Dodecahema leptoceras

(Slender-horned spineflower)

5-Year Review:
Summary and Evaluation

Photo by Mary Crawford 2022

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Carlsbad, California

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5-YEAR REVIEW

Slender-horned spineflower
Dodecahema (Centrostegia) leptoceras

GENERAL INFORMATION

Species: Slender-horned spineflower, *Dodecahema (Centrostegia) leptoceras*, a plant species
Date listed under the Endangered Species Act: September 28, 1987
Federal Register citation: USFWS 1987 (52 FR 36265)
Classification: Endangered
Recovery Plan: There is no recovery plan for this species.
Recovery Priority Number: 7C
Critical Habitat Designation: No critical habitat has been designated for this species.

BACKGROUND

Under the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 *et seq*.), the U.S. Fish and Wildlife Service (USFWS), referred to as "we" in this document, maintain lists of endangered and threatened wildlife and plant species (referred to as the List) in the Code of Federal Regulations (CFR) at 50 CFR 17.11 (for wildlife) and 17.12 (for plants). Section 4(c)(2)(A) of the Act requires us to review each listed species' status at least once every 5 years.

Most recent status review: Service 2010. *Dodecahema leptoceras* (slender-horned spineflower) 5-year review: summary and evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 37 pp. + appendices.

Federal Register notice announcing this status review: On May 20, 2021, we published a Federal Register notice announcing initiation of the 5-year review of this species, and the opening of a 60-day comment period to receive information (Service 2021, pp. 27462–27464).

Species Overview and Habitat: Slender-horned spineflower (spineflower) is an annual plant in the buckwheat family (*Polygonaceae*). This species occurs in Los Angeles, Riverside, and San Bernardino Counties in southern California (Service 2010, pp. 5–10). It grows in sandy and gravely soils within alluvial scrub habitat, in areas where intermittent, scouring floods occur (Service 2010, p. 11).

ASSESSMENT

Information acquired since the last status review

This 5-year review was conducted by the USFWS Carlsbad Fish and Wildlife Office. Information for this review was solicited from the public and interested parties through a Federal Register notice announcing this review on May 20, 2021. We also contacted staff from the U.S. Forest Service (Forest Service) 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.

SUMMARY OF NEW INFORMATION SINCE 2010

Occurrence status

This section summarizes updates to spineflower occurrence status since 2010. We have new information from conservation planning efforts and project-related surveys for spineflower. We also have new information from Forest Service surveys for this species.

To update spineflower occurrence status, we reviewed Element Occurrence (EO) data from the California Natural Diversity Database[1] (CNDDB), monitoring data from the Western Riverside County Multiple Species Habitat Conservation Plan (WRC-MSHCP) Biological Monitoring Program (BMP), herbaria records from the Consortium of California Herbaria (CCH2), data from the Upper Santa Ana River Wash Habitat Conservation Plan (Wash Plan), and Forest Service occurrence records.

For this review, we used the following definitions of occurrence status:

1. We considered an occurrence extant if spineflower had been observed at the occurrence within the last 10 years.

2. We considered an occurrence presumed extant if spineflower had not been observed for over 10 years, but suitable habitat was present.

3. We considered an occurrence possibly extirpated if spineflower had not been observed for over 30 years and the habitat was degraded or partially developed.

4. We considered an occurrence extirpated if the habitat was destroyed.

Our 2010 5-year review identified 36 occurrences of spineflower. Twenty were presumed extant, 3 were possibly extirpated, and 8 were extirpated (Table 1).

This 2022 review of new information finds that there are 44 occurrences of spineflower (Table 1). Eight newly added occurrences were either not considered in the 2010 5-year review, or have been discovered since 2010.

Changes to occurrence status in Los Angeles County

In our 2010 5-year review, we considered 10 spineflower occurrences in Los Angeles County. Currently, there are 11 occurrences of spineflower in Los Angeles County. The changes to occurrence count or status (or both) between 2010 and 2022 are because:

1. The Arroyo Seco spineflower occurrence (Devil's Gate Reservoir area, EO 41) has been added to CNDDB based on a 1920 Otley collection (CDFW 2021, p. 44). Suitable habitat for spineflower is present in the Devil's Gate Reservoir area (Chambers Group

[1] The California Natural Diversity Database (CNDDB) is an inventory of the status and locations of rare plants and animals in California. The CNDDB assigns "Element Occurrence" (EO) numbers to unique locations of rare taxa. In this document, we use the term "occurrence" to refer to EOs delineated by the CNDDB, or locations not in the CNDDB that are greater than 0.25 miles (0.40 kilometers) apart.

2010, Appendix D, p. 14), but no plants were detected during focused surveys in late June of 2010 for a sediment removal project (Chambers Group 2010, Appendix D, p. 9).

2. In the 2010 5-year review, we considered the Mint Canyon (EO 5) and Newhall (EO 6) occurrences to be extirpated (Service 2010, p. 31). However, the CNDDB considers the Mint Canyon occurrence to be possibly extirpated, because the north end of the canyon may have spineflower habitat (CDFW 2021, p. 8). The CNDDB also considers the Newhall occurrence to be possibly extirpated, because although much of the area has been developed, potential spineflower habitat is present (CDFW 2021, p. 9).

3. In the 2010 5-year review, we considered the Big Tujunga Wash occurrence (EO 7) as presumed extant (Service 2010, p. 31). This occurrence is now extant, because spineflower was observed in 2012 (Meyer *et al*. 2012, entire).

In summary, of the 11 spineflower occurrences in Los Angeles County, 1 is extant, 2 are presumed extant, 3 are possibly extirpated, and 5 are extirpated (Table 2).

Changes to occurrence status in Riverside County

In our 2010 5-year review, we considered 12 spineflower occurrences in Riverside County. Currently, there are 17 occurrences of spineflower in Riverside County. The changes to occurrence count or status between 2010 and 2022 are because:

1. Three new occurrences have been discovered or newly reported since the 2010 5-year review: (1) Bautista Canyon, Horse Creek (EO 44); (2) Bautista Canyon, Baisley Creek (EO 45); and (3) San Jacinto River, Highway 74 at Cranston station (EO 46). EOs 44 and 45 were discovered in 2014 by Forest Service botanists (Forest Service 2021, entire; CDFW 2021, pp. 47–48). EO 46 was discovered in 2008 (CDFW 2021, p. 49).

2. Five Riverside County occurrences were presumed extant in 2010: (a) Temescal Canyon (EO 16); (b) Vail Lake vicinity, Kolb Creek drainage (EO 24); (c) Bautista Creek Canyon (EO 21); (d) Vail Lake vicinity, Arroyo Seco Wash (EO 23); and (e) San Jacinto River (EO 1) (Service 2010, pp. 35–36). At these five occurrences, spineflower has been observed on-site in the last 10 years (since 2012), so we consider these occurrences extant instead of presumed extant.

3. A 1982 Krantz collection from along the San Jacinto River above Valle Vista is mapped approximately 2.6 miles (mi) [4.2 kilometers (km)] southeast of EO 46, so we count this record as a separate occurrence. This occurrence is presumed extant because suitable habitat is present.

4. An 1876 Parry and Lemmon collection from Whitewater is attributed to the Whitewater River, in the vicinity of Highway I-10 (CDFW 2021, p. 46). This occurrence is presumed extant because suitable habitat is present.

In summary, of the 17 spineflower occurrences in Riverside County, 8 are extant, 7 are presumed extant, 1 is possibly extirpated, and 1 is extirpated (Table 2).

Changes to occurrence status in San Bernardino County

In our 2010 5-year review, we considered 14 spineflower occurrences in San Bernardino County. Currently, there are 16 occurrences of spineflower in San Bernardino County. The changes to occurrence number or status in San Bernardino County between 2010 and 2022 are because:

1. Potential habitat is present at two occurrences that were considered extirpated in our 2010 5-year review (Devore/Cajon Creek Wash, EO 3, and Yucaipa Valley, EO 11), so we consider them possibly extirpated for this review.

2. The Cajon Canyon (1 mile below Blue Cut) occurrence (EO 39) was presumed extant in our 2010 5-year review (Service 2010, p. 34). This occurrence was observed in 2013 (CDFW 2021, p. 42), so we consider it extant for this review.

3. There are 6 spineflower CNDDB EOs within the Upper Santa Ana River Wash Habitat Conservation Plan (Wash Plan) (EOs 2, 22, 30, 31, 32, and 34) (CDFW 2021, entire; ICF 2021a, entire). These occurrences were presumed extant in the 2010 5-year review (Service 2010, pp. 32–36). Four have been observed within the last 10 years, so we considered them extant for this review.

4. Two locations of spineflower within the Wash Plan area are not in the CNDDB: 0.15 mi (0.24 km) south of Greenspot Road (extant) and 0.4 mi (0.64 km) north of Pioneer Avenue (presumed extant) (ICF 2021a, entire). Since they are greater than 0.25 miles (0.4 kilometers) from other CNDDB polygons, we included them as separate occurrences in the occurrence table.

In summary, of the 16 spineflower occurrences in San Bernardino County, 6 are extant, 4 are presumed extant, 3 are possibly extirpated, and 3 are extirpated (Table 2). Two occurrences are new since 2010.

Land acquisition

In Los Angeles County, two occurrences have received an elevated level of conservation due to land acquisition:

1. Between 2009 and 2011, the Arroyos and Foothills Conservancy acquired three adjoining parcels in Rubio Canyon, totaling 41 acres (ac) [17 hectares (ha)] (Arroyos and Foothills Conservancy 2021, entire). This acquisition conserved a portion of the Rubio Wash spineflower occurrence (EO 8) as mapped in the CNDDB, but this occurrence is still considered extirpated due to development (CCED 2020, entire; CDFW 2021, p. 12).

2. In 2011, the Mountains Recreation and Conservation Authority (MRCA) acquired 277.5 ac (112.3 ha) of open space adjacent to the Angeles National Forest, including the Big Tujunga Wash (Brasuell 2011, entire). This acquisition conserved most of the Big Tujunga Wash spineflower occurrence (EO 7) (CCED 2020, entire). In 2018, the MRCA acquired an additional 111 ac (45 ha) in Big Tujunga Canyon (MRCA 2018, entire).

In Riverside County, an area adjacent to the Temescal Canyon spineflower occurrence (EO 16) has been conserved by the Glen Eden Conservation Easement (CCED 2020, entire). However, other portions of the occurrence (including recent observations in CCH2) are on non-conserved lands (CCED 2020, entire).

Table 1. Summary of spineflower occurrence status in 2010 and 2022, showing the number of occurrences extant, presumed extant, possibly extirpated, or extirpated.

Occurrence status	2010 count	2022 count
Extant	NA	15
Presumed extant	20	13
Possibly extirpated	3	7
Extirpated	13	9
Total number of occurrences	**36**	**44**

Table 2. Summary of 2022 occurrence count in Los Angeles, Riverside, and San Bernardino Counties. The table shows the number of occurrences of each status by county, and the total number of occurrences.

Occurrence status	Los Angeles	Riverside	San Bernardino	Total number of occurrences
Extant	1	8	6	**15**
Presumed extant	2	7	4	**13**
Possibly extirpated	3	1	3	**7**
Extirpated	5	1	3	**9**
Total number of occurrences	**11**	**17**	**16**	**44**

Habitat Conservation Planning

In the 2010 5-year review, we discussed the Western Riverside County Multiple Species Habitat Conservation Plan and its conservation implications for spineflower (Service 2010, p. 21). This section discusses additional Habitat Conservation Plans that have been completed or are in progress since 2010.

Upper Santa Ana River Wash Habitat Conservation Plan

The San Bernardino Valley Water Conservation District prepared the Wash Plan as part of an Incidental Take Permit application submitted to the Service pursuant to section 10 of the Act (ICF 2020, p. 1-1). The goal of the Wash Plan is to balance ground-disturbing activities with conservation within the Wash Plan area (ICF 2020, p. 1-2).

The Wash Plan encompasses approximately 4,892 ac (1,980 ha) in San Bernardino County. The Wash Plan has two phases linked to a BLM land exchange and incorporates provisions so that

conservation stays ahead of impacts (ICF 2020, p. 1-5; Service 2020, pp. 5, 7, 13). The Wash Plan includes the following categories of covered activities: (1) aggregate mining, (2) water conservation, (3) wells and water infrastructure, (4) transportation, (5) flood control, (6) trails, (7) habitat enhancement and monitoring, and (8) agriculture (ICF 2020, p. 1-9; Service 2020, pp. 8–9).

Spineflower is a covered species under the Wash Plan (ICF 2020, p. 1-7; Service 2020, p. 8), and there are 22 extant patches and 48 historical patches of spineflower in the Wash Plan area (observations prior to 2005 were considered historical and observations between 2005 and 2016 were considered extant; Service 2020, pp. 45, 48). Covered activities will result in the removal of 1 extant patch and 12 historical patches of spineflower (Service 2020, p. 47). The Wash Plan will conserve and actively manage:

1. Five extant patches and 14 historical patches of spineflower during Phase 1 (ICF 2020, p. 5-16).

2. An additional 15 extant patches and 22 historical patches of spineflower during Phase 2 (ICF 2020, p. 5-16).

In 2020, we issued a section 10(a)(1)(B) permit for the Wash Plan and addressed effects to spineflower in our biological and conference opinion on the Wash Plan (Service 2020, p. 3). We determined that Covered Activities are not likely to jeopardize the continued existence of spineflower, due to: (1) avoidance and minimization measures; (2) restoration of temporarily disturbed areas; (3) conservation and management to offset impacts; (4) conditional impacts dependent on successful relocation of spineflower; and (5) adaptive management and monitoring, and the activities of the Spineflower Working Group (Service 2020, pp. 50–51, 86–90).

The Spineflower Working Group is a group of species experts assembled to develop and inform adaptive management in the HCP Preserve (Service 2020, p. 46). The Spineflower Working Group identified three management actions or habitat conditions as important to the long-term persistence of spineflower within the HCP Preserve: (1) nonnative annual grass and other invasive species, (2) sheet flow to refresh habitat, and (3) seed bank management (Service 2020, p. 47).

Draft Upper Santa Ana River Habitat Conservation Plan

The draft Upper Santa Ana River Habitat Conservation Plan (Upper SAR HCP) is a draft regional plan that would address the potential effects of water agency activities to sensitive species and habitats in the Upper Santa Ana River watershed (ICF 2021b, draft, p. 1-1). The Upper SAR HCP would streamline permitting for covered activities while providing a framework to conserve habitat for covered species (ICF 2021b, p. 1-5).

Spineflower is a covered species under the draft Upper SAR HCP (ICF 2021b, p. 1-14). Impacts to individual plants are expected to be near zero due to pre-project surveys, refinements to project siting, and avoidance and minimization measures (ICF 2021b, p. 4-4).

Summary

We reviewed data from the CNDDB, CCH2, Habitat Conservation Plans, project-related surveys, and the Forest Service to update spineflower occurrence numbers and status.

Our 2010 5-year review identified 36 occurrences of spineflower. Twenty were presumed extant, 3 were possibly extirpated, and 13 were extirpated (Table 1).

This 2022 review of new information finds that there are 44 occurrences of spineflower. Eight occurrences that were not considered in the 2010 5-year review have been either (1) discovered since 2010, or (2) were known to others but not included in our last review. Across the range of spineflower in Los Angeles, Riverside, and San Bernardino counties, 15 occurrences are extant, 13 are presumed extant, 7 are possibly extirpated, and 9 are extirpated (Table 1).

Since 2010, conservation land acquisition has occurred at or adjacent to three occurrences of spineflower. The spineflower is also a covered species under the draft Upper SAR HCP and the 2020 Wash Plan, which will implement measures to help conserve and manage for the species.

THREATS

In the 2010 5-year review, we discussed nine threats to spineflower. We discussed Factor A threats (the present or threatened destruction, modification, or curtailment of habitat or range) from: (1) development, (2) mining, (3) altered hydrology, (4) off-highway vehicle activity, (5) trash dumping, (6) nonnative invasive plants (also discussed under Factor E), and (7) camping and associated activities (Service 2010, pp. 13–17). We discussed Factor E threats (other natural or manmade factors affecting a species' continued existence) from (1) nonnative invasive plants, (2) small population size, and (3) climate change (Service 2010, pp. 23–25).

For this review, we have new information about six threats discussed in the 2010 5-year review. We do not have new information about the other three threats discussed in our 2010 5-year review (off-highway vehicle activity, camping and associated activities, or small population size). Refer to the 2010 5-year review for discussion of those threats (Service 2010, pp. 16–17, 24).

Development

In the 2010 5-year review, we discussed threats to spineflower from residential development and highway realignment (Service 2010, pp. 13–14). Since 2010, we consulted with other agencies on transportation and pipeline construction projects involving spineflower under section 7 of the Act.

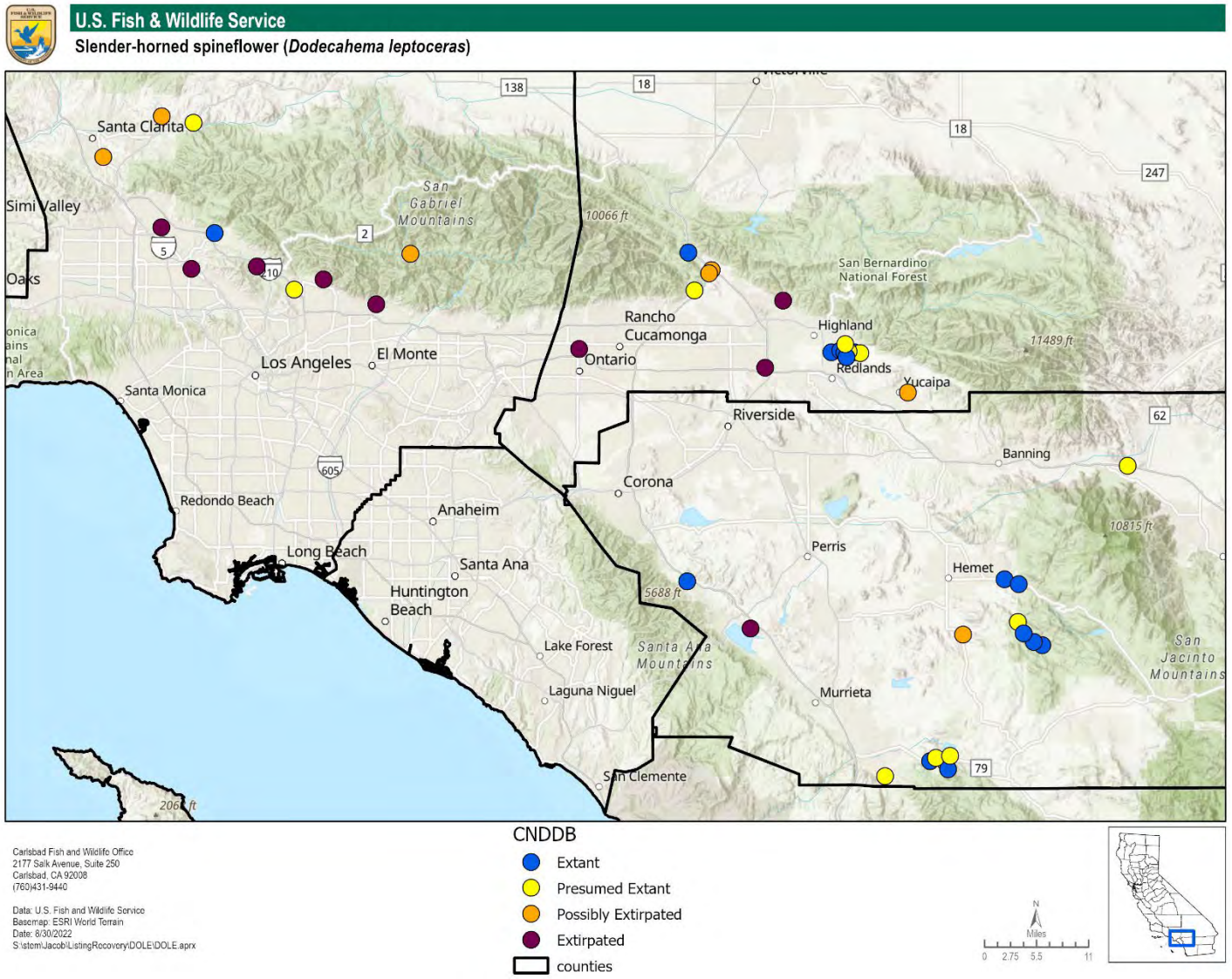

Figure 1. Rangewide occurrences of *Dodecahema leptoceras* (*slender-horned spineflower)* in Los Angeles, San Bernardino, and Riverside Counties.

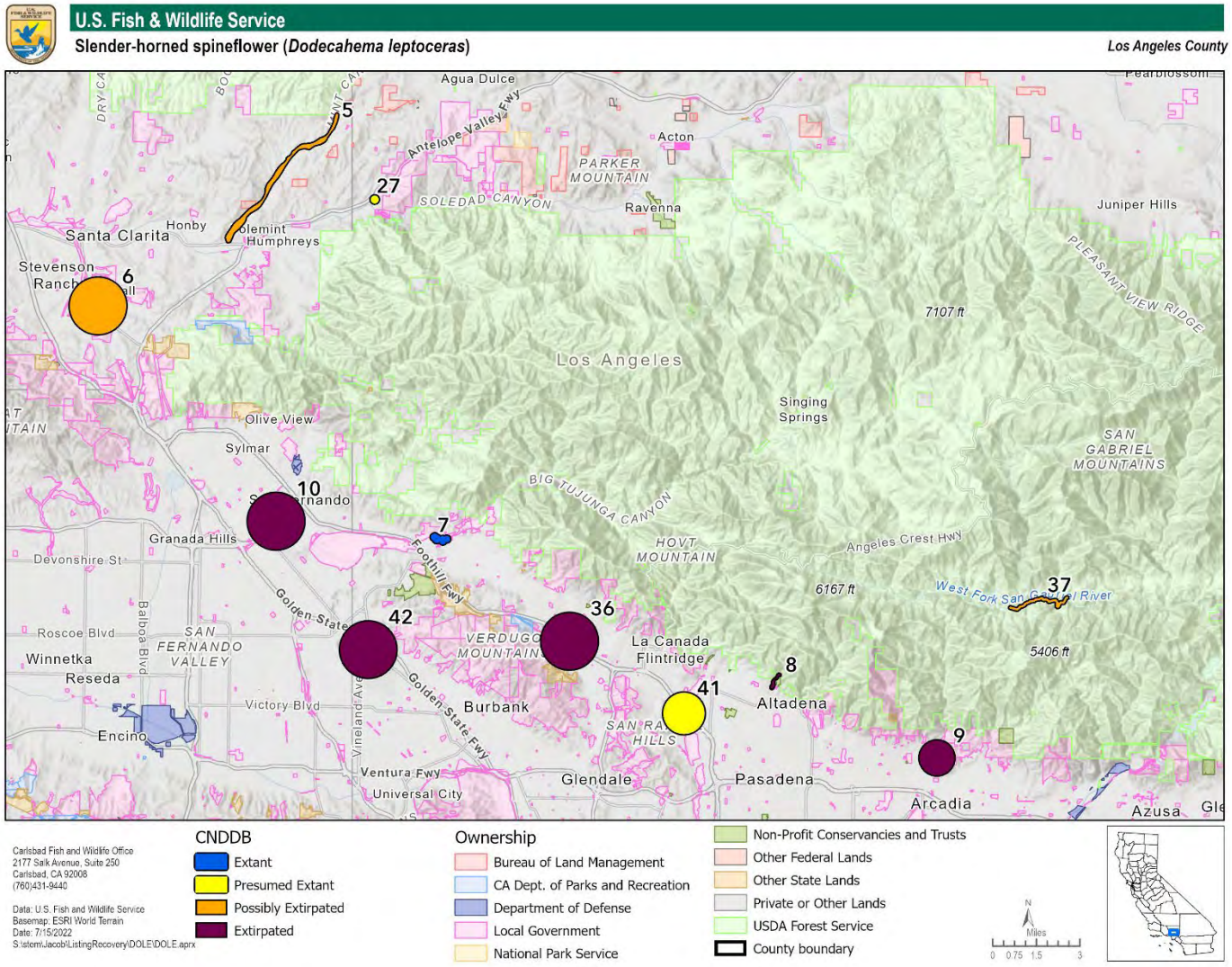

Figure 2. Occurrences of *Dodecahema leptoceras (slender-horned spineflower)* in Los Angeles County, showing occurrence status and land ownership.

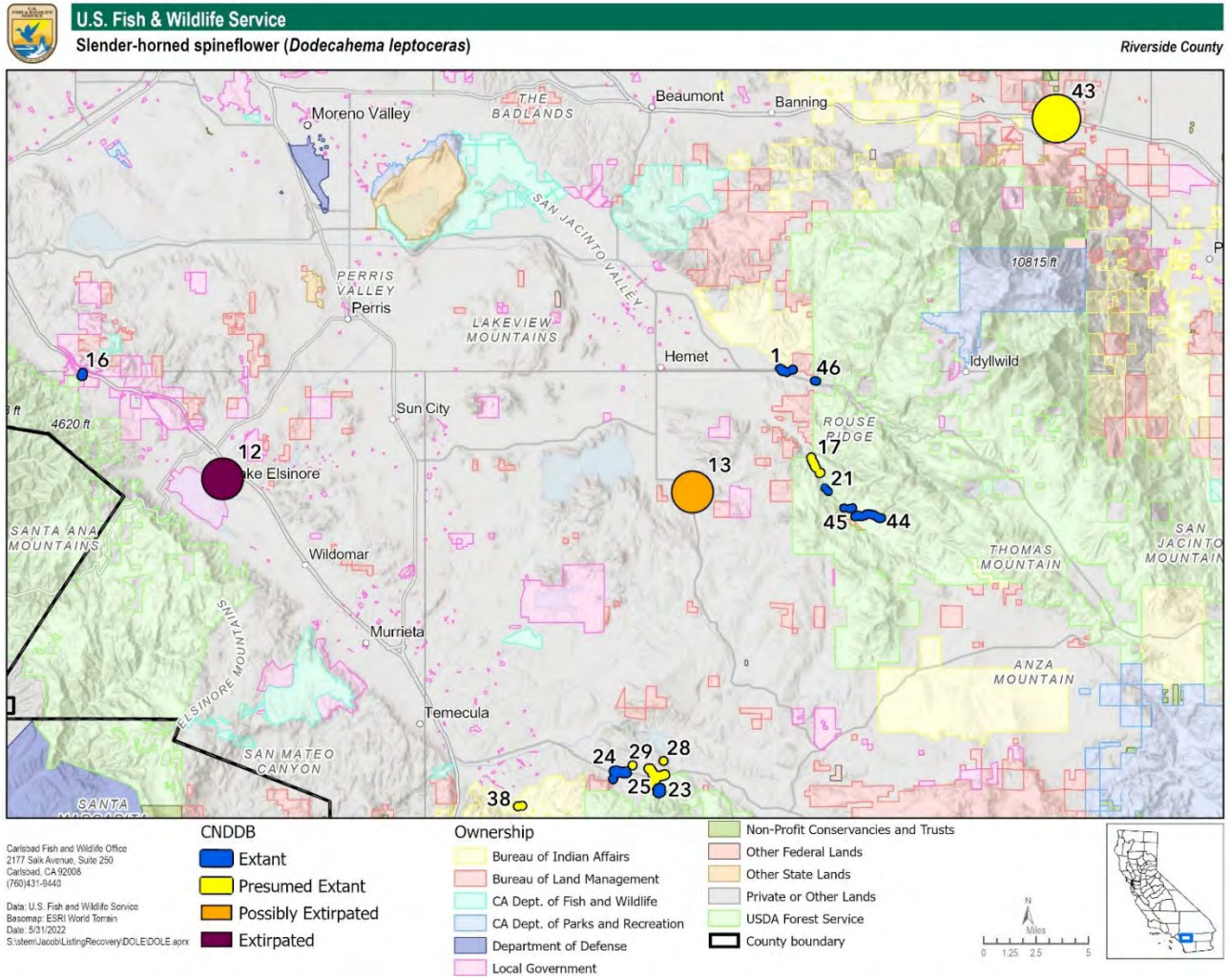

Figure 3. Occurrences of *Dodecahema leptoceras (slender-horned spineflower)* in Riverside County, showing occurrence status and land ownership.

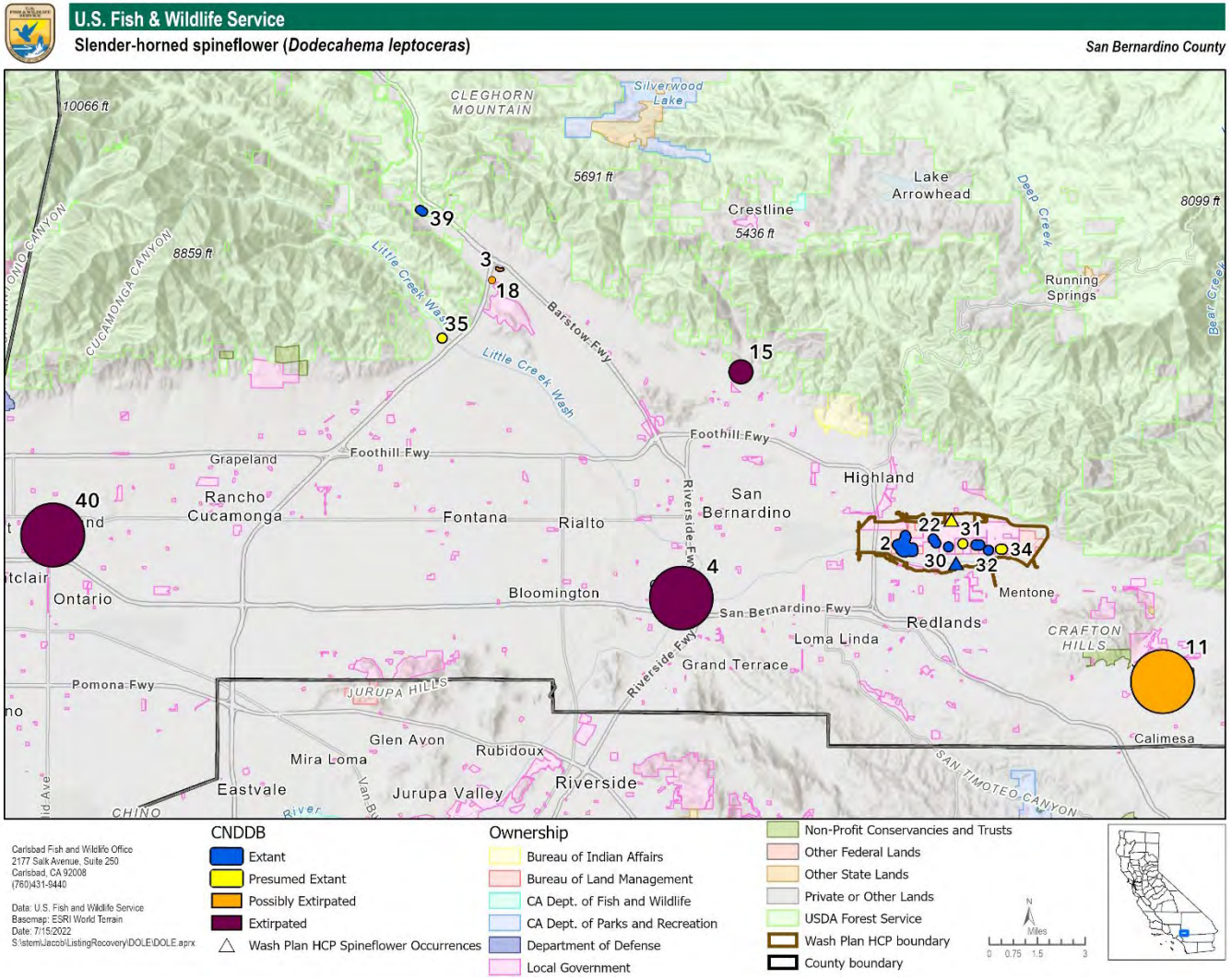

Figure 4. Occurrences of *Dodecahema leptoceras (slender-horned spineflower)* San Bernardino County, showing occurrence status, land ownership, and the Wash Plan boundary.

Transportation projects

Glen Helen Parkway grade separation (EO 3)

In 2011, we completed formal consultation for the Glen Helen Parkway Grade separation project (Service 2011, entire). The biological study area for this project included a portion of the Cajon Creek Wash/Devore occurrence (EO 3) (Caltrans 2011a, pp. 6, 8, 10). Focused spineflower surveys were conducted in 2006, 2009, and 2010, and no spineflower were found (Service 2011, p. 2). Additionally, Caltrans modified the project alignment to avoid suitable habitat for spineflower and other listed species. Therefore, in our biological opinion, we concluded that the project was not likely to adversely affect spineflower (Service 2011, p. 3).

State Route 138 route widening (north of EO 39)

In 2012, we completed informal consultation for the State Route 138 widening project (Service 2012b, entire). In 2010 and 2011, focused surveys for spineflower were conducted in the Cajon Creek portion of the project area (Caltrans 2011b, p. 20), approximately 4.6 air mi (7.4 km) northwest of EO 39. No spineflower were detected during surveys (Caltrans 2011b, p. 20 (Service 2012b, p. 2). In our biological opinion, we concluded that the project was not likely to adversely affect spineflower (Service 2012b, p. 2).

Garnet Street bridge replacement (southeast of EO 34)

In 2016, we completed consultation for the Garnet Street bridge replacement project (Service 2016, entire). EO 34 is approximately 2.0 mi (3.2 km) northwest of the project area. Suitable spineflower habitat was present within the Biological Study Area (Caltrans 2015, p. 15), and botanical surveys were conducted in 2010 and 2015 (Caltrans 2015, p. 32). No individuals were detected within the study area, and Caltrans modified the project to mitigate effects to spineflower habitat by (1) purchasing conservation credits, and (2) restoring and enhancing temporarily disturbed habitat (Caltrans 2015, p. 35). Therefore, in our biological opinion, we concluded that the project was not likely to adversely affect spineflower (Service 2016b, p. 2).

State Route 79 shoulder widening (EOs 24 and 25)

In 2019, Caltrans completed environmental review for a shoulder widening project along State Route 79 in the Vail Lake area (Caltrans 2019c, entire). During plant surveys, approximately 80 spineflower were detected at the Vail Lake vicinity/Kolb Creek draining occurrence (EO 24) (Caltrans 2019c, p. 16). Plants were detected well outside the roadway, and the project would not affect the hydrology of Kolb Creek (Caltrans 2019c, p. 16).

The Biological Study Area for this project also included portions of EO 25, but no plants were detected during surveys (Caltrans 2019c, Figures 3a, 7e, 7f, 8b).

State Route 79 bridge replacement (EO 25)

In 2019, Caltrans completed environmental review for the Arroyo Seco bridge replacement project, which intersects EO 25 (Caltrans 2019a, entire; Caltrans 2019b, entire). Surveys for spineflower were conducted in 2018 (Caltrans 2019a, p. 20). No spineflower were detected in the

Biological Study Area, but suitable habitat was present (Caltrans 2019a, p. 20; Caltrans 2019b, p. 47). The project included measures to avoid and minimize impacts to spineflower habitat (Caltrans 2019a, pp. 34–35, Appendix A).

Wash Plan transportation projects

Four road construction, widening, or replacement projects have coverage under the Wash Plan (ICF 2020, p. 2-17). While equipment associated with covered activities could crush or uproot spineflower individuals and destroy seed-containing soils, Avoidance and Minimization Measures would be implemented to minimize damage or loss of spineflower individuals (Service 2020, pp. 32–33, 36–40, 47–48).

Other infrastructure development under the Wash Plan is discussed under **Mining** and **Altered hydrology**.

Other development projects

Calnev Pipeline construction (EOs 3, 18, 39)

In 2016, we completed consultation for the Bureau of Land Management's issuance of a right-of-way grant for the proposed Calnev Expansion Project (Service 2016a, entire). The proposed project was the construction, operation, and maintenance of a 16-in diameter pipeline between Colton, California and Las Vegas, Nevada, as well as improvements and construction activities at pipeline facilities (Service 2016a, pp. 3–7).

The 50-year project impact to spineflower is 0.25 ac (0.10 ha) (Service 2016a, p. 13). No spineflower were located during pre-construction surveys in 2008 (Service 2016a, p. 100), but the proposed pipeline is adjacent to EOs 3 and 39 (Service 2016a, Appendix C, pp. 28–31), and an existing pipeline is adjacent to EO 18 (Service 2016a, Appendix C, pp. 28–31).

The proposed action included conservation measures for spineflower to avoid impacts to known spineflower occurrences and conduct preconstructions surveys in areas of suitable spineflower habitat (Service 2016a, p. 44). The proposed action also included measures to restore occupied areas disturbed by temporary impacts, or to compensate for impacts off-site (Service 2016a, pp. 45–46). Our biological opinion concluded that the proposed action is not likely to jeopardize the continued existence of spineflower due to avoidance and minimization measures, including habitat acquisition to offset impacts (Service 2016a, p. 107).

Mining

In the 2010 5-year review, we discussed threats to spineflower from sand and gravel mining (Service 2010, p. 14). We identified threats from mining at five spineflower occurrences (EOs 1, 2, 22, 27, and 30). Three of those occurrences (EOs 2, 22, and 30) are within the Wash Plan area. For this review, we have new information about this threat at the occurrences within the Wash Plan area.

Upper Santa Ana River Wash Habitat Conservation Plan

Aggregate mining is a covered activity under the Wash Plan (ICF 2020, p. 2-7; Service 2020, p. 7). Two mining companies are participating in Wash Plan implementation to receive coverage for their projects within the Wash Plan area (ICF 2020, p. 1-27). As part of HCP implementation, existing mining areas will expand and new mining activities will occur on 400.7 ac (162.2 ha) within the Wash Plan area (ICF 2020, p. 2-7).

There are 22 extant patches and 48 historical patches of spineflower in the Wash Plan area (Service 2020, p. 45), and covered activities will result in the removal of 1 extant patch and 12 historical patches of spineflower (Service 2020, p. 47).

Aggregate mining will permanently impact 1 extant patch and 10 historical patches:

1. Seven historical patches of spineflower within or near the north part of EO 2, which were observed in the 1990s (ICF 2021a, entire).

2. Two historical patches of spineflower within or near EO 22, which were observed in the 1990s (ICF 2021a, entire).

3. One historical patch of spineflower and one extant patch observed in 2012, both within EO 30 (ICF 2021a, entire). Mining will permanently affect this entire occurrence as a covered activity under the Wash Plan (Table A1).

The Wash Plan designated a "contingency parcel" that could be mined in the future if spineflower were successfully established elsewhere within the HCP Preserve (Service 2020, p. 47). This parcel will become isolated as existing and future mining operations occur in the area (Service 2020, p. 47). However, overall fragmentation of spineflower populations from covered activities will be minimal (Service 2020, p. 47).

The loss of 1 extant spineflower patch and 10 historical patches (at or near EOs 2, 22, 30) due to mining will be offset through preservation or management of 20 extant spineflower patches and 36 historical patches (Service 2020, p. 49). Additionally, six new spineflower patches will be established and maintained within the HCP Preserve, and spineflower seeds will be salvaged from areas of permanent impact and used for habitat restoration within the Preserve (Service 2020, p. 49, Appendix B, pp. 86–90). Due to the planned conservation and management of 91 percent of spineflower patches within the Wash Plan area (Service 2020, p. 49), threats from aggregate mining have been reduced.

Altered hydrology

In the 2010 5-year review, we discussed altered hydrology at numerous spineflower occurrences. We concluded that 14 of 20 extant spineflower occurrences were threatened by flood control measures or possible reservoir expansion (Service 2010, p. 15). In general, we considered most occurrences threatened by the interruption of natural flood regimes (Service 2010, p. 15).

For this review, we have information about planned or ongoing projects at the Arroyo Seco–Devil's Gate Reservoir spineflower occurrence (EO 41), and hydrology-related information within the Wash Plan area.

Arroyo Seco–Devil's Gate Reservoir (EO 41)

The Arroyo Seco occurrence (EO 41) in the vicinity of Devil's Gate Reservoir is based on 1920 Ottley collection (CDFW 2021, p. 44). In 2010, the Chambers Group conducted spineflower surveys for a post-fire sediment removal project (Chambers Group, Inc. 2010, pp. 1, 9). No spineflower were found during surveys (Chambers Group, Inc. 2010, p. 9). Sediment removal at the Devil's Gate reservoir began in 2019 (Los Angeles County Public Works 2022, entire).

North of EO 41, in 2019 spineflower surveys were conducted for the Arroyo Seco Canyon Project Areas 2 and 3, which consists of (1) diversion dam and intake replacement, and (2) spreading basin expansion (Dudek 2020, pp. 1, 6, G-3). No spineflower were found (Dudek 2020, p. G-3). Although suitable habitat was present, Dudek (2020, p. G-3) stated that spineflower had a low potential to occur in the study area.

Upper Santa Ana River Wash Habitat Conservation Plan

Three categories of covered activities under the Wash Plan are related to altered hydrology: (1) water conservation, (2) wells and water infrastructure, and (3) flood control. The Wash Plan covers numerous planned activities under these categories (see ICF 2020, pp. 2-8–2-17).

Water conservation activities are related to water management for the conservation, recharge, or extraction of potable groundwater (ICF 2020, p. 2.2). Existing recharge basins are present north of EO 34 (ICF 2021a, entire). Under the Wash Plan, water recharge project footprints are planned north of EO 32 (ICF 2021a, entire).

The Spineflower Working Group identified sheet flow to refresh habitat as important for the long-term persistence of spineflower within the HCP Preserve (Service 2020, p. 46). According to the Wash Plan, the protection of most spineflower patches within the HCP Preserve will ensure the preservation of hydrological processes important for spineflower (i.e., sheet flow during storm events) (ICF 2020, p. 4-10). Monitoring and adaptive management and the development of a Spineflower Restoration Program could also provide more information about spineflower habitat conditions (ICF 2020, p. B.25 and Appendix B; Service 2020, pp. 87–88).

Nonnative invasive plants

In the 2010 5-year review, we discussed nonnative invasive plants as threats to spineflower habitat and individual plants (Service 2010, pp. 16, 23). Nonnative plants could alter fire regimes in spineflower habitat, and compete for light, resources, and space (Service 2010, p. 23).

Since the 2010 5-year review, we have new observations of nonnative plant presence at three spineflower occurrences:

1. At EO 39 (Cajon Canyon north of Ruddell Hill), the CNDDB lists infestation by wild oats (*Avena* species) as a threat (CDFW 2021, p. 42).

2. At EO 44 (Bautista Canyon, Horse Creek), multiple nonnative species are noted in the CNDDB, including cheatgrass (*Bromus tectorum*) and red brome (*Bromus rubens*) (CDFW 2021, p. 47).

3. Nonnative plants are present at EO 46 (San Jacinto River, Highway 74 Cranston Station). Rattail six weeks grass (*Festuca myuros*) and red brome were noted onsite (BMP 2020, entire).

Since 2010, we completed section 7 consultation for three nonnative species removal projects:

1. Nonnative plant removal in the Big Tujunga Watershed (Service 2016c, entire). We determined that the potential for adverse effects from herbicides and trampling during nonnative plant treatment was discountable (Service 2016c, p. 3).

2. Nonnative plant removal from the Angeles National Forest (Service 2015, entire). There are no extant spineflower occurrences on the Angeles National Forest (EOs 8 and 37 are extirpated and possibly extirpated, respectively). Prior to nonnative plant treatment, surveys would occur in suitable spineflower habitat (Service 2015, p. 5). We determined that the potential for adverse effects from nonnative plant treatment was discountable, and that the project could benefit listed plant habitat (Service 2015, p. 5).

3. Ongoing activities on the San Bernardino National Forest with effects to eight riparian species (Service 2012a, entire). This consultation included a number of Forest Service activities, including nonnative species removal (Service 2012a, pp. 1, 3–7). We concluded that nonnative plant removal would not adversely affect spineflower, and could be beneficial (Service 2012a, p. 12).

We also have new information from a study of methods to control nonnative grasses in Riversidian scrub habitat (SAIC 2011, entire). The study examined six nonnative grass treatments of different herbicide, application timing, or physical treatment (SAIC 2011, pp. 2, 5). All treatments were effective at controlling nonnative cheatgrass, but not all treatments successfully controlled rattail six weeks grass (SAIC 2011, p. 13).

Upper Santa Ana River Wash Habitat Conservation Plan

Habitat enhancement and monitoring is a Covered Activity under the Wash Plan (Service 2020, p. 7). Within the Wash Plan area, preserve habitat management focuses on habitat quality maintenance and enhancement in part through invasive plant control (Service 2020, pp. 13, 18). Reducing invasive plant cover within and adjacent to suitable spineflower habitat is one of the spineflower objectives under the Wash Plan (Service 2020, Appendix B, pp. 88–89). Therefore, Wash Plan implementation is expected to ameliorate threats to spineflower from nonnative invasive plants within the Wash Plan area.

Dumping and trash

In our 2010 5-year review for spineflower, we identified trash dumping as a threat at three spineflower occurrences but noted that the incidence of trash dumping could be higher than reported (Service 2010, p. 16).

Since 2010, we have new information indicating that this threat is present at four additional occurrences:

1. At the Temescal Canyon spineflower occurrence (EO 16), debris pile encroachment is noted as a threat in collection information (CCH2 2021, entire).

2. At two occurrences in Bautista Creek Canyon (EOs 17 and 21), vandalism, dumping, or litter is noted as a threat in CNDDB (CDFW 2021, pp. 21, 23).

3. At the San Jacinto River–Cranston Station occurrence (EO 46), vandalism, dumping, or litter is listed as a threat in CNDDB (CDFW 2021, p. 49).

We have no new information about dumping or litter at other occurrences.

Climate change

Climate change refers to a shift in the mean or variability in measures of climate (e.g., precipitation or temperature) that persists for an extended period of time, typically a decade or more, due to natural variability, human activity, or both (IPCC 2013, p. 1450). In our 2010 5-year review, we considered climate change a threat to spineflower (Service 2010, pp. 24–25).

Since 2010, scientists have used downscaled climate models to project changes in temperature and precipitation in California under a range of future climate scenarios (Kalansky *et al*. 2018, entire; Pierce *et al*. 2018, entire). Temperature has increased throughout Southern California over the past century, and warming is expected to continue (Table 3) (Hall *et al*. 2018, pp. 10–11).

Wet and dry precipitation extremes are projected to increase in the future, although models project small mean changes compared to historical precipitation variability (Hall *et al*. 2018, p. 13). Models also project increases in the frequency of atmospheric-river storms, which deliver intense precipitation and can cause severe flooding (Dettinger 2011, p. 519). However, droughts are also projected to become more frequent and intense and will be exacerbated by higher temperatures (Kalansky *et al*. 2018, p. 25).

Table 3. Projected annual average minimum and maximum temperatures across the range of spineflower. The values are the average of projections from four priority models (MIROC5, CanESM2, HadGEM2-ES, and ENRM-CM5) during the mid-century (2035–2064) and end-of-century time period (2070–2099). Data from Cal-Adapt (CEC 2022, entire). All columns display the modeled 30-year annual average and range in degrees (°) Fahrenheit.

Year Range	RCP 4.5 projected annual average minimum temperature (°F)	RCP 4.5 projected annual average maximum temperature (°F)	RCP 8.5 projected annual average minimum temperature (°F)	RCP 8.5 projected annual average maximum temperature (°F)
Historical (1961–1990)	46.4 (range 44.6–48.7)	74.0 (range 71.0–77.2)	Same as RCP 4.5	Same as RCP 4.5
Mid-century (2035–2064)	50.8 (range 48.7–54.0)	78.7 (range 75.4–82.3)	51.8 (range 48.9–56.0)	79.9 (range 76.8–84.3)

Year Range	RCP 4.5 projected annual average minimum temperature (°F)	RCP 4.5 projected annual average maximum temperature (°F)	RCP 8.5 projected annual average minimum temperature (°F)	RCP 8.5 projected annual average maximum temperature (°F)
End of century (2070–2099)	52.1 (range 49.9–54.4)	80.3 (range 77.2–83.3)	55.5 (range 52.0–60.1)	83.0 (range 78.6–88.1)

In response to climate change, plant species may persist in a modified climate, move to areas of more suitable climate, or go extinct (Theurillat and Guisan 2001, p. 78; Parmesan 2005, pp. 48–52). Hughes (2000, entire) identified four broad categories of climate change effects on species:

1. Physiological effects, caused by changes in precipitation, temperature, and atmospheric CO_2 concentration. In plants, those variables affect photosynthesis and respiration.

2. Effects on species distributions due to increased temperature. As the climate warms, species are expected to shift towards higher latitudes and elevations.

3. Phenological effects, including alteration of environmental cues, such as temperature and resource availability.

4. *In situ* adaptation, in which species evolve to adapt to changing conditions over time.

In our 2010 5-year review, we discussed several potential effects of climate change to spineflower, and we considered it likely that climate change would exacerbate existing threats and introduce new threats (Service 2010, p. 24). We do not have new information about how increasing temperatures or precipitation extremes may affect spineflower habitat or individual plants.

Summary of threats

Since the 2010 5-year review, we received new information about six threats to spineflower: (1) development (including transportation projects and pipeline construction), (2) mining, (3) altered hydrology, (4) nonnative invasive plants, (5) dumping and trash, and (6) climate change.

In our consultations for transportation and pipeline construction projects involving spineflower, we concluded that either (1) the project was not likely to adversely affect spineflower, or that (2) the project was not likely to jeopardize the continued existence of spineflower. For these projects, impacts to spineflower plants or habitat were avoided or minimized by surveys, changes to project siting, off-site compensation for impacts, or other measures.

Our biological and conference opinion on the Wash Plan addressed impacts to spineflower from multiple covered activities, including mining. Threats from mining within the Wash Plan area have been reduced at five EOs due to the planned conservation and management of 91 percent of spineflower patches within the Wash Plan area.

In our 2010 5-year review, we discussed altered hydrology at specific occurrences, and we considered most occurrences threatened by the interruption of natural flood regimes. We have

new information about hydrology-related projects at EO 41, and for occurrences within the Wash Plan area. Monitoring and adaptive management within the Wash Plan area could provide more information about habitat conditions and restoration methods for spineflower. However, altered hydrology remains a rangewide threat to spineflower at 14 occurrences.

Nonnative plants and dumping have been noted at additional occurrences since 2010. Planned nonnative plant treatments could ameliorate this threat at some occurrences in the future.

Climate modeling available since 2010 projects increased temperatures and precipitation extremes, but we do not have new information or models about how these changes could affect spineflower in the future.

CONCLUSION

In 2010, we recommended no change in status, due to ongoing threats and range-wide altered hydrology (Service 2010, pp. 25–26). We recognized that the magnitude of threats to spineflower had been reduced compared to listing (Service 2010, p. 25) due to the increased spineflower range and number of occurrences, but that the species remained endangered.

In the 2010 5-year review, we were aware of 36 occurrences of spineflower: 20 were presumed extant, 3 were possibly extirpated, and 13 were extirpated (Table 1). For this review, we reported 44 occurrences of spineflower: 15 occurrences are extant, 13 are presumed extant, 7 are possibly extirpated, and 9 are extirpated. Eight occurrences that were not considered in the previous review were either (1) discovered since 2010, or (2) were known to others but not included in our last 5-year review.

Rangewide altered hydrology and other ongoing threats are still present at spineflower occurrences. Thirty-six percent of occurrences (16 of 44) are extirpated or possibly extirpated due to development and altered hydrology, and 30 percent of occurrences (15 of 44) have not been observed for over 10 years (i.e., are presumed extant).

Since our 2010 review, two occurrences have received an elevated level of conservation due to land acquisition by conservation organizations. Additionally, the Wash Plan HCP addresses impacts to spineflower from covered activities and will conserve and actively manages 91 percent of spineflower patches within the Wash Plan area, conserving or partially conserving five of the six CNDDB EOs within the Wash Plan area (Table A1).

There are currently 28 extant or presumed extant spineflower occurrences across Los Angeles, Riverside, and San Bernardino Counties. While some threats have been reduced since 2010, the new information and updated occurrence status does not substantially alter the species' status or the results of our five-factor analysis in the 2010 5-year review. Therefore, we conclude that slender-horned spineflower remains a federally endangered species and recommend no status change at this time.

RECOMMENDATIONS FOR FUTURE ACTIONS

To recover slender-horned spineflower, we need to conserve additional spineflower habitat and enhance or restore degraded habitat. To accomplish these actions, we also need additional

monitoring, surveys, and site assessment across the species' range. We recommend that the following actions be completed over the next 5 years to enhance habitat and manage threats to slender-horned spineflower. We recognize that conservation of this species will require cooperation and coordination with partners.

1. Monitor known and historical occurrences to determine presence and condition of spineflower. Evaluate threats and develop site-specific recommendations to prioritize management actions.

2. Model suitable habitat across the range of spineflower and prioritize areas for further survey. Work with interested landowners to survey suitable habitat where spineflower has not been detected.

3. Collect spineflower seed from occurrences outside the Wash Plan area and conserve seed in an off-site conservation seed bank.

4. Enhance spineflower habitat using the site-specific recommendations developed under action 1.

5. At spineflower occurrences that are not conserved, identify opportunities to work with landowners to acquire lands or encourage conservation actions for spineflower.

6. Over the next 10 years, identify adaptive management and monitoring approaches from the Spineflower Working Group that could be applied range-wide, especially in regard to invasive species management and hydrological conditions.

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FIELD OFFICE APPROVAL

Lead Field Supervisor, Fish and Wildlife Service

☒ Approved

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Appendix

APPENDIX A

Occurrence Table

Table A1. Occurrence table for slender-horned spineflower, showing CNDDB EO number, occurrence status in 2010 and 2022, land conservation status, and a summary of changes since 2010. All conservation status information references CCED (2020, entire).

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
Los Angeles	Mint Canyon	5	Extirpated	Possibly extirpated	Partially conserved (Forest Service)	Considered possibly extirpated by CNDDB, because although areas have been developed, potential habitat is present. Threats include altered hydrology and development. The CNDDB polygon extends only part way up the canyon, but additional habitat may be present in the north part of Mint Canyon.	CDFW 2021, p. 8
Los Angeles	Newhall	6	Extirpated	Possibly extirpated	Not conserved	Considered possibly extirpated by CNDDB, because although much of the area has been developed, potential habitat is present.	CDFW 2021, p. 9
Los Angeles	Big Tujunga Wash, near Sunland	7	Presumed extant	Extant	Partially conserved (Mountains Recreation and Conservation Authority)	In 2018, the MRCA acquired 111 ac of the Big Tujunga Wash (including portions of EO 7) for conservation. Due to this acquisition, the threat of development has been partially ameliorated. Other threats listed in CNDDB may also have been ameliorated.	MRCA 2018, entire; CDFW 2021, pp. 10–11, Meyer 2012, entire

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
Los Angeles	Rubio Wash, Altadena	8	Extirpated	Extirpated	Partially conserved (Arroyos and Foothills Conservancy and Forest Service)	Due to acquisition by a non-profit conservancy (the Arroyos and Foothills Conservancy) between 2009 and 2011, part of this area is conserved. However, the occurrence is still considered extirpated.	CDFW 2021, p. 12; Arroyos and Foothills Conservancy, entire
Los Angeles	Santa Anita Wash, Arcadia	9	Extirpated	Extirpated	Partially conserved (Monrovia Wilderness Preserve)	No change in EO or conservation status. Habitat has been highly modified for flood control and by development (CNDDB 2021).	CDFW 2021, p. 13
Los Angeles	Pacoima Canyon Wash, San Fernando Valley	10	Extirpated	Extirpated	Not conserved	No change in EO or conservation status. Habitat has been highly modified by development. The Pacoima Reservoir is upstream of the mapped occurrences.	CDFW 2021, p. 14
Los Angeles	Bee Canyon Wash, tributary of Santa Clara River	27	Presumed extant	Presumed extant	Not conserved	No change in EO or conservation status. Seed was collected from this occurrence in 1991.	CDFW 2021, p. 31; CaPR 2022, entire
Los Angeles	La Crescenta	36	Extirpated	Extirpated	Partially conserved	No change in EO status. This EO is mapped as a circular polygon over a non-specific area. It includes lands conserved as the City of Glendale Verdugo Mountains Open Space. This occurrence is considered extirpated due to development.	CDFW 2021, p. 39
Los Angeles	West Fork San Gabriel River	37	Possibly extirpated	Possibly extirpated	Conserved (Forest Service)	No change in EO conservation status. Habitat has been altered by the Cogswell Dam.	CDFW 2021, p. 40

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
Los Angeles	Arroyo Seco (Devil's Gate Reservoir area)	41	Not considered in 2010 review	Presumed extant	Not conserved	This occurrence is in CNDDB based on a 1920 Ottley collection but was not considered in our 2010 review. Suitable habitat for spineflower is present in the Devil's Gate Reservoir area Because suitable habitat is present, we consider this occurrence presumed extant. Development and hydrology-related projects from the Devil's Gate Reservoir are possible threats at this occurrence.	CDFW 2021, p. 44; Chambers Group 2010, Appendix D, pp. 9, 14
Los Angeles	Sun Valley, San Fernando Valley	42	Extirpated	Extirpated	Not conserved	Assigned a CNDDB number since last review; no other change in EO or conservation status	CDFW 2021, p. 45
Riverside	San Jacinto River, 1.5 mile east of Valle Vista.	1	Presumed extant	Extant	Partially conserved (Eastern Municipal Water District San Jacinto River Conservation Easement, Western Riverside County Regional Conservation Authority)	This occurrence is extant because it has been observed within the past 10 years. The area is partially conserved, so development is not a direct threat to some portions of the occurrence.	CDFW 2021, pp. 1–2
Riverside	Elsinore	12	Extirpated	Extirpated	Not conserved	No change in EO or conservation status.	CDFW 2021, p. 16

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
Riverside	7.4 mi south of Hemet, Saint John's Creek and Cactus Valley	13	Possibly extirpated	Possibly extirpated	Not conserved	No change in EO or conservation status. This occurrence is possibly extirpated because plants have not been observed since 1937. There may be suitable habitat in the area.	CDFW 2021, p. 17
Riverside	Temescal Canyon, Indian Wash at De Palma Road	16	Presumed extant	Extant	Partially conserved (Glen Eden Conservation Easement)	The area has been partially conserved as part of the Glen Weldon Conservation Easement, and adjacent parcels are owned by the Cleveland National Forest. However, other portions of the occurrence are on private lands. Debris pile encroachment is noted as a threat in collection information.	CDFW 2021, p. 19; BMP 2020, entire; Forest Service 2021, entire; CCH2 2021, entire
Riverside	Bautista Creek Canyon, San Jacinto Mountains.	17	Presumed extant	Presumed extant	Partially conserved (Forest Service)	No change in EO or conservation status. Vandalism/dumping/litter is also noted as a threat in CNDDB.	CDFW 2021, p. 17; Forest Service 2021, entire; CCH2 2021, entire
Riverside	Bautista Creek Canyon, 0.5 mi northwest Bautista Guard Station	21	Presumed extant	Extant	Conserved (Forest Service)	Since this EO has been observed within the last 10 years, it is extant rather than presumed extant. CNDDB lists trash dumping and nonnative plants as threats	CDFW 2021, p. 23; BMP 2020, entire; Forest Service 2021, entire
Riverside	Vail Lake vicinity, Arroyo Seco Wash, south Dripping Springs Camp.	23	Presumed extant	Extant	Conserved (Forest Service)	Since this EO has been observed within the last 10 years, it is extant rather than presumed extant. No change in conservation status.	CDFW 2021, p. 25; Forest Service 2021, entire; BMP 2020, entire

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
Riverside	Vail Lake vicinity, Kolb Creek drainage	24	Presumed extant	Extant	Not conserved	No change in EO status or conservation status since 2010. Slender-horned spineflower were detected at this EO during surveys for the Highway 79 shoulder-widening project. Plants were outside of the construction footprint (Caltrans 2019c, p. 16).	Forest Service 2021, entire; CDFW 2021, p. 28; Caltrans 2019c, p. 16 and Figure 8b
Riverside	Vail Lake vicinity, near Dripping Springs Guard Station	25	Presumed extant	Presumed extant	Partially conserved (Forest Service)	No change in EO or conservation status. The Arroyo Seco bridge replacement project occurred at this location.	Forest Service 2021, entire; CDFW 2021, pp. 29–30; Caltrans 2019a, p. 6
Riverside	Vail Lake vicinity, south of road between Vail Lake Marina and Campground	28	Presumed extant	Presumed extant	Not conserved	No change in EO or conservation status.	CDFW 2021, p. 32
Riverside	Vail Lake vicinity, Dripping Springs, west of Aguanga	29	Presumed extant	Presumed extant	Not conserved	No change in EO or conservation status	CDFW 2021, p. 33
Riverside	Pechanga Indian Reservation	38	Presumed extant	Presumed extant	Unknown	No change in EO or conservation status	CDFW 2021, p. 41

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
Riverside	Whitewater	43	Not considered in 2010 review	Presumed extant	Partially conserved (BLM)	Not considered in 2010. Mining occurs in lower Whitewater Canyon and may threaten this occurrence; however, since the occurrence location is unknown, threats are also unknown	CDFW 2021, p. 46
Riverside	Bautista Canyon, Horse Creek	44	Not considered in 2010 review	Extant	Conserved (Forest Service)	This conserved occurrence was reported in 2014. Nonnative plants including *Bromus rubens*, *B. tectorum*, *Schismus barbatus*, and *Tamarix ramosissima* were noted onsite	Forest Service 2021, entire; CDFW 2021, p. 47
Riverside	Bautista Canyon, Baisley Creek	45	Not considered in 2010 review	Extant	Conserved (Forest Service)	This conserved occurrence was reported in 2014.	Forest Service 2021, entire; CDFW 2021, p. 48
Riverside	San Jacinto River, Highway 74 Cranston Station	46	Not considered in 2010 review	Extant	Conserved (Forest Service)	This conserved occurrence was reported in 2007, but was not considered in our 2010 5-year review. Threats listed in CNDDB are foot traffic/trampling, nonnative invasive plant species, and vandalism/dumping/litter.	Forest Service 2021, entire; BMP 2020, entire; CDFW 2021, p. 49
Riverside	San Jacinto River	NA	Not considered in 2010 review	Presumed extant	Not conserved	This occurrence was reported in 1982 but was not considered in the last 5-year review. Specimen notes describe the locality as "along San Jacinto River above Valle Vista", but in CCH2 the occurrence is mapped approximately 2.5 miles southeast of EO 46. It is unclear whether this occurrence should be attributed to EO 46, or whether it is a separate occurrence.	CCH2 2021, entire

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
San Bernardino	Santa Ana River wash East Highlands, Highway 30	2	Presumed extant	Extant	Partially conserved (Wash Plan Phase 2 conservation)	Since this EO has been observed within the past 10 years, it is extant rather than presumed extant. Mining will occur at the north portion of this occurrence as a covered activity under the Wash Plan, affecting seven historical patches of spineflower at this occurrence.	ICF 2021a, entire, CDFW 2021, p. 3
San Bernardino	Devore, Cajon Creek Wash	3	Extirpated	Possibly extirpated	Not conserved	This occurrence was considered extirpated in 2010, but potential habitat still exists in the area, so we consider it possibly extirpated for this review. It is also possibly extirpated in CNDDB. Focused surveys in a portion of the EO were conducted in 2006, 2009, and 2010 for the Glen Helen Parkway Grade separation project. No plants were found, and Caltrans modified the project area to avoid suitable habitat for spineflower.	Service 2011, p. 2; CDFW 2021, p. 4
San Bernardino	San Bernardino, vicinity	4	Extirpated	Extirpated	Not conserved	No change in EO or conservation status. Considered extirpated by CNDDB due to altered hydrology (channelization and modification) and development	CDFW 2021, p. 7
San Bernardino	Yucaipa Valley	11	Extirpated	Possibly extirpated	Not conserved	This occurrence was considered extirpated in the 2010 5-year review, but it is possibly extirpated in CNDDB. We considered it possibly extirpated for this review because potential habitat exists in the north part of the CNDDB polygon.	CDFW 2021, p. 15
San Bernardino	Arrowhead Springs	15	Extirpated	Extirpated	Not conserved	No change in EO or conservation status.	CDFW 2021, p. 18

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
San Bernardino	Cajon Canyon, near Devore, north of existing Glen Helen Campground	18	Possibly extirpated	Possibly extirpated	Not conserved	No change in EO or conservation status	CDFW 2021, p. 22
San Bernardino	East of Church Street. Santa Ana River Wash	22	Presumed extant	Extant	Partially conserved (Wash Plan Phase 1 conservation)	Since this EO has been observed within the past 10 years, it is extant rather than presumed extant. Mining will occur at a portion of this occurrence as a covered activity under the Wash Plan, affecting two historical patches of spineflower.	ICF 2021a, entire; CDFW 2021, p. 24
San Bernardino	Santa Ana River Wash, 0.9 mi east-southeast La Carrera Field	30	Presumed extant	Extant	Not conserved	Since this EO has been observed within the past 10 years, it is extant rather than presumed extant. Since this EO has been observed within the past 10 years, it is extant rather than presumed extant. Mining will permanently affect this entire occurrence as a covered activity under the Wash Plan. One extant spineflower patch and one historical patch will be permanently impacted by future mining at this EO.	ICF 2021a, entire; CDFW 2021, p. 34
San Bernardino	Santa Ana River Wash, 1.3 mi east La Carrera Field	31	Presumed extant	Presumed extant	Conserved (Wash Plan Phase 1 conservation)	No change in EO status. There are three historical spineflower patches within 0.14 miles of this occurrences. These patches will be conserved under Phases 1 or 2 of the Wash Plan conservation phasing.	ICF 2021a, entire; CDFW 2021, p. 35

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
San Bernardino	Santa Ana River Wash, 1.6 mi east La Carrera Field	32	Presumed extant	Extant	Conserved	Since this EO has been observed within the past 10 years, it is extant rather than presumed extant. Under the Wash Plan, this EO is conserved as part of the Wooly-Star Preserve Area or under HCP Phase 1 Conservation	ICF 2021a, entire; CDFW 2021, p. 36
San Bernardino	Santa Ana River Wash, 1 mi south Greenspot Road	34	Presumed extant	Presumed extant	Conserved	No change in EO status. This EO is conserved as part of the Wooly-Star Preserve Area or under HCP Phase 1 Conservation	ICF 2021a, entire; CDFW 2021, p. 37
San Bernardino	Lytle Creek, 0.25 mi east Nealey's Corner	35	Presumed extant	Presumed extant	Not conserved	No change in EO or conservation status	CDFW 2021, p. 38
San Bernardino	Cajon Canyon. 1 mile below Blue Cut, north of Ruddell Hill	39	Presumed extant	Extant	Conserved (Forest Service)	We consider this occurrence extant because it has been observed within the last 10 years. The CNDDB lists nonnative plants and road construction/maintenance as threats to this occurrence, noting infestation by wild oat (*Avena* sp.) and that the occurrence is adjacent to railroad tracks and Cajon Boulevard. The Cajon Canyon portion of the SR-138 road widening project was approximately 4.6 air miles north-west-north of this occurrence.	Caltrans 2012, p. 2-114; CDFW 2021, p. 42
San Bernardino	Upland, likely Cucamonga Creek	40	Extirpated	Extirpated	Not conserved	No change in EO or conservation status. Extirpated due to development	CDFW 2021, p. 43

County	Location name	CNDDB EO	2010 status	2022 status	2022 conservation	Overall change summary 2010–2022	References
San Bernardino	Santa Ana River Wash, approximately 0.15 mi south of Greenspot Road	NA	NA	Extant	Conserved	This occurrence is not in CNDDB and was not considered in our 2010 5-year review, but it was included in the Wash Plan. This occurrence is conserved under HCP Phase 1 Conservation (Plunge Creek Management Area)	ICF 2021a, entire
San Bernardino	Santa Ana River Wash, approximately 0.4 mi north of Pioneer Avenue	NA	NA	Presumed extant	Not conserved	This occurrence is not in CNDDB and was not considered in our 2010 5-year review, but it was included in the Wash Plan. This occurrence is within a future flood control mitigation area and is not currently conserved.	ICF 2021a, entire