5-YEAR REVIEW
Contra Costa Goldfields (*Lasthenia conjugens*)

GENERAL INFORMATION:

Species: Contra Costa goldfields (*Lasthenia conjugens*)
Date listed: June 18, 1997
Federal Register (FR) citation: 62 FR 33029 (Service 1997)
Classification: Endangered

State Listing:
The Contra Costa goldfields is not listed by the State of California.

BACKGROUND:

Species overview:
Contra Costa goldfields is an annual flowering plant in the aster family (Asteraceae) that grows 10 to 30 centimeters (4 to 12 inches) tall and usually has a branched stem **(**Service 2005a, p. II-27). The leaves are opposite, light green, and hairless. The lower leaves have smooth margins, but stem leaves have one or two pairs of narrow lobes. The daisy-like flower heads are terminal, solitary, and all disk and ray flowers are golden-yellow (Greene 1888, p. 221; Ornduff 1993, p. 298). The phyllaries (bracts below the flower head in the aster family) are one-quarter to one-half fused; all other species of the *Lasthenia* genus have either free phyllaries or phyllaries fused more than two thirds of their length. The achenes (fruits) of Contra Costa goldfields are less than 1.5 millimeters (0.06 inch) long and always lack a pappus (the hair-like or scale-like structures attached to an achene, which assist in dispersal; Ornduff 1969, p. 1042; Ornduff 1993, p. 298). Contra Costa goldfields flower from March to June (Ornduff 1966, p. 13**;** Ornduff 1976, p. 94) and are self-incompatible. The species has been reported in ten counties within California: Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma (Service 2013, p. 5).

Most recent status review:
[Service] U.S. Fish and Wildlife Service. 2013. *Lasthenia conjugens* (Contra Costa Goldfields) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. 36 pp.

We did not recommend a status change in the 2013 status review.

FR notice citation announcing this status review:
[Service] U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 40 Species in California, Nevada, and Oregon. Federal Register 87:5832–5834.

We did not receive information from the public regarding Contra Costa goldfields 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 Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on February 2, 2022. We also contacted species experts, performed a literature search, reviewed information from our own files, and obtained data from an occurrence search of the California Natural Diversity Database (Diversity Database) maintained by the California Department of Fish and Wildlife.

Since the 2013 status review, we have received survey reports from consulting agencies contracted to monitor vernal pool habitat and species (summarized in **Distribution** and **Abundance**). Survey results indicate the species is still present at previously known locations. The species has been transplanted to two localities on Travis Air Force Base in Solano County, resulting in two new occurrence records in the Diversity Database (addressed in **Distribution**). These new occurrences are in proximity to other previously known occurrences of the species and therefore do not greatly alter our understanding of the distribution of the species. Overall, the distribution of the species remains as described in our 2013 status review. The species continues to be impacted by the threats described in our 2013 status review and new information has become available on the potential threat of pesticides (discussed in **Threats**).

Distribution:

Contra Costa goldfields is most often associated with vernal pools, though natural occurrences are found in a variety of habitat types, including vernal and playa pools, seasonal pond edges, stream terraces, and margins of the San Francisco Bay (Vollmar 2022, p. 4). Contra Costa goldfields is known to have historically occurred in seven vernal pool regions: Central Coast, Lake-Napa, Livermore, Mendocino, Santa Barbara, Santa Rosa, and Solano-Colusa (Service 1997, p. 33029; Keeler-Wolf *et al.* 1998, p. 104). In addition, several historical occurrences in Contra Costa County are outside of the defined vernal pool regions. Ornduff (1966, p. 38) reported collection of the species from 13 sites in Alameda, Contra Costa, Mendocino, Napa, Santa Barbara, Santa Clara, and Solano counties.

The majority of the location information used in this status review is from the Diversity Database that reports species locations as "occurrences" rather than populations. An "occurrence", which may represent a documented collection, observation, or museum specimen of a species, is defined by the Diversity Database as a location occupied by a species separated from other locations by at least 0.25 mile, and may contain multiple records. At the time of listing in 1997, there were only 13 known occurrences of Contra Costa goldfields in four counties: Napa, Contra Costa, Alameda, and Solano. The species had been extirpated from Mendocino, Santa Barbara, and Santa Clara counties (Service 1997, pp. 33029, 33033; Diversity Database 2023, pp. 14–16). At the time of the 2005 Recovery Plan for Vernal Pools Ecosystems of California and Southern Oregon (Recovery Plan) (Service 2005a), and 2008 status review (Service 2008), 32 occurrences of Contra Costa goldfields were catalogued, and when the 2013 status review was completed, there were 34 occurrences documented in ten counties in the Diversity Database: Alameda, Contra Costa, Marin, Mendocino, Monterey, Napa, Santa Barbara, Santa Clara, Solano, and Sonoma. Seven of these occurrences were considered extirpated and four were considered

potentially extirpated (Service 2013, pp. 4–5). The species is believed to be completely extirpated from Santa Clara and Santa Barbara counties (Service 2013, p. 5).

Currently, the distribution of the species remains as described in our 2013 status review. The Diversity Database now reports 36 occurrences of Contra Costa goldfields (**Appendix A**; Diversity Database 2023, entire). The two occurrences (occurrences #45 & 46) added to the Diversity Database since the 2013 status review are found in Solano County in proximity to other known occurrences on Travis Air Force Base and are mapped as "transplanted populations" (Diversity Database 2023, p. 41). These occurrences do not represent new populations of Contra Costa goldfields, but are part of ongoing conservation efforts and mitigation for projects on Travis Air Force Base (Collinge 1999, entire) (discussed in **Conservation Efforts**). These transplanted occurrences are within the previously known range of the species and do not change our understanding of the distribution of the species.

Seven occurrences continue to be considered extirpated and four are considered potentially extirpated (Diversity Database 2023, entire). The majority of the presumed extant occurrences are located in Solano County, where 13 occurrences are presumed extant (Diversity Database 2023, pp. 4–41). Other large concentrations of occurrences are in Monterey County and Alameda County, each with three occurrences (Diversity Database 2023, p. 25). Of the 25 presumed extant records, 4 occurrences may now be extirpated having not been seen for some time or the exact location is unknown (Diversity Database 2023, p. 39):

(1) An occurrence (occurrence #16) in Mendocino County has not been observed since 1937;

(2) An occurrence (occurrence #37) in Alameda County has not been observed since 1959;

(3) A single plant (occurrence #21) was observed in Napa County in 1987 and has not been documented since; and

(4) An occurrence (occurrence #43) in Solano County was noted on a field checklist in 1996 and the specific location of the occurrence is unknown.

The distribution of Contra Costa goldfields is uncertain due in part to the difficulty of relocating sites and because this species may reappear on a site after several years of it being absent.

In December 2022, Vollmar Natural Lands Consulting, as part of the Contra Costa goldfields captive propagation and reintroduction to Contra Costa County project (discussed in Conservation efforts), conducted a status survey of 20 subpopulations associated with 9 known Contra Costa goldfields occurrences (occurrences # 1, 3, 7, 20, 23, 24, 30, & 33). Data from these status surveys have not yet been added to the Diversity Database. Their findings are in line with previous understanding of Contra Costa goldfields habitat requirements. They found that while Contra Costa goldfields occurs in a wide range of habitats, all occupied sites have similar characteristics: grassland habitat grazed by cattle, seasonally wetted soils, and fine-grained soil with high clay or silt content that is likely alkaline (Vollmar 2022, pp. 4–7).

Abundance:
The final listing rule provided no abundance data for Contra Costa goldfields. The 2008 status review stated that informal status surveys had occurred at five occurrences and that annual monitoring had been initiated at various localities in Solano County in support of development of

the Solano Habitat Conservation Plan (Service 2008, p. 14). The 2013 status review presented the results of informal status surveys conducted at several occurrences and monitoring data for the five Solano County occurrences that were censused annually for 3- or 4-year periods between 2006 and 2011 (Service 2013, p. 6). Overall, Contra Costa goldfields population size can vary greatly season to season based on rainfall and other site-specific factors (e.g., prevalence of invasives, thatch ground cover, grazing practices, etc.). Only a few of the known occurrences have long term monitoring in place from which population dynamics and trends can be identified, which are described below. Initial abundance estimates from the Contra Costa goldfields captive propagation and reintroduction to Contra Costa County project (discussed in **Conservation efforts**) are presented in Appendix A. Additional years of monitoring are needed to better understand the population dynamics and trends at these locations (Vollmar 2022, pp. 5–6).

The 2019 annual report for the Noonan Ranch Conservation Bank (Conservation Bank) in Solano County, California, was submitted to the Service by LSA Associates, Inc. in February 2020. The report includes the results of the initial years (2008–2013 and 2019) of long-term monitoring for the Contra Costa goldfields population at the Conservation Bank (Occurrence #24). Monitoring for Contra Costa goldfields on the Conservation Bank will continue every five years. **Table 1** below provides a summary of the monitoring results through 2019. According to the report, Contra Costa goldfields continues to occur in the majority of the wetlands on the Conservation Bank with distribution, emergence, and density varying within individual wetlands (LSA 2020, entire). Contra Costa goldfields populations are only found within wetlands with specific hydrologic characteristics (LSA 2020, pp. 2–6). Average percent cover on the Conservation Bank during this time period varied from 9.9 percent in 2012 to 31 percent in 2019 (LSA 2020, pp. 2–5). This variation in average percent cover is largely attributed to the number of small wetlands present on the Conservation Bank in a given year. The number of small wetlands with conditions suitable for Contra Costa goldfields germination and growth on the landscape is highly dependent on the seasonal timing of rainfall.

Table 1: Contra Costa goldfields occupied wetlands and occupied acreage at Noonan Ranch Conservation Bank (LSA 2020, pp. 2–4, 2–5)

Year	Number of Occupied Wetlands	Acreage of Occupied Wetlands	Percent Cover
2008	49	21.48	unreported
2009	63	22.15	24
2010	72	23.03	29
2011	59	22.30	15
2012	59	22.48	9.9
2013	60	22.58	20
2019	79	22.51	31

The other known occurrence of Contra Costa goldfields that is closely monitored is at the Warm Springs Unit of Don Edwards San Francisco Bay National Wildlife Refuge (Wildlife Refuge) in Alameda County, California (occurrence # 29). The data show similar trends to the population at the Conservation Bank with population numbers and total absolute cover varying widely year to year based on precipitation (*Figure 1*).

Contra Costa goldfields abundance and distribution in any given year is dependent on multiple factors: seasonal timing, duration, and amount of rainfall as well as land use considerations. Contra Costa goldfields responses (such as emergence, plant size, density) to these factors also vary by the type of wetland and how the timing and amount of rainfall affects annual grass growth in specific wetlands (Service 2022, p. 18).

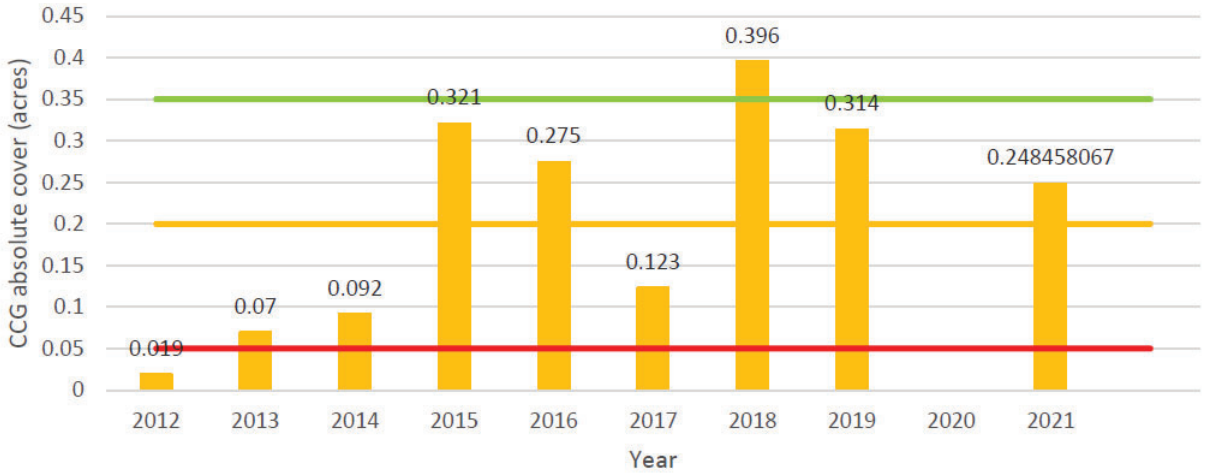

Figure 1. Total Contra Costa goldfields (CCG) absolute cover (acres) across 19 monitored pools at Don Edwards San Francisco Bay National Wildlife Refuge from 2012–2021. Acreage of Contra Costa goldfields is one of the National Wildlife Refuge's key ecological indicators for habitat management. The colored lines represent the upper boundaries of the poor (red), fair (yellow), and good (green) ranks. Values below red line indicate a poor status and values above green indicate very good status. No data for 2020 due to Covid-19 restrictions (Service 2022, p. 11).

Threats:

Threats identified in the 1997 listing rule included activities that result in the direct destruction of the plants and their habitats or hydrologic changes in their vernal pool habitats (Service 1997, p. 33033). Such activities include urbanization, wetland drainage, industrial development, agricultural land conversion, ditch construction, off highway vehicle use, road widening, and trampling by cattle (Service 1997, p. 33034). The 2008 status review identified additional threats to the species including climate change and drought, vineyard conversion, inappropriate livestock grazing (intensive grazing and insufficient grazing), and competition from invasive plants (Service 2008, pp. 20–22). All these threats were noted in the 2013 status review and are still present. New information on the potential threat of neonicotinoid pesticides is presented below.

The Environmental Protection Agency (Agency) recently released final biological evaluations assessing the effects of labeled uses of three neonicotinoid pesticides on listed species (Agency 2022a, entire; Agency 2022b, entire; Agency 2022c, entire). The three pesticides (clothianidin, imidacloprid, and thiamethoxam) are registered for use on a variety of agricultural crops; there are also some non-agricultural applications. The three pesticides target insect species by acting on their neurotransmitters to cause excessive nervous stimulation, paralysis, and death. The pollinators of Contra Costa goldfields are diverse and include species of generalist and oligolectic bees, flies, and beetles (Thorp and Leong 1998, p. 174). The Agency's final

biological evaluations determined that all three pesticides are highly toxic to bees, have the potential to result in bee brood and colony reductions, and if affected bee colonies decline are near Contra Costa goldfields, there is a potential for the three pesticides to indirectly adversely affect the species (Agency 2022a, p. 4; Agency 2022b, p. 2; Agency 2022c, p. 3). The Agency anticipates releasing amended proposed interim decisions and a national consultation with the Agency is currently pending.

Conservation efforts:
In 2015, Contra Costa goldfields were recorded at two new locations (occurrences #45 and 46) on Travis Air Force Base (Diversity Database 2023, p. 41). These occurrences are mapped in the Diversity Database as "transplanted sites" and are attributed to the ongoing conservation efforts and compensatory mitigation for projects on Travis Air Force Base. In 1999, as part of compensatory mitigation for housing development and inadvertent loss of Contra Costa goldfield habitat on Travis Air Force Base, vernal pool habitat was preserved, damaged pools were restored, and a monitoring plan was put in place. The Service's 1999 Biological Opinion (1-1-99-F-84) called for the protection of 2.21 acres of vernal pools located along the western edge of the base south of the Travis Aero Club and an additional 0.2 acres of potential Contra Costa goldfields habitat was to be restored and protected (Service 1999, entire; Collinge 1999, p. 1). The total acreage of vernal pool preservation areas and constructed vernal pool complexes on Travis Air Force Base to off-set the loss of Contra Costa goldfields is 7.75 acres. Of that total, 3.84 acres are constructed pools (Collinge 1999, p. 15).

In 2022, Vollmar Natural Lands Consulting completed the first year of their study to assess habitat for the reintroduction of Contra Costa goldfields to Contra Costa County. The primary purpose of the project is to establish new self-perpetuating populations of the Contra Costa goldfields on suitable sites within its namesake county. At the inception of the project, the species was considered extant at only one occurrence (with two adjacent sub-occurrences) in Contra Costa County. The project objectives carried out during 2022 were to:

(1) Conduct status surveys of selected known Contra Costa goldfields occurrences;

(2) Produce a habitat model to identify potential reintroduction sites; and

(3) Gain access to and survey potential Contra Costa goldfields reintroduction sites.

The project also includes the following objectives that have not yet begun:

(4) Finalize selection of at least three optimal reintroduction sites;

(5) Propagate Contra Costa goldfields seeds and seedlings and out-plant to sites;

(6) Conduct three years of annual monitoring at reintroduction and selected natural populations;

(7) Conduct low-level habitat management at reintroduction sites; and

(8) Prepare interim and final reports.

Recovery criteria:
General recovery criteria for the Contra Costa goldfields and 19 other listed plants and animals are described in the Recovery Plan (Service 2005a, p. III-94). The Recovery Plan uses an ecosystem-level approach because many of the listed species and species of concern addressed in the plan co-occur in the same natural ecosystem and share the same threats. The five key elements that comprise this ecosystem-level recovery and conservation strategy are: habitat protection; adaptive management, restoration, and monitoring; status surveys; research; and public participation and outreach. The overarching recovery strategy for Contra Costa goldfields is habitat protection and management. The downlisting recovery criteria for the Contra Costa goldfields have not been met, therefore, delisting criteria is not considered. The current status of each downlisting criterion and its status at the time of the 2013 status review (Service 2013, pp. 20–27) is detailed below in **Table 2**.

Table 2. Contra Costa goldfields downlisting criteria for (1) habitat protection; (2) adaptive management, restoration, and monitoring; (3) status surveys; (4) research; and (5) public participation and outreach.

Downlisting Criteria	2013 Status	2023 Status
1A: 95 percent of suitable Contra Costa goldfields habitat in Solano-Colusa and Jepson Prairie core areas (Zone 1) and the Lake-Napa and Berryessa core areas (Zone 2) is protected, and 85 percent of suitable Contra Costa goldfields habitat in the Central Coast, Napa River, Suisun Marsh, and Rodeo Creek core areas (Zone 2) is protected.	Not met	Not met. The status remains as described in the 2013 status review. The Service still does not have sufficient information to quantify the acreage of suitable habitat within each core area for this specific species. While progress has been made in mapping vernal pool grassland habitat within core areas in the Central Valley, vernal pool grassland habitat within other core areas has not been mapped.
1B: 90 percent of species occurrences distributed across the species' geographic and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.	Partially met. Eleven occurrences protected.	Partially met. At this time, 12 of the 36 Diversity Database occurrences are protected including 3 at Fort Ord National Monument (occurrences #31, 32, & 41), 2 at Don Edwards San Francisco Bay National Wildlife Refuge (occurrences #29 & 30), 1 at North Suisun Mitigation Bank (occurrence #34), 1 at State Route 4 preserve (occurrence #23) and 1 on Travis Air Force Base (occurrence #22). The four occurrences protected since the last status review are in Solano County: three are on Travis Air Force Base (occurrences #42, 45, & 46) and one is at Rush Ranch Preserve (occurrence # 43). Additionally, one protected population at Noonan Ranch Conservation Bank has yet to be added to the Diversity Database but will be added to occurrence #24, and the occurrence will then be considered partially protected. The extreme edges of the species' range remain unprotected.
1C: Reintroductions and introductions must be carried out and meet success criteria.	Not met	Partially met. The species was transplanted to two new areas on Travis Air Force Base (occurrences #45 and 46). Reintroductions in areas where the species has been expatriated are planned but have not yet occurred.

Downlisting Criteria	2013 Status	2023 Status
1D: Additional localities that are detected (and determined essential to recovery goals) are permanently protected.	Not met. Two new localities were not protected.	Partially met. Six additional localities have been detected since the publication of the Recovery Plan and two of the localities are permanently protected as they are located on Travis Air Force Base.
1E: Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.	Not met	Not met. The status remains as described in the 2013 status review. Monitoring of rainfall, water quality, inundation of pools, and pool parameters has been conducted at some occurrences; however, the monitoring criteria described in the Recovery Plan have not been met. Not all protected occurrences have hydrology monitoring plans.
2A: Habitat management and monitoring plans have been developed and implemented within five years of individual parcel/property/area protection that facilitate maintenance of vernal pool ecosystem function and population viability by including provisions for managing nonnative and native competitors, appropriate grazing, fire or other management regimes, adaptive habitat management, incorporation of new information resulting from implementation of research actions and addressing site-specific threats.	Partially met	Partially met. Since the 2013 status review the Comprehensive Conservation Plan for Don Edwards San Francisco Bay National Wildlife Refuge was completed and implemented. Occurrence #43 on Rush Ranch Preserve does not have a habitat management plan for Contra Costa goldfields. All other protected occurrences of Contra Costa goldfields have developed and implemented habitat management plans.
2B: Mechanisms are in place to provide for management in perpetuity and long-term monitoring of 1A–E, as previously discussed (funding, personnel, etc.).	Partially met	Partially met. The status remains as described in the 2013 status review. Funding is still needed to carryout reintroduction plans.
2C: Monitoring indicates that ecosystem function has been maintained in the areas protected under 1A–D for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.	Not met	Not met. The status remains as described in the 2013 status review. Monitoring of ecosystem function has not occurred for any of the known populations of this species; therefore, the Service is unable to determine if ecosystem function has been maintained at locations that have supported viable populations through a variety of hydrologic conditions.

Downlisting Criteria	2013 Status	2023 Status
2D: Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.	Not met	Not met. Seeds were collected by the University of California Botanical Gardens in 1998 and 2014 and are stored at the University of California Botanical Garden (California Plant Rescue 2023, unpaginated). However, the Recovery Plan recommends that seed be collected in each vernal pool region and core area, and that seed collection from each population should be stored in at least two sites.
3A: Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.	Not met	Not met. Monitoring is currently ongoing in the Solano, Central Coast, and Livermore vernal pool regions. Other vernal pool regions where the species occurs have yet to begin long term monitoring. Monitoring has not occurred for a duration that meets the requirements specified in the Recovery Plan.
3B: Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.	Not met	Not met. The status remains as described in the 2013 status review. The limited systematic habitat monitoring that has occurred does not demonstrate the amelioration or elimination of threats identified since listing.
4A: Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.	Partially met	Partially met. This criterion has been initiated, although the majority of information needs discussed in the Recovery Plan are still outstanding.

Downlisting Criteria	2013 Status	2023 Status
4B: Research on genetic structure has been completed and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in 1A–E, above.	Met	Met. The status remains as described in the 2013 status review. Several published studies have investigated the genetic structure of Contra Costa goldfields and were discussed in the 2013 status review. No new genetic studies have been conducted since the 2013 status review.
4C: Research necessary to determine appropriate parameters to measure population viability for each species has been completed.	Partially met	Partially met. Studies and monitoring programs are currently ongoing and population parameters are being refined.
5A: Recovery Implementation Team is established and functioning to oversee range-wide survey efforts.	Partially met	Partially met. The Vernal Pool Implementation Team was established in 2009 to oversee the formation and functioning of multiple working groups focused at the scale of the vernal pool region. The Implementation Team was meeting quarterly in 2013 but is not currently active. The Service has formed a more informal, internal vernal pool working group in the Sacramento Fish and Wildlife Office. The primary goal of this internal team will be to re-emphasize the recovery plan and incorporate recovery planning into our everyday workload. This team will not function as the official recovery implementation team as it will only consist of Service employees, but the hope is that this internal working group will eventually provide the basis for creating a true recovery implementation team as well as regional working groups.
5B: Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.	Not met	Not met. See 5A above.
5C: Participation plans for each vernal pool region have been completed and implemented.	Not met	Not met. See 5A above.
5D: Vernal pool regional working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1–4.	Not met	Not met. See 5A above.

Conclusion:
After reviewing the best available scientific information, we conclude that Contra Costa goldfields remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Endangered Species Act and analysis of the status of the species in our 2013 status review remains an accurate reflection of the species' current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Here we propose several habitat conservation and ecological research recommendations which will aid in the recovery and conservation of Contra Costa goldfields. Some of these recommendations have already been discussed in previous recovery documents (Service 2013, pp. 28–29) and remain valid.

1. The majority of known localities of this species are on private land and not protected. Protection of additional localities is necessary to recover this species. Protecting occurrences in Sonoma, Marin, and Napa counties should be a priority over the next five years, as this is the northwestern edge of the species' range, and no occurrences in these counties are protected at this time.

2. Once additional sites are protected, management plans should be prepared. Results from standardized monitoring discussed in item 3, below, should be included in the management plans for these protected sites. Grazing management and invasive weed control should be primary components of these management plans.

3. Conduct monitoring and research at as many of the presumed extant localities as possible to incorporate research recommendations outlined in the Recovery Plan. The following research should be prioritized over the next five years:

    a. Develop a standardized method to monitor species status and population trends at all known locations. This will better our understanding of potential threats to the species and will aid in the development of methods to ameliorate these threats.

    b. Conduct research on invasive weedy plant species to determine the most appropriate methods to control these plants and increase population numbers of Contra Costa goldfields and other listed vernal pool plants.

    c. Conduct further research on the genetic structure of the species to determine the feasibility of introducing Contra Costa goldfields to biologically appropriate vernal pool regions and soil types from which status surveys indicate the species has been extirpated.

4. Regional vernal pool working groups should be created in regions where Contra Costa goldfields is known to occur to aid with monitoring and management efforts.

5. Conduct additional research on how Contra Costa goldfields is pollinated. If certain insects are found to be important to pollination, and therefore to seed production, their habitat should be protected in each core area to contribute to the recovery of Contra Costa goldfields.

6. Expand studies on captive propagation and reintroduction to areas outside of Contra Costa County.

Field Supervisor, Sacramento Fish and Wildlife Office

Approve MICHAEL FRIS Digitally signed by MICHAEL FRIS Date: 2024.02.27 15:25:05 -08'00' **Date** _____

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Appendix A:

Occurrence data for Contra Costa goldfields from the Diversity Database 2023 and Vollmar 2022 (pp. 5–6).

Occurrence Number	County	Presence	Last Year Surveyed	Notes
1	Napa	Presumed Extant	Spring 2022	2017 roadside survey estimated population size (10k+) may be for both Contra Costa goldfields and California goldfields (*Lasthenia californica*) combined; Population 500–1000 (Vollmar 2022, p. 5)
2	Napa	Extirpated	1989-xx-xx	
3	Solano	Presumed Extant	Spring 2022	Includes former occurrences #9 & 19; Population in the "thousands" (Vollmar 2022, p. 5)
4	Solano	Presumed Extant	1999-xx-xx	
5	Solano	Possibly Extirpated	1993-04-14	
7	Solano	Presumed Extant	Spring 2022	Includes former occurrences #25–27; Population 100–500 (Vollmar 2022, p. 5)
8	Contra Costa	Extirpated	1921-xx-xx	
10	Contra Costa	Extirpated	1990-03-xx	
11	Contra Costa	Extirpated	1990-03-xx	
13	Alameda	Extirpated	1895-05-06	
14	Santa Clara	Extirpated	1990-03	
16	Mendocino	Presumed Extant	1987	Only source of information is 1937 Eastwood and Howell collection; Mapped in the vicinity of Manchester, exact location of the sites is unknown

Occurrence Number	County	Presence	Last Year Surveyed	Notes
18	Santa Barbara	Extirpated	1973	Site has been developed; Includes former occurrence #17
20	Solano	Presumed Extant	Spring 2022	Includes former occurrence #42
21	Napa	Presumed Extant	1987-05-11	
22	Solano	Presumed Extant	Spring 2022	
23	Contra Costa	Presumed Extant	Spring 2022	Includes former occurrence #38; Located within State Route 4 preserve and managed by Muir Heritage Land Trust.
24	Solano	Presumed Extant	Spring 2022	Several sites grouped into one occurrence on or near Travis Air Force Base; Includes Noonan Ranch Conservation Bank
28	Solano	Presumed Extant	1993	Surveys from 2006–2009 mistakenly referenced this occurrence number but were likely surveys of occurrence #7
29	Alameda	Presumed Extant	2009	
30	Alameda	Presumed Extant	Spring 2022	Population 100–500 (Vollmar 2022, p. 6)
31	Monterey	Presumed Extant	1998-06-13	
32	Monterey	Presumed Extant	2009-05-05	
33	Solano	Presumed Extant	Spring 2022	Population 100–500 (Vollmar 2022, p. 6)

Occurrence Number	County	Presence	Last Year Surveyed	Notes
34	Solano	Presumed Extant	2009-05-06	North Suisun Mitigation Bank managed by Wildlands Inc.
35	Marin	Presumed Extant	2013-05-10	
36	Solano	Possibly Extirpated	1918-10-01	
37	Alameda	Presumed Extant	1959-03-29	Exact location of site is unknown; Needs fieldwork
39	Sonoma	Presumed Extant	2011-xx-xx	
40	Napa	Possibly Extirpated	2003	
41	Monterey	Presumed Extant	2016-05-27	
42	Solano	Presumed Extant	2016-04-01	
43	Solano	Presumed Extant	1996	Only source of information is 1996 survey by Grewell; Located on Rush Ranch Preserve; Needs fieldwork
44	Santa Clara	Extirpated	1955-04-02	
45	Solano	Presumed Extant	2016-04-01	Plants found in created and natural pools; Mapped as a transplanted site
46	Solano	Presumed Extant	2015-04-08	Plants found in created and natural pools; Mapped as a transplanted site