resilient to some amount of livestock grazing. Rink and Hazelton (2022) established monitoring plots at two sites that surveyors previously noted signs of heavy livestock grazing. They found that livestock grazing was not affecting *C. specuicola* at those sites as the prior surveyors noted because the plants appeared healthy in the continued presence of livestock grazing. Continued monitoring of *C. specuicola* sites where livestock grazing occurs will help us understand the long-term effects of this activity.

Researchers developed a model of hanging gardens and the hydrologic basins that support those gardens (Rink 2018). This model has implications for the persistence of *C. specuicola* and suggests that the loss of groundwater reserves will have no effect on the perched aquifers that supply the seeps, upon which *C. specuicola* depends (Rink 2018). Therefore, they did not consider groundwater development a threat to the species. However, local water development, such as that associated with livestock management, could affect individual gardens.

In 2014, we noted that increased temperature and altered precipitation patterns associated with climate change were previously unidentified threats to the species that could modify habitat by negatively affecting the flow or water from hanging garden seeps (Factor A). Recent studies have confirmed that drought, which climate change exacerbates, is a threat to the continued existence of *C. specuicola* by negatively affecting the discharge of water from the seeps on which the species depends (Chapin *et al.*, 2022, Rink and Talkington 2021).

### **2.3 Synthesis:**

The number of known EOs of *C. specuicola* has increased since 2014. However, in the 38 years since we listed *C. specuicola* as a threatened species, we do not have definitive population trends. New monitoring plots may help to develop this data. Increased temperature and altered precipitation patterns associated with climate change may have implications for *C. specuicola* as it inhabits sites that depend on continuous discharge of small volumes of water. We lack long-term demographic data to assess population trends and specific information about the dynamics of the sources of water for seeps that support *C. specuicola*.

Livestock grazing or trampling can affect individual hanging gardens but does not appear to be a threat across all or a significant portion of the species' range. However, it is possible the effects of grazing could exacerbate the effects of drought-associated climate change, which we should continue to monitor and factor into future status reviews.

After reviewing the best available scientific information, we conclude that *C. specuicola* remains a threatened species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our 2014 5-year review (USFWS 2014) remains an accurate reflection of the species current status.

## **3.0 RESULTS**

### **3.1 Recommended Classification:**

No change is needed.

### **3.2 New Recovery Priority Number:**

No change recommended.

### **Brief Rationale:**

Not applicable.

### **3.3 Listing and Reclassification Priority Number:**

The current listing and reclassification priority number for *C. specuicola* is an 8 (moderate degree of threat/high recovery potential).

### **Brief Rationale:**

Not applicable.

## **4.0 RECOMMENDATIONS FOR FUTURE ACTIONS**

We will work with our partners to implement the following recommended actions during the next five-year review period:

- We recommend quantifying the drought threshold for *C. specuicola* in hanging gardens. Threshold parameters may include soil moisture content and/or spring discharge rate, and variability in that moisture level over time. *C. specuicola* appears resilient to some amount of drought, but persistence of a population is dependent on the intensity, duration, and variability of the drought, along with site conditions. To determine these thresholds, we need to collect data on a much finer scale than has been done to date.
- We recommend studying the dynamics of the aquifers upon which *C. specuicola* depends to understand how climate change and local ground water pumping may affect seep discharge. This study should include an understanding of the aquifer sizes and distribution of seeps supporting *C. specuicola* associated with each of those aquifers; and recharge and depletion rates.
- We recommend conducting studies on reproductive strategy (including breeding success, seed viability, and pollination) and dispersal mechanisms of *C. specuicola*.
- We recommend continued monitoring of *C. specuicola* sites where livestock grazing occurs to better understand the timing, duration, and intensity of grazing so we may increase our understanding of long-term grazing effects on the plant.
- We recommend we work with land management entities to develop management plans. These management plans should address newly understood or emerging threats such as climate change.
- We recommend working with our partners to develop robust dispersal and colonization rates for *C. specuicola*. As workload allows, the Service could then use these rates to develop an additional delisting criterion addressing increasing *C. specuicola* abundance.
- As workload allows, we recommend reviewing and revising, as needed, designated critical habitat.

## **5.0 REFERENCES**

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**U.S. FISH AND WILDLIFE SERVICE**

**5-YEAR REVIEW of Navajo Sedge (*Carex specuicola*)**

**Current Classification:** Threatened

**Recommendation resulting from the 5-Year Review:**

No change needed.

**Appropriate Listing/Reclassification Priority Number, if applicable:** Not Applicable

**FIELD OFFICE APPROVAL:**

**Lead Field Supervisor, Fish and Wildlife Service, Arizona Ecological Services Office**

Approve \_\_\_\_\_