

**5-YEAR REVIEW**  
**Tiburon jewelflower (*Streptanthus niger*)**

**GENERAL INFORMATION:**

**Species:** Tiburon jewelflower (*Streptanthus niger*)

**Date listed:** February 3, 1995

**Federal Register (FR) citation:** 60 FR 6671

**Classification:** Endangered

**State Listing:**

The Tiburon jewelflower was listed by the State of California as endangered in 1990.

**BACKGROUND:**

**Most recent status review:**

U.S. Fish and Wildlife Service. 2010. *Streptanthus niger* (Tiburon jewelflower) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. 20 pp.

**FR Notice citation announcing this status review:**

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 66 Species in California and Nevada. Federal Register 85:4692-4694.

We did not receive information from the public regarding the Tiburon jewelflower in response to the notice.

**ASSESSMENT:**

**Information acquired since the last status review:**

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Sacramento Field Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on January 27, 2020 (Service 2020). We also contacted species experts, performed a literature search, and reviewed information from our own files, much of which was compiled during a recent recovery plan amendment for the species. The recovery plan amendment included quantitative criteria for downlisting and delisting the species (Service 2019, pp. 28–30, 44–45). New information has been incorporated into the relevant sections below.

**Species overview:**

The Tiburon jewelflower is an annual herb in the mustard family (Brassicaceae) that can grow between 30–60 cm (1–2 feet) in height. It is restricted to shallow rocky serpentine soils on slopes of the southern Tiburon Peninsula in Marin County at elevations of approximately 100 meters (350 feet) (Service 2010, p. 1). The lower leaves are toothed while the upper leaves are less toothed or are not toothed at all. The sepals are a very dark purple, and the petals have a purple claw and a white blade with a purple midvein. The zig-zag inflorescence pattern and the lack of

hairs distinguish the Tiburon jewelflower from its near relative, *Streptanthus glandulosus glandulosus* (Service 1995, p. 6673). The species requires insect pollinators for reproduction and the pollinators most often seen visiting the plants are bumblebees (*Bombus* spp.) and western honey bees (*Apis mellifera*) (Swope 2019, p. 2).

#### **New research:**

Since the last 5-year review, several research projects involving the Tiburon jewelflower have been initiated. In 2017, the Rancho Santa Ana Botanic Garden transferred Tiburon jewelflower seeds to the University of Minnesota for host range testing of potential biological control insects of the invasive garlic mustard (*Alliaria petiolata*), a non-native biennial herb also in the family Brassicaceae. Host range testing, or testing a range of potential host plants that are closely related to the target plant species, is conducted prior to releasing a biological control insect to determine whether the insect will negatively impact other closely related species. The biological control insects being tested on the Tiburon jewelflower and other native at-risk Brassicaceae include the crown-mining weevil (*Ceutorrynchus scrobicollis*) and seed-feeder (*Ceutorrynchus consttictus*) (Service *in litt.* 2017, entire).

Another research project involved several components, including the introduction of an experimental population of Tiburon jewelflower to a location it has never been documented before. The project had two primary goals: the first was to determine the level of genetic diversity in existing populations and in plants grown from seeds collected in 1997 and 2002, and the second was to determine the relative importance of connectivity and genetic diversity to patch persistence (Swope undated, pp. 1–2; Swope 2019, pp. 2, 4). In order to determine the level of genetic diversity within each population, genetic samples needed to be analyzed; however, because microsatellite markers had not yet been developed specifically for the Tiburon jewelflower, Swope *et al.* (2019, entire) developed the first microsatellite markers for the species. A total of 15 markers were developed to complete the genetic analysis portion of this project and for use in future research projects (Swope *et al.* 2019, pp. 1–3; Swope 2019, p. 7).

In order to determine the relative importance of population connectivity and genetic diversity to population persistence, a total of 2,100 Tiburon jewelflower plants were introduced to Ring Mountain in experimental patches that were considered isolated or connected. Each experimental patch contained 25 plants and patches were considered isolated when they only contained a focal patch that was at least 50m away from the next closest focal patch. This distance was selected because it is the distance measured between natural patches within the grassland habitat at the Old St. Hilary's preserve. Connected patches contained a focal patch with satellite patches within 3–5 m from the focal patch (Swope 2019, p. 11).

A patch was considered to have low genetic diversity if it only contained plants from one source population, either from Middle Ridge or from one of two habitat types the species is known to occur at Old St. Hilary's Preserve: bare openings within native serpentine grassland and an artificial roadcut created for a fire road. The grassland habitat encompasses a larger proportion of Old St. Hilary's Preserve, but due to the invasion of non-native grasses, the species is patchily distributed across the landscape and is much less dense than what is seen in the roadcut habitat (Swope 2019, p. 3). The primary habitat at the Middle Ridge location is similar to the roadcut habitat at Old St. Hilary's Preserve; however, grassland habitat is present within the Middle

Ridge site, but it is comprised primarily of non-native annual grasses that largely exclude the species (Swope 2019, pp. 3–4).

Patches considered to have high genetic diversity contained plants from 5 different sources: the Middle Ridge population, individuals from the roadcut habitat at Old St. Hilary’s Preserve, individuals from the grassland habitat at Old St. Hilary’s Preserve, and seedlings grown using seeds from two historical seed collections in 1997 and 2002 (Swope 2019, p. 11). Although there was habitat within the Ring Mountain Preserve that was similar to the roadcut habitat at Old St. Hilary’s Preserve, the experimental plots were placed on west and south facing slopes within bare areas of the serpentine grassland. Experimental plots were not placed in the roadcut habitat because the area experiences too much pedestrian traffic and were ultimately considered unsuitable (Swope 2019, pp. 4–5).

The results showed plants from the high genetic diversity plots had higher survival from transplantation to flowering than plants from the low diversity plots, and the individuals that appeared to have the highest survival within the high diversity plots were those sourced from the grassland habitat at Old St. Hilary’s Preserve (Swope 2019, p. 13). These findings suggest there is some level of local adaptation to habitat type since the habitat within the experimental plots at Ring Mountain is similar to the grassland habitat at Old St. Hilary’s Preserve (Swope 2019, p. 14). Furthermore, individuals within the connected patches had more seed, suggesting isolated patches are less likely to be visited by pollinators and that even short distances between patches can have an impact on patch persistence (Swope 2019, p. 13). Due to dispersal far outside of the experimental patches, population growth rate could not be estimated and the interaction between connectivity and genetic diversity to patch persistence could not be tested (Swope 2019, p. 14).

#### **Distribution:**

Historically, the Tiburon jewelflower was thought to encompass the entire Tiburon Peninsula of Marin County as one large population that was likely composed of thousands of individuals (Swope 2019, p. 2). However, by the time the final listing rule published the species was restricted to just two populations within the southern portion of the peninsula (Service 1995, p. 6673). The current distribution of Tiburon jewelflower is similar to what was described in the final listing rule, the previous 5-year review, and the recovery plan amendment (Service 1995, p. 6673; Service 2010, p. 3; Service 2019, pp. 15–16). It is only known to occur at two locations found within 3 kilometers (2 miles) of one another; one at the tip of the peninsula at Old St. Hilary’s Preserve and the other along the Middle Ridge of the peninsula (Service 1995, pp. 6673, 6678). No other occurrences outside of Old St. Hilary’s Preserve and Middle Ridge have been documented (Morey and Hunter 1990, pp. 2–3); however, as described above an experimental population of Tiburon jewelflower was introduced to the Ring Mountain Preserve on the Tiburon Peninsula in 2016. This small population has had only limited success and is unlikely to be self-sustaining without continued augmentation into the future (Marin County 2021, p. 3).

#### **Abundance:**

The final listing rule indicated the two populations can have anywhere from 50 to 2,000 individuals (Service 1995, p. 6673), but does not give a further description of what time period these estimates came from or whether one population is larger than the other. As described in the previous 5-year review, the Middle Ridge site had a population of approximately 2,000 individuals in 2009 and abundance information for Old St. Hilary’s Preserve was not available

(Service 2010, p. 3). The recovery plan amendment described the Middle Ridge population as approximately 400-500 individuals and the Old St. Hilary’s Preserve population as approximately 3,000 individuals (Swope pers. comm. 2018; Service 2019, p. 15). A 2018 survey of the Old St. Hilary’s Preserve population documented 4,086 individuals spread out across three areas of the preserve (Marin County Parks 2021, p. 3). We do not have an updated population estimate for the Middle Ridge population since the recovery plan amendment.

**Threats:**

Threats described in the final listing rule include urban development, road construction, pedestrian traffic, non-native invasive plant species, restricted habitat and range, and small population size (Service 1995, pp. 6678, 6680–6682). The previous 5-year review noted the same threats as the final listing rule, but also included climate change (Service 2010, pp. 4–9). An additional threat described in the recovery plan amendment was the loss of genetic diversity seen in the Middle Ridge population, which has implications for the population’s ability to adapt to climate change (Service 2019, p. 16; Swope pers. comm. 2018). The threats noted in the final listing rule, previous 5-year review, and the recovery plan amendment continue to act on the species. We are not aware of any new or additional threats since the recovery plan amendment.

**Recovery criteria:**

Recovery criteria for downlisting and delisting the Tiburon jewelflower are described in the Recovery Plan Amendment for Serpentine Soil Species of the San Francisco Bay Area (Service 2019, pp. 28–30, 44–45). Downlisting criteria for the Tiburon jewelflower have not been met (Table 1) and therefore, delisting criteria are not considered here.

*Table 1. Delisting criteria for the Tiburon jewelflower.*

Downlisting criteria	Has criterion been met?
Occupied habitat at Old St. Hilary's Preserve and Middle Ridge is fully protected and managed with the primary intention of preserving the population in perpetuity.	This criterion has been partially met. Old St. Hilary's Preserve is protected by Marin County Parks and Open Space; however, a portion of the Tiburon jewelflower population at the top of the hill occurs on land that is privately owned and is proposed for development (Service 2010, p. 5). The Middle Ridge location is protected and owned by the Town of Tiburon (Service 2010, p. 11).
Management plan approved and implemented for populations at Old St. Hilary's Preserve, Middle Ridge, and any other location the species may be discovered.	This criterion has been partially met. Marin County Parks and Open Space manages the Old St. Hilary's Preserve and we are unaware of a management plan for the species at this location; however, there is a <i>Vegetation and Biodiversity Management Plan</i> (Marin County 2015) that guides management of invasive plant species within the preserve. The Middle Ridge location is managed by the Town of Tiburon using the Open Space Resource Management Plan, which includes the management of nonnative plants, monitoring passive recreational use, and minimizing impacts from passive recreational use through education and trail enhancements (Service 2010, p. 11; LSA Associates, Inc. 2010, entire).

Downlisting criteria	Has criterion been met?
Monitoring at Old St. Hilary's Preserve, Middle Ridge, and any other location the species may be discovered shows stable or increasing trends over a period of 20 years.	This criteria has not been met. As described above, the Tiburon jewelflower population at the Preserve has been documented at over 4,000 individuals; however, this population has also seen declines in recent years of monitoring. Furthermore, we are unaware of regular monitoring of the Middle Ridge population.
Old St. Hilary's Preserve and any other population that may be discovered contain an average of at least 3,000 flowering individuals, and the Middle Ridge population contain an average of at least 2,000 flowering individuals.	This criteria has not been met. Recent surveys at Old St. Hilary's Preserve has documented over 4,000 individuals; however, this population has also seen declines in recent years of monitoring. The most recent population estimate for Middle Ridge is approximately 400-500 individuals, which is short of the 2,000 flowering individuals described in the criterion.
Seeds stored in at least two facilities certified by the Center for Plant Conservation, and reliable germination and propagation techniques understood.	This criteria has been met. Tiburon jewelflower seeds have been stored in at least two certified facilities: the California Botanic Garden and the University of California Botanical Garden at Berkeley. Furthermore, seeds have been germinated and propagated by multiple researchers.

**Conclusion:**

After reviewing the best available scientific information, we conclude that Tiburon jewelflower remains an endangered 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 the previous 5-year review (Service 2010) remains an accurate reflection of the species' current status.

**RECOMMENDATIONS FOR FUTURE ACTIONS:**

Here we propose several habitat conservation and research recommendations which will aid in the recovery and conservation of the Tiburon jewelflower. Some of these recommendations have already been discussed in previous recovery documents (Service 2011, p. 13; Service 2019, pp. 52–53) and remain valid.

1. Preserve and protect all Tiburon jewelflower habitat in perpetuity. Only a portion of the Tiburon jewelflower population located at the Old St. Hilary's Preserve is currently protected and areas near Middle Ridge could be threatened by future development. Protecting all potential and occupied habitat in perpetuity would eliminate this threat.
2. Continue to conduct research on the species, specifically on its demography, reproduction, and genetics. Additional information on these topics would be helpful in trying to manage and preserve the existing populations. It is also important to better understand the potential effects of global climate change on the habitat and microclimate

of the Tiburon Peninsula; potential changes in phenology and demography of Tiburon jewelflower; ecosystem associates such as pollinators; and pest and disease outbreaks associated with Tiburon jewelflower.

3. Manage a seed bank of this species for potential reseeded in newly created or discovered habitat, and to ensure that a seed bank exists for replanting in case of total loss of wild populations.
4. To increase species redundancy and meet delisting criterion A/1 (Service 2019, p. 44), introduce and maintain one new Tiburon jewelflower population in an area on the Tiburon peninsula that contains suitable protected habitat and the appropriate plant associates.
5. Work with Marin County Parks and Open Space to update their current management plan to include the Tiburon jewelflower. Implementation of species-specific management actions will ensure a self-sustaining population over the long-term.
6. Conduct research to better understand the relationship between genetic diversity and the species capacity for adaptive evolution.
7. In order to reflect the most current understanding of the species taxonomy, formally change the species name in the Code of Federal Regulations from *Streptanthus niger* to *Streptanthus glandulosus niger*.
8. Conduct annual surveys at all known locations to track population sizes each year. Given the low number of individuals in some years, it is extremely important to be aware of when these lows are occurring, and to ensure that the populations do not disappear altogether.

**Field Supervisor, Sacramento Fish and Wildlife Office**

**Approve** \_\_\_\_\_ **Date** \_\_\_\_\_

## Literature Cited

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- \_\_\_\_\_. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 66 Species in California and Nevada. Federal Register 85:4692–4694.

### Personal Communication

Swope, Sarah. 2018. Assistant Professor of Biology and Botanic Garden Director, Mills College, Oakland, California. Telephone conversation with Amber Aguilera of the Sacramento Fish and Wildlife Office, July 27, 2018. Subject: Status updates and overviews of biology and ecology for Tiburon mariposa lily and for Tiburon jewelflower.

### In Litteris

U.S. Fish and Wildlife Service (Service). 2017. Letter from the U.S. Fish and Wildlife Service to the Rancho Santa Ana Botanic Garden and the University of Minnesota. 08ESMF00-2017-TA-0901. Subject: Seed Transfer Request for *Streptanthus glandulosus* spp. *niger*. U.S. Fish and Wildlife Service Office, Sacramento, California. January 30, 2017.