5-YEAR REVIEW
Pennell's bird's-beak *(Cordylanthus tenuis* ssp. *capillaris)*

GENERAL INFORMATION:

Species: Pennell's bird's-beak (*Cordylanthus tenuis* ssp. *capillaris*)
Date listed: February 3, 1995
FR citation: 60 FR 12872
Classification: Endangered

BACKGROUND:

Most recent status review:

[USFWS]. 2011. *Cordylanthus tenuis ssp. capillaris* (Pennell's Bird's-beak) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento, California. 24pp. [CLICK HERE TO VIEW DOCUMENT]

FR Notice citation announcing this status review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews for 50 Species in California, Nevada, and the Klamath Basin of Oregon. Federal Register 83:28251 – 28254. [CLICK HERE TO VIEW DOCUMENT]

ASSESSMENT:

Information acquired since the last status review: This 5-year review was conducted by the U.S. Fish and Wildlife Service's (USFWS) Sacramento Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on June 18, 2018, but we did not receive any information regarding this species. We contacted the California Department of Fish and Wildlife (CDFW) and the non-governmental organization, Landpaths for information on the status of Pennell's bird's-beak. These entities own and operate most of the land known to be occupied by the species. We used survey information from the California Natural Diversity Database (CNDDB 2018), maintained by CDFW. Additionally, we conducted a literature search and review of information from our own files.

Pennell's bird's-beak is an herbaceous annual of the broomrape family (Orobanchaceae) (Olmstead *et al.* 2001). This species occurs in the Outer North Coast Ranges floristic province of Sonoma County, California (Chuang and Heckard 1986; CNDDB 2018). It is a narrow-range endemic, originally reported from an area of a few square miles and is consistently associated with closed-cone coniferous forests and chaparral habitat on serpentine soils (Chuang and Heckard 1986).

Like others of the genus, Pennell's bird's-beak is hemiparasitic; although it contains chlorophyll, it collects water and other nutrients from the roots of a host plant (Marvier and Smith 1997). Research shows many broomrape species use multiple species as hosts, and might change host species throughout a season (Marvier and Smith 1997). Studies on Pennell's bird's-beak have identified Baker's Manzanita (*Arctostaphylos bakeri* ssp. *bakeri*) and Sargent's cypress (*Cupressus sargenii*) as possible host plants (Heckard 1997; Chuang and Heckard 1971).

In 2011, Pennell's bird's-beak was recognized to occur in five separate locations (USFWS 2011). Currently, Pennell's bird's-beak is known from four locations (CNDDB 2018). California Natural Diversity Database lists occurrence #1 as mainly within the Harrison Grade Ecological Reserve, owned and managed by CDFW. The fifth occurrence is combined with occurrence #4. Two occurrences (#2 and #4) are within what is now the Bohemia Ecological Preserve. This property is protected under a conservation easement, which is owned and managed by LandPaths since 2012 (E. Mullen, pers. comm. 2018). Occurrence #3 is located on the privately owned Twin Valley Ranch near Porter Creek, about 11 kilometers (6.8 miles) northeast of occurrence #2. However, this site has not been surveyed in the past 20 years. While the status of this population remains unknown, it is assumed to be extant. Anecdotal reports suggest many Pennell's bird's-beak populations exist on private property outside of the before mentioned occurrences in areas where botanical surveys have not been done (G. Cooley, pers. comm. 2018). Biologists with CDFW have observed Pennell's bird's-beak on private properties outside of the reserve boundaries at the Harrison Grade Ecological Reserve (J. Bjerke, *in litt.* 2018b). The full extent of the population remains unknown.

Pennell's bird's-beak abundance varies annually at the Bohemian Preserve and Harrison Grade Ecological Reserve (G. Cooley, pers. comm. 2018). Over the past few decades, numbers have fluctuated from a few individuals to well over 10,000 plants at each location (USFWS 1998). Though no formal abundance survey was done, both sites appeared to contain dense populations of several thousand individuals in 2018 (E. Bainbridge, per. obs. 2018).

The most significant threat to Pennell's bird's-beak is habitat loss and degradation. The serpentine habitat on which the plant relies is generally patchy and discontinuous, possibly limiting dispersal and gene flow. In 2011, roads and other infrastructure projects associated with urban development were considered a major threat (USFWS 2011). In recent years, residential and vineyard construction has become an increasing concern to serpentine habitats. Anecdotal reports suggest that most Pennell's bird's-beak populations exist on private property, where no formal botanical surveys have been conducted (G. Cooley 2018 pers. comm.). These undocumented occurrences are threatened by such land-use conversion activities.

Due to the high calcium-magnesium ratios in serpentine soils, few non-native plants grow well on serpentine soils (Kruckenberg 1984; G. Cooley, pers. comm. 2018). However, barbed goatgrass (*Aegilops truncialis*) is tolerant of serpentine soils, potentially allowing for succession of other species (G. Cooley, pers. comm. 2018). Native forest trees such as California bay (*Umbellularis californica*) and Douglas fir (*Pseudotsuga mensiesii*) are also somewhat tolerant of serpentine soil, and are known to colonize (invade) serpentine habitat, shading areas that would otherwise be suitable to Pennell's bird's-beak, which appear to require an open canopy (G. Cooley, *in litt*. 2018).

At the time of listing (USFWS 1995), off-road vehicle use, camping, hiking, target-shooting, and dumping were considered threats. In 2018, an illegal marijuana (*Cannabis* spp.) operation was found on the Harrison Grade Ecological Reserve by CDFW biologists (J. Bjerke, *in litt*. 2018b). Therefore, unauthorized human activities still contribute to the aforementioned threats at this site today. Due to its narrow range and specific habitat requirements, Pennell's bird's-beak is susceptible to random environmental effect such as flooding, drought and fire. Other threats to the persistence of Pennell's-bird's-beak include increasing human populations, loss of habitat connectivity, loss of pollinators, and climate change. Our understanding of these threats has not changed since the previous status review (USFWS 2011).

Conclusions:

At the time of listing in 1995, two populations of Pennell's bird's-beak were documented (USFWS 1995). Today there are four known occurrences. Three of the four occurrences are located generally within two protected properties; the Harrison Grade Ecological Reserve (owned and managed by CDFW) and the Bohemia Ecological Preserve (owned and managed by LandPaths). The unique ecological niche Pennell's bird's-beak has come to occupy might be susceptible to a variety of natural or manmade random effects on the population.

The recovery priority number for Pennell's bird's-beak is a 6 (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, 1983). This number indicates that the taxon is a subspecies that faces a high degree of threat and has a low potential for recovery. The narrow range of Pennell's bird's-beak makes it susceptible to a variety of natural and anthropogenic effects. Currently, there is little information on the possibility of establishing populations outside of known occurrences. However, there is reason to believe suitable habitat exists within the historical range on private lands.

After reviewing the best available information, we conclude that Pennell's bird's-beak 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 last 5-year review (USFWS 2011) remains an accurate reflection of the species' current status.

RECOMMENDATIONS FOR FUTURE ACTIONS

Survey to identify potential habitat. A comprehensive and systematic survey of serpentine habitats for the presence of Pennell's bird's-beak has yet to be conducted. A new occurrence was discovered in 1997 during surveys for a different serpentine plant (CNDDB 2018). Anecdotal reports suggest additional populations might exist on private property. By identifying these areas and working with local landowners, additional occurrences might be protected in perpetuity.

Conduct research to better understand Pennell's bird's-beak life history, demographics, annual establishment, etc. Very little is known about the demographics and life history of Pennell's bird's-beak. Future research should be focused on informing conservation and management decisions. Current occurrences indicate that site disturbance might promote colonization, yet the role of disturbance mechanisms such as fire and flooding is unknown. Conducting long-term

demographic surveys and monitoring that include habitat surveys, genetic research, host-parasite dynamics and annual establishment would further recovery goals.

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Approve _____ Date 5/2/2019

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