

*Brodiaea filifolia*  
(Thread-leaved brodiaea)

**5-Year Review:  
Summary and Evaluation**



Photo: Service/Joanna Gilkenson 2019

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

**August 2023**

## 5-YEAR REVIEW

### *Brodiaea filifolia* (Thread-leaved brodiaea)

#### GENERAL INFORMATION

**Species:** Thread-leaved brodiaea, *Brodiaea filifolia*, a plant species

**Date listed under the Endangered Species Act:** October 13, 1998

**Federal Register citation:** Service 1998 (63 FR 54975)

**Classification:** Threatened

**Recovery Plan:** To date, a final recovery plan has not been prepared for *Brodiaea filifolia*.

**Recovery Priority Number:** 8C

**Critical Habitat Designation:** On February 8, 2011, we published a final rule designating approximately 2,947 acres (1,193 hectares) of critical habitat for *Brodiaea filifolia* (Service 2011, pp. 6848–6325).

**State of California classification:** Endangered

#### 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 (Service), 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 2009. *Brodiaea filifolia* (thread-leaved brodiaea) 5-year review: summary and evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 47 pp.

**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). We received comments from Marine Corps Base Camp Pendleton (MCBCP) and the Center for Natural Lands Management (CNLM).

**Species overview and habitat:** *Brodiaea filifolia* is a perennial herb with dark-brown, fibrous-coated corms (underground bulb-like storage stems). It can be distinguished from other members of the genus by its narrow, pointed staminodes (sterile stamens), saucer-shaped flower, and thin perianth tube (Niehaus 1971, p. 37; Munz 1974, pp. 877–878). Leaves grow from corms, then senesce during flowering. The flowering period extends from March to June (Tibor 2001, p. 99). *Brodiaea filifolia* typically occurs on gentle hillsides, valleys, and floodplains in association with valley needlegrass grassland, valley sacaton grassland, nonnative grassland, alkali playa, vernal pools soils and in the interstitial spaces within coastal sage scrub. It is usually found on clay, loamy sand, or alkaline silty-clay soils in Orange, Riverside, San Bernardino and San Diego counties (Service 2009, p. 4).

In the 1998 listing rule we stated that *Brodiaea filifolia* is known to hybridize with *B. orcuttii*, *B. terrestris*, and possibly *B. jolonensis*, where these species coexist (citing Boyd et al. 1992, p. 19; Morey 1995, p. 4 *in litt*; CNDDDB 1997, p. 7). We also discussed *Brodiaea filifolia* and *B. orcuttii* hybridization on the Santa Rosa Plateau and at Miller Mountain (Service 1998, p. 54976). Subsequently, in 2007, Chester et al. (2007, pp. 188, 191, 193) described plants at Miller Mountain as a new taxon (*B. santarosae*; Santa Rosa Basalt brodiaea) based on floral morphology. Multiple observers have reported potential hybrid plants (*B. filifolia* X *B. orcuttii*) at the Upham site (CNDDDB EO 10) in the City of San Marcos (Chester et al. 2007, pp. 188, 191, 193; Roberts 2007, pers. comm.; Dudek 2023, p. 2). Hybridization with *B. joloensis* may occur here as well (Roberts 2007, pers. comm. Service 2009, p. 15; CDFW 2023). There have been no definitive studies to determine the genetic identity or exact parentage, or distribution of supposed hybrids relative to parent taxa from any sites.

## ASSESSMENT

### Information acquired since the last status review

This 5-year review was conducted by the Service's 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), San Diego Monitoring and Management Program (SDMMP), the Western Riverside County Multi-Species Habitat Conservation Plan (WRCMSHCP) Biological Monitoring Program (BMP), Natural Communities Coalition, the California Department of Fish and Wildlife, and MCBCP 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 2009

#### Pollination

Pollination studies were initiated at MCBCP and by CNLM since the last 5-year review. Between 2018 and 2020, the CNLM implemented a pollination study at several of the preserves they manage in San Diego County (Prentice-Dekker 2019, pp. 5–6, 12–14; Prentice-Dekker 2020, pp. 5, 7–10). The study assessed pollinator abundance diversity, visitation rates, and measured seed pod and seed production (Prentice-Dekker 2019, pp. 12–14; Prentice-Dekker 2020, pp. 7–10). Successful pollination, defined as at least one seed pod and seed produced, was observed at 16 (18 percent) of the 90 plants measured in 2020 (Prentice-Dekker 2020, p. 9). At MCBCP, several native and nonnative potential pollinators were observed (Kenney 2021, *in litt*;) (Appendix A); observations from both studies contribute to our understanding of potential *Brodiaea filifolia* pollinators. Additional research is needed to characterize the range of seed set and whether certain populations may have reduced sexual reproduction due to pollinator limitation or reduced genetic diversity.

#### Occurrence status

This section summarizes updates to *Brodiaea filifolia* occurrence status since 2009 and includes new information from conservation planning efforts, surveys, and monitoring. To update *B. filifolia* occurrence status, we reviewed Element Occurrence (EO) data from the California

Natural Diversity Database<sup>1</sup> (CNDDDB), monitoring data from the WRCMSHCP, SDMMP, MCBCP, herbaria records from the Consortium of California Herbaria (CCH2), and Forest Service occurrence data.

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

1. We considered an occurrence extant if *Brodiaea filifolia* had been observed at the occurrence within the last 10 years and the habitat is still intact.
2. We considered an occurrence presumed extant if *Brodiaea filifolia* had not been observed for over 10 years, but suitable habitat is still intact and we are not aware of other threats that would cause the species to be extirpated.
3. We considered an occurrence possibly extirpated if *Brodiaea filifolia* had not been observed for over 30 years and the habitat was degraded or partially developed such that large portions may no longer be suitable to support the species.
4. We considered an occurrence extirpated if the habitat was destroyed and could no longer support the species.

At listing in 1998, there were 37 extant occurrences of *Brodiaea filifolia* (Table 1). Nine historical occurrences were considered extirpated (Service 1998, p. 54977). Then in our 2009 5-year review, we identified 68 extant occurrences based on a 0.25 mile (0.40 kilometer) distance between occurrences. There were 23 newly identified or confirmed occurrences since listing, and 11 were extirpated (Service 2009, p. 7).

**Table 1.** Summary of thread-leaved brodiaea occurrence status in 1998, 2009, and 2023.<sup>1</sup>

Occurrence status	1998 Listing	2009 5-year review	2023 5-year review
Extant	37	68	83
Presumed extant			65
Possibly extirpated			9
Extirpated	9	11	9
<b>Total</b>	<b>46</b>	<b>79</b>	<b>166</b>

<sup>1</sup> Shows the number of occurrences extant, presumed extant, possibly extirpated, or extirpated.

<sup>1</sup> The California Natural Diversity Database (CNDDDB) is an inventory of the status and locations of rare plants and animals in California. The CNDDDB 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 CNDDDB, or locations not in the CNDDDB that are greater than 0.25 miles (0.40 kilometers) apart.

This 2023 review of new information finds that there is a substantial increase in the number of occurrences: a total of 148 occurrences are extant or presumed extant, and 18 are possibly extirpated or extirpated (Figure 1; Table 1). Although new occurrences of the plant have been found since listing, none of the new documented occurrences are outside of the original range identified in the final listing rule (Service 1998, p. 54977). The current distribution is discussed by county below and maps by county can be found in Appendix B.

## Abundance

We also characterized the size of each occurrence using the maximum recorded plant count. Most extant or presumed extant occurrences have at least one plant count estimate after 1992. We based our occurrence size classes on the generalized population size classes for herbaceous perennials (CBI 2018, p. 27; CBI and AECOM 2021, p. 44) (Table 2). We also included very small and very large occurrence size classes. Where estimated abundance data were not available, “NA” was indicated in Table 4 below.

**Table 2.** Occurrence size classes.

Size class	Abundance range
Very small	<100
Small	≥100–1,000
Medium	>1,000–10,000
Large	>10,000–100,000
Very Large	>100,000

Monitoring of both vegetative and flowering plants has found that only a subset of plants will flower in any given year (Service 2009, p. 13; MCBCP 2017, p. 17; Prentice-Dekker 2019, p. 8). For example, 2012 through 2019 counts of vegetative and flower individuals at CNLM study sites found that the ratio of flowering to vegetative plants was 0 to 8.3 percent (Prentice-Dekker 2019, p. 8). Therefore, counts or estimates of flowering plants likely underestimate total population size.

## Discussion of occurrence status by county or at MCBCP

A summary of occurrences and status by county are summarized below. Appendix B includes detailed occurrence descriptions, and Appendix C includes maps illustrating occurrence status by county.

### *Los Angeles County*

In Los Angeles County, the number of extant or presumed extant occurrences of *Brodiaea filifolia* increased from two to seven (Service 2009, p. 8) (Table 3). This total includes a 2010 herbarium record that has not been assigned a CNDDDB EO (CCH2 1339614, CCH 2022, p. entire). We have abundance information for three of the seven occurrences: all three are categorized as “very small” to “small” (Table 4; Figure 2; Appendix B). Four of the occurrences are permanently conserved.

**San Bernardino County**

In San Bernardino County, the number of extant or presumed extant occurrences of *Brodiaea filifolia* increased from two to three, and an herbarium record not addressed in the 2009 5-year review is considered extirpated (Service 2009, p. 8) (Table 3). Two of the three extant occurrences are “very small” to “small” (Table 4; Figure 2; Appendix B). One occurrence is conserved on lands within the San Bernardino National Forest.

**Table 3.** 2023 thread-leaved brodiaea occurrence status by county.

Occurrence status	Los Angeles	San Bernardino	Orange	Riverside	San Diego (MCBCP) <sup>2</sup>	San Diego (outside of MCBCP)	Total
Extant	3		9	10	35	27	84
Presumed extant	4	3	14	9	16	18	64
Possibly extirpated			2	1		6	9
Extirpated		1	2			6	9
<b>Total number of occurrences</b>	<b>7</b>	<b>4</b>	<b>27</b>	<b>20</b>	<b>51<sup>3</sup></b>	<b>57</b>	<b>166</b>

**Table 4.** 2023 thread-leaved brodiaea occurrence size class by county.<sup>1</sup>

Occurrence size class	Los Angeles	San Bernardino	Orange	Riverside	San Diego (MCBCP)	San Diego (outside of MCBCP)	Total
Very small	1	1	5 (1)	2	16	11 (4)	36
Small	2	1	15 (1)	6	13	11	48
Medium			3 (1)	3	11	9	26
Large			1	1	5	4	11
Very large					4	2	6
NA <sup>4</sup>	4	2 (1)	3(1)	8 (1)	2	20 (8)	39
<b>Total number of occurrences</b>	<b>7</b>	<b>4 (1)</b>	<b>27 (4)</b>	<b>20 (1)</b>	<b>51</b>	<b>57 (12)</b>	<b>166 (18)</b>

<sup>1</sup> (Historical size class data for extirpated and possibly extirpated occurrences are also included in this table, with the number of possibly extirpated/extirpated occurrences indicated in parenthesis. The possibly extirpated/extirpated occurrences are included in the total count of each occurrence size class).

<sup>2</sup> EO 94 crosses ownership boundaries. This occurrence is partially on MCBCP land and partially on conserved land owned by the Buena Vista Audubon Society (Cheatham Acquisition). For Tables 3 and 4 we counted the occurrence in the “San Diego (MCBCP)” column.

<sup>3</sup> MCBCP reports 52 occurrences of *Brodiaea filifolia* on Base using the 0.25 mile (0.40 kilometer) mapping distance. For this review we considered a group of polygons north of EO 96 (OccIDQtrMileSurvey ID BRF1-001) to be part of EO 96 because *Brodiaea filifolia* is mapped between the two locations. This determination reduced the number of occurrences on MCBCP to 51.

<sup>4</sup> “NA” in this row indicates that no abundance data were available.

**Orange County**

There are currently 23 extant or presumed occurrences in Orange County, nearly double the 12 occurrences reported in the last 5-year review (Service 2009, pp. 8–9) (Table 3). Of the 23 extant or presumed extant occurrences, 21 are located within the Southern Subregion HCP. The remaining 2 occurrences are located within the Central/Coastal HCP, where *Brodiaea filifolia* is not a covered species (County of Orange 1996, Table 2-ES).

In Orange County, 20 of 27 *Brodiaea filifolia* occurrences are in the “very small” or “small” size classes with less than 1,000 individuals (Table 4), while 4 occurrences have greater than 1,000 individuals (Table 4; Figure 2; Appendix B).

Of the four extirpated or possibly extirpated occurrences, three were previously reported as such at listing or our 2009 5-year review. One additional herbarium record (CCH2 902186) was first reported in 2011 and is considered possibly extirpated because the habitat is highly degraded (Appendix B).

**Riverside County**

In Riverside County there are 19 extant or presumed extant occurrences, 5 more than reported in our 2009 5-year review. One possibly extirpated occurrence (EO 1) was likely so at listing, and no new extirpations have been recorded (Table 3, Appendix B).

All Riverside County occurrences are within the WRCMSHCP planning area. The WRCMSHCP Biological Monitoring Program monitors eight occurrences every 8 years to document occurrence presence (BMP 2020, Appendix B, p. 83; Grillo 2023, pers. comm.) We have abundance data for 12 occurrences: 4 are “moderate” to “large” and the remaining occurrences have less than 1,000 individuals (Table 2, Figure 2). The majority of the extant and presumed extant occurrences are conserved (15 of 19; Appendix B).

**Marine Corps Base Camp Pendleton**

The number of occurrences on MCBCP has increased since listing and 30 percent of *Brodiaea filifolia* occurrences are now located on MCBCP, including some of the largest contiguous populations of the species. One occurrence was known on MCBCP in 1993, 19 were reported in the 2009 5-year review, and the species is now known from 51 extant occurrences (Appendix B; Service 2009, p. 20; Kenney 2021, *in litt.*). Although extensive surveys have been conducted over about 8,548 acres (3,459 hectares) on MCBCP (Kenney 2021, *in litt.*), *B. filifolia* likely occurs in other areas of MCBCP that have not been surveyed (MCBCP 2017, p. 25).

Estimated plant abundance on MCBCP has also increased since listing. 2020 monitoring estimated 18 million individuals and 98 acres (40 hectares) of occupied habitat (Kenney 2021, *in litt.*). Four occurrences on MCBCP have greater than 100,000 individuals (EOs 46, 96, 97 and 147; Table 4; Appendix A; Figure 2).

Since the 2009 5-year review, MCBCP published a Thread-leaved Brodiaea (*Brodiaea filifolia*) Management Plan (Plan) to conserve *B. filifolia* while maintaining flexibility for military training (MCBCP 2017, p. 1). The Plan was initiated after MCBCP conducted extensive surveys (MCBCP 2017, p. 17; Kenney 2021, *in litt.*) and determined that the species distribution and

abundance was more extensive than described in the 2007 Integrated Natural Resources Management Plan (INRMP). The Plan identified 52<sup>5</sup> occurrences and established three management units (MUs) encompassing 88 percent of *B. filifolia* individuals on MCBCP: Lima (EO 97), Horse Pasture (EO 96), and Finch (EO 46) (MCBCP 2017, pp. 1, 18; Kenney 2021, *in litt*). In 2019, we consulted on the Plan and determined that plan implementation was not likely to jeopardize the continued existence of the species due to the conservation and management of the three MUs, limited adverse effects to *B. filifolia* outside the MUs, and offsets for any future loss (Service 2019, p. 14).

Military training within the MUs is limited, such that no off-road vehicle travel, bivouacking or digging will occur. Enhancement of the three large MUs allows for military training to continue in the remaining 48 occurrences. However, the Plan also identifies a no net loss approach to *Brodiaea filifolia* occurrences due to anthropogenic causes for both planned and unplanned activities; and no extirpations have occurred as a result of military training (MCBCP 2017, pp. 42, 66; Kenney 2021, *in litt*). Population monitoring and adaptive management will occur throughout the known occurrences on MCBCP. The Plan outlines the Department of Defense responsibility to maintain and manage federally listed species on Federal lands; and provides both management of *B. filifolia* occurrences and addresses unavoidable project impacts through programmatic mitigation measures with the goal of ensuring self-sustaining populations.

### ***San Diego County outside of MCBCP***

In San Diego County there are 45 extant/presumed extant occurrences of *Brodiaea filifolia* outside of MCBCP, a substantial increase compared to the 30 occurrences reported in the 2009 5-year review (Service 2009, pp. 8–12). They occur within several approved or proposed regional habitat conservation plans (discussed further under “Threats, conservation, and management”). Eight occurrences are located within the Multiple Species Conservation Program (MSCP) in south San Diego County (Table 6). In north county, 14 occurrences within the City of Carlsbad are covered under an approved subarea plan of the Multiple Habitat Conservation Program (MHCP) and managed under the Carlsbad Habitat Management Plan (HMP). Under the HMP, all known occurrences of *B. filifolia* within existing preserve areas will be fully conserved and managed to provide for the long-term conservation of the plant (City of Carlsbad 2004, Appendix C-7). There are 27 occurrences located within the MHCP area, including within the cities of Oceanside and San Marcos. These occurrences are not covered under the MHCP because these cities have not completed their respective subarea plans, although some occurrences have been conserved or partially conserved (Appendix B). Similarly, 3 occurrences are located within the proposed North County Multiple Species Conservation Plan and are not yet afforded protection under this plan, but two occurrences already have some level of conservation (EOs 91 and 95; see Appendix B). The County of San Diego Resource Protection Ordinance (RPO) limits impacts to sensitive habitat lands (San Diego County 2012, pp. 3, 12; Sections 86.602(n) and 86.604(f)), which includes areas supporting *B. filifolia*. For *B. filifolia* occurrences within the proposed North County MSCP, the RPO provides a level of protection similar to approved HCPs.

Abundance ranges from “very small” to “very large” throughout the County and 13 occurrences have greater than 1,000 individuals. In particular, the San Marcos occurrence (EO 10, Upham

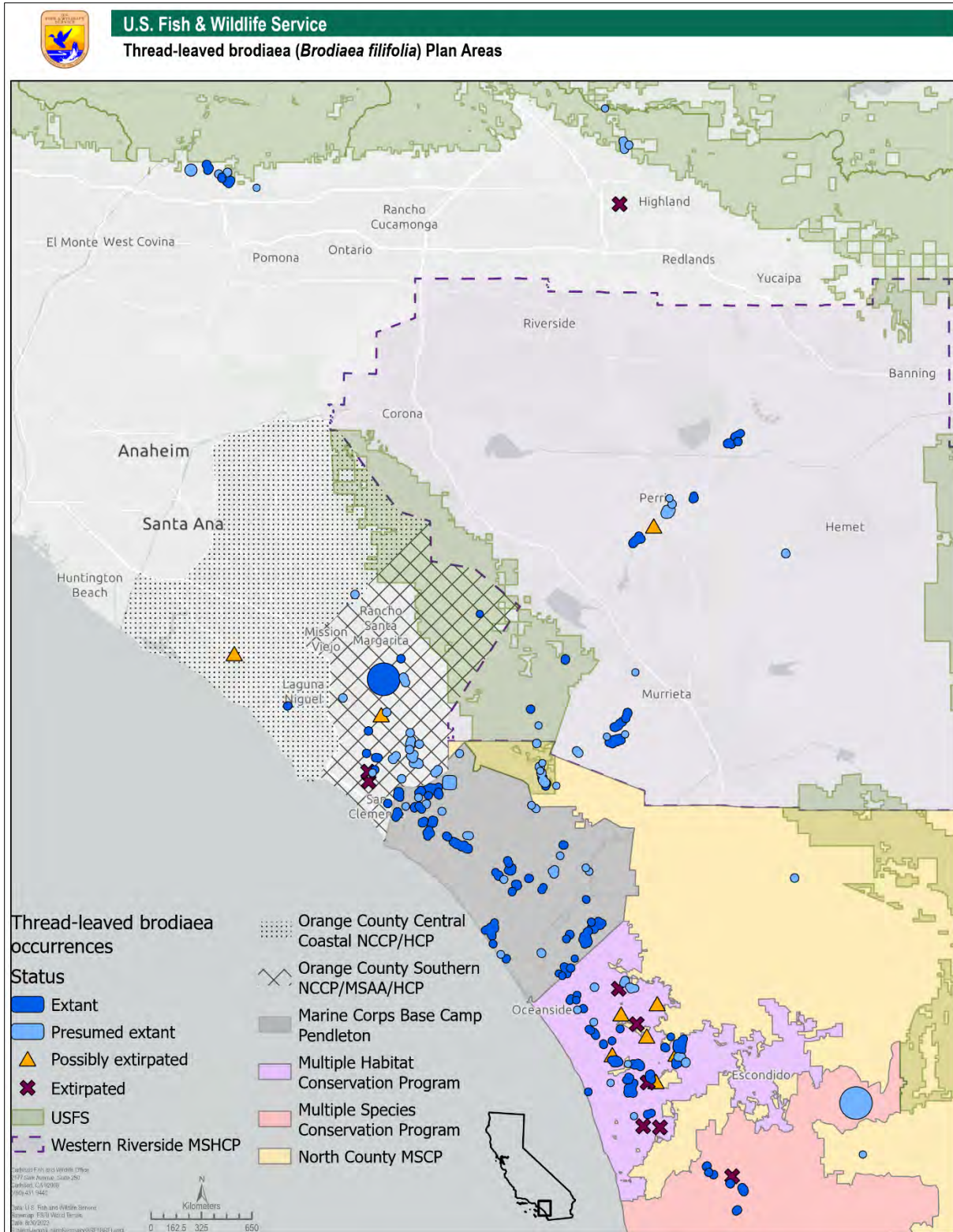
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<sup>5</sup> MCBCP reports 52 occurrences of *Brodiaea filifolia* on Base using the 0.25 mile (0.40 kilometer) mapping distance. For this review we determined that there are 51 occurrences on Base.

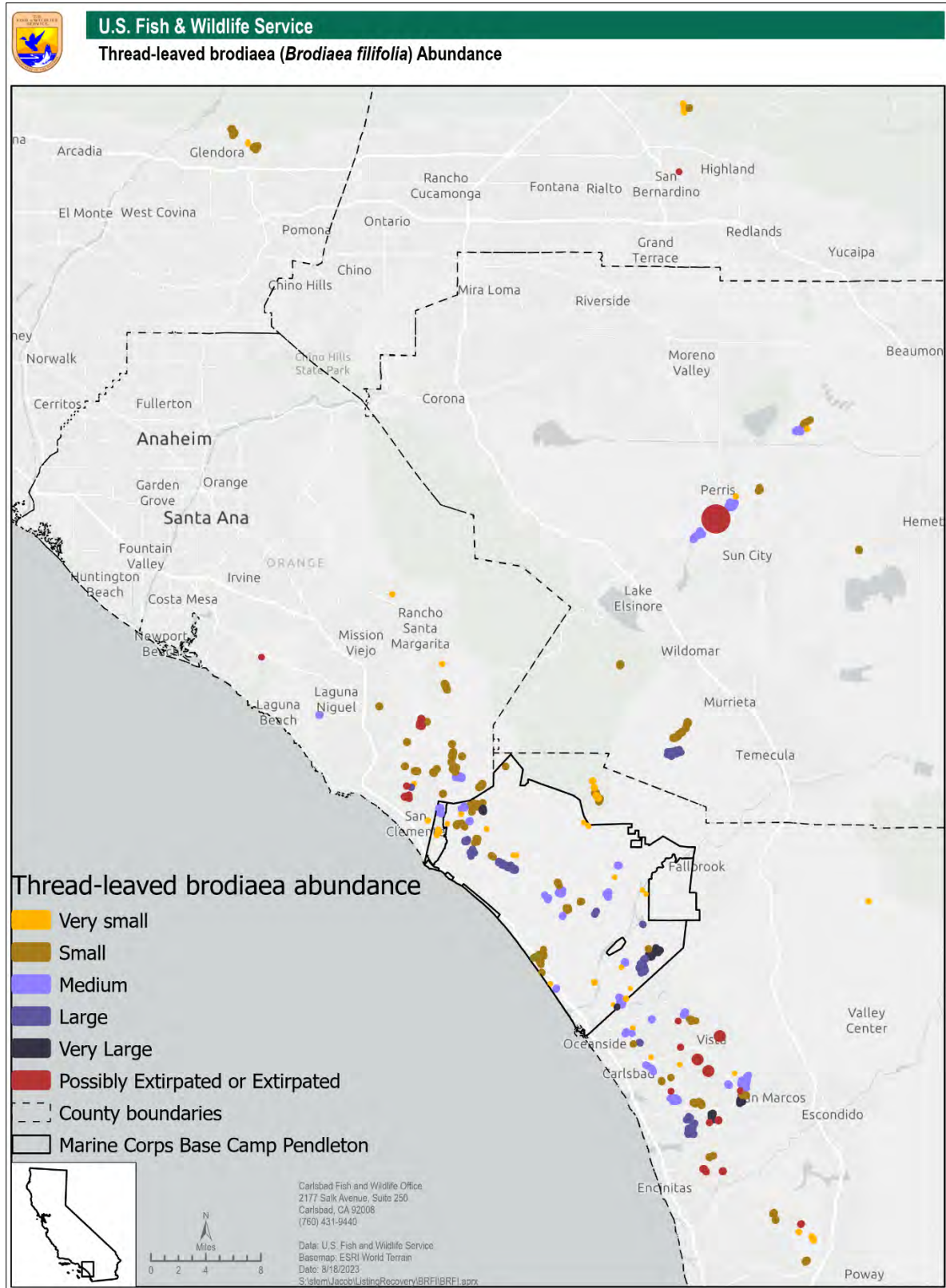


site) and the Rancho Carrillo occurrence (EO 22) are estimated to have greater than 100,000 individuals (Figure 2).

The SDMMP was created in 2008 to provide regional coordination of management and monitoring on conserved lands within San Diego County. Monitoring for *Brodiaea filifolia* is conducted in 2-year intervals (CBI and AECOM 2021, pp. 5, 7; Table 1-1). San Diego populations are considered stable, persistent, and at lower risk relative to other species, though still requiring species-specific management (CBI and AECOM 2021, pp. 5, 7; Table 1-1).



**Figure 1.** Rangelwide occurrence status of *Brodiaea filifolia*, along with Habitat Conservation Plan areas (proposed or approved) and Federal ownership (U.S. Forest Service and Marine Corps Base Pendleton).



**Figure 2.** Abundance and distribution of *Brodiaea filifolia* occurrences, showing occurrence size class across the species' range.

### Translocations

A total of 10 occurrences discussed above were augmented or established due to translocations associated with project avoidance measures (Table 5). Since the last 5-year review, two projects were implemented in Orange County and two additional projects were translocated in San Diego County. One translocation was unsuccessful (EO 18), and the remaining translocations are extant.

**Table 5.** Summary of translocated occurrences in Orange and San Diego counties.<sup>1</sup>

County	EO	Translocated occurrence/site	Status	Number (Year last observed)	Reference
Orange	64	Chiquita Canyon Clump Relocation Site (PA) Prima Deshecha landfill expansion	Extant	45 (2016)	GLA 2016
Orange	61/114	Prima Deshecha landfill expansion and La Pata Avenue Extension Project (2012) to Cage 1B	Extant	1,240 (2019)	LSA 2020
Orange	113	Camino Del Rio Extension	Extant	43 (2018)	LSA 2018
Orange	24	Caspers Wilderness Park	Presumed Extant	850 (1995)	CDFW 2023
Orange	59	San Clemente (from EO 58 and 60)	Presumed Extant	14,177 (2004)	CDFW 2023
Orange	113	San Clemente	Extant	100 (2010)	CDFW 2023
San Diego (MCBCP)	131	Las Pulgas Canyon	Presumed Extant	32 (1998)	CDFW 2023
San Diego	18	Brengle Terrace Park	Possibly Extirpated	- (1992)	CDFW 2023
San Diego	84	Escondido (from EO 88 4-S Ranch)	Extant	10 (2017)	CDFW 2023
San Diego	91	San Marcos (from EO 15)	Extant	9,800 (2017)	CDFW 2023

<sup>1</sup> Includes CNDDDB EO number, location, status, and the estimated number last observed by county.

### Habitat

As discussed under “Species overview and habitat,” *Brodiaea filifolia* occurs in native and nonnative grasslands, alkali playas, vernal pools soils and within coastal sage scrub. Since our 2009 5-year review, we have become aware of two occurrences in streamside habitat on the Cleveland National Forest: 1) CNDDDB EO 116 along San Mateo Creek, based on a 2010 Boyd collection, and 2) a 2020 collection by McGowan and Fisher (CDFW 2023, CCH2 2023). At these locations, *B. filifolia* grows in rocky areas or seeps near creeks, in association with *Juncus* (rush) (CCH2 2023) (Figure 3).

In 2009, we reported an elevation range of 100 to 2,500 feet (20 to 765 meters) for *Brodiaea filifolia* (Service 2009, p. 1). The collection by McGowan and Fisher increases the known elevation range to 2,972 feet (906 meters) (CCH2 2023).

We previously reported that *Brodiaea filifolia* can be found on a range of soil types, including clay, silty loam, loamy sand, cobble, or alkaline silty-clay soils (Service 2009, p. 4). In 2018, Conservation Biology Institute reported that the species does not occur in alkaline clay soils and occurs within a narrow pH range (pH 6.1–6.4) typical of non-clay soils as well as relatively high sodium content (CBI 2018, p. 8). The report hypothesizes that records on alkaline clay soils likely occur on patches of unmapped clay soils that are salty but not alkaline, though field investigations are recommended to confirm their results.



**Figure 3.** *Brodiaea filifolia* habitat in grassland habitat near Elsinore Peak (EO 115) (left); and in streamside habitat near San Mateo Creek (EO 116) (right) (Photos: Service 2023).

### Threats, Conservation, and Management

Long-term conservation of *Brodiaea filifolia* is dependent on protecting extant occurrences and minimizing threats. In the 2009 5-year review, we discussed nine threats to *Brodiaea filifolia* across 68 occurrences: (1) urbanization, (2) altered hydrology, (3) discing for fire suppression, (4) nonnative invasive plants, (5) grazing, (6) off-highway vehicle activity, (7) manure dumping, (8) climate change, and (9) vandalism (Service 2009, pp. 16–34). Urbanization likely remains the greatest threat to *B. filifolia*.

We have new information about the threat of climate change. One model projected that under medium and high emissions scenarios, there would be no suitable habitat for this species in the future (CBI 2018, p. 16). Under the lowest emission scenario (representative concentration pathways (RCP 2.6)), small to very small habitat patches were projected to persist in Riverside and San Diego counties (CBI 2018, p. 16). *Brodiaea filifolia* corms can persist during periods of drought (Service 2009, p. 13), but we currently lack data to predict the timing and magnitude of the species' response to climate change effects.

In this status review we evaluated the conservation status at each occurrence to assess overall species' status, since threats are restricted, managed and/or monitored at protected and conserved occurrences. In addition, we summarize new information about habitat conservation planning, the MCBCP *Brodiaea filifolia* Management Plan, and planned development at a very large occurrence in the City of San Marcos.

### **Conservation Status**

Based on the available data and different conservation mechanisms for *Brodiaea filifolia*, we characterized the conservation status of the species across its range according to those occurrences or critical habitat that are conserved or afforded protection under conservation easements, Regional HCPs, preserves and open space, and Federal lands. The level of protection and management varies and is indicated below as appropriate. This discussion is summarized by occurrence, size class, and critical habitat.

#### ***Regional HCPs***

The 2009 5-year review identified State and Federal regulatory mechanisms that provide conservation benefits to *Brodiaea filifolia* (Service 2009, pp. 22–29). Regional habitat conservation planning affords the species protection in habitat covered under the WRCMSHCP, Orange County Southern Subregional HCP, San Diego County MHCP City of Carlsbad Subarea Plan, and the Multiple Species Conservation Program (MSCP; Table 6). There are 62 *B. filifolia* occurrences that are afforded specific avoidance, minimization, and conservation measures because the species is covered within a regional HCP.

#### ***Proportion of Occurrence Conserved***

We also approximated the number of occurrences and percent of *Brodiaea filifolia* area in conservation using CNDDDB and conserved area databases (CDFW 2023; GreenInfo Network 2022a; GreenInfo Network 2022b). Some *B. filifolia* monitoring protocols precisely map occurrence extent and are appropriate for calculations of area occupied (i.e., SDMMP and MCBCP protocols), while other databases (i.e., CNDDDB) have different accuracy levels and may overrepresent the area occupied (CNDDDB 2011 pp. 2–4). For this status review, we removed 11 features with low accuracy from our calculations of conserved polygon area. We characterized conservation status based on the proportion of the EO area conserved (>95%, 55–95%, 45–55%, <45%, and <5%), excluding occurrences on MCBCP (which are indicated separately) (Table 7). Of the 141 extant or presumed extant occurrences, 75 occurrences benefit from some level of conservation under an HCP or similar conservation mechanism<sup>6</sup> (Table 7). At MCBCP, 3 of the 51 occurrences occur within MUs that are protected and managed, and the remaining 48 occurrences are largely protected from development but may be exposed to disturbance associated with military training.

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<sup>6</sup> Includes the three occurrences in unincorporated north San Diego County may benefit from RPOs, as discussed in the “San Diego County (outside of MCBCP)” section.

**Table 6 .** Summary of regional habitat conservation plans or Federal landowner that may provide protection from urbanization or conservation benefit to *Brodiaea filifolia*.<sup>1</sup>

Regional Plan or Federal landowner	Plan status	County					Total
		Los Angeles	San Bernardino	San Diego	Orange	Riverside	
Multiple Habitat Conservation Program: City of Carlsbad Subarea Plan (Carlsbad Habitat Management Plan)	Approved			14			14
Cleveland National Forest <sup>7</sup>	NA			5	1	3	9
Marine Corps Base Pendleton	NA <sup>8</sup>			51			51
Multiple Habitat Conservation Program	Proposed			27			27
Multiple Species Conservation Program	Approved			8			8
North County MSCP	Proposed			3			3
Orange County Central Coastal HCCP/HCP <sup>9</sup>	Approved				3		3
Orange County Southern NCCP/MSAA/HCP	Approved				23		23
Western Riverside County MSHCP	Approved					17	17
San Bernardino National Forest	NA		1				1
Not within a plan area	NA	7	3				10
<b>Grand Total</b>		<b>7</b>	<b>4</b>	<b>108</b>	<b>27</b>	<b>20</b>	<b>166</b>

<sup>1</sup> The table shows the number of occurrences managed by each Federal landowner or within a plan area.

### Conservation by Size Class

Due to the large variability in occurrence size and the presence of several very large occurrences, we also evaluated conservation and management by occurrence size class (Table 8). Outside of MCBCP, 80 percent of the occurrences within each size class are conserved at some level. Of the six “very large” *Brodiaea filifolia* occurrences rangewide, four are on MCBCP and are unlikely to be impacted by development; and 2 occur within defined MUs where military training is restricted. (An additional “large” occurrence is within the third MU). Of the two “very large” occurrences in San Diego and outside of MCBCP, one is not conserved (EO 10 in the City of San Marcos).

<sup>7</sup> Some occurrences are within both the Cleveland National Forest and the proposed North County MSCP. In this table these occurrences are counted under the Cleveland National Forest.

<sup>8</sup> MCBCP has an approved Management Plan for *Brodiaea filifolia*.

<sup>9</sup> *Brodiaea filifolia* is not a covered species. Within the boundaries of this plan area, one occurrence is conserved, one is partially conserved and the third is not conserved.

**Table 7.** Summary of current and future conservation by occurrence status including the percent of the occurrence that is conserved. Seven features with high locational uncertainty were dropped from the analysis of percent conserved.

Occurrence status	Percent of polygon area conserved				Potential future conservation	Not conserved	MCBCP <sup>10</sup>	Total
	>95%	55–95%	45–55%	<45%				
Extant	23	6	1	9	3	9	35	86
Presumed extant	10	4	2	4	10	13	16	59
Possibly extirpated				1	1	4		6
Extirpated			1	1		6		8
<b>Total</b>	<b>33</b>	<b>10</b>	<b>4</b>	<b>15</b>	<b>14</b>	<b>32</b>	<b>51</b>	<b>159</b>

**Table 8.** Summary of current and future conservation by occurrence abundance class for 143 extant or presumed extant occurrences, including the proportion of the occurrence conserved or protected. This table excludes possibly extirpated or extirpated occurrences, and 7 features with high location uncertainty.

Size class	Abundance range	Percent of polygon area				MCBCP	Potential future conservation	Not conserved	Total
		>95%	55–95%	45–55%	<45%				
Very small	<100	6	3		1	16	2	3	31
Small	100–1,000	11	1	2	3	13	9	8	47
Medium	1,001–10,000	4	2		7	9	1	2	25
Large	10,001–100,000	3			1	6	1	1	12
Very large	>100,000		1			3		1	5
NA	No count available	9	4	1	1	2		6	23
	<b>Total</b>	<b>33</b>	<b>11</b>	<b>3</b>	<b>13</b>	<b>49</b>	<b>13</b>	<b>21</b>	<b>143</b>

In the City of San Marcos, EO 10 is the largest population of *Brodiaea filifolia* without some level of management or conservation (Appendix B). Approximately 15 acres of the 33-acre site are currently proposed for developed under the Pacific Specific Plan (Service 2023, p. 1). Because this site supports the largest remaining vernal pool complex and native grassland in the City of San Marcos—including *B. filifolia* and other listed species—we recommended that impacts be limited to no more than 25 percent of the site and that development be limited to the southernmost third of the project site (Service 2023, pp. 2–3). These recommendations would avoid and minimize impacts to habitat occupied by *B. filifolia* and other listed species and address the lack of viable off-site mitigation options (Service 2023, pp. 2–3).

<sup>10</sup> 3 of the 51 extant or presumed extant occurrences on MCBCP occur within management units.



### ***Critical Habitat***

Finally, we evaluated the conservation status of lands designated as critical habitat. In 2011, we published a final rule designating approximately 2,947 acres (1,193 hectares) of critical habitat for *Brodiaea filifolia* (Service 2011, pp. 6851, 6865–6866). Approximately 38 percent of critical habitat is currently conserved (GreenInfo Network 2022b, p. entire; GreenInfo Network 2022a, p. entire) (Table 9) (Refer to Appendix D for subunit acreages and percent conserved). The highest proportion of critical habitat conserved occurs in Orange, Riverside, and San Diego counties, which are also the counties with the highest number of occurrences.

**Table 9 .** Summary of total and conserved designated critical habitat acreage, by county.

<b>County</b>	<b>Critical habitat (acres)</b>	<b>Conserved critical habitat (acres)</b>	<b>Percent (%) conserved</b>
Los Angeles	206	77	37
Orange	744	53	7
Riverside	1,113	572	51
San Bernardino	61	0	0
San Diego	824	406	49
<b>Total</b>	<b>2,948</b>	<b>1,108</b>	<b>38</b>

### ***Summary of Conservation and Management***

The majority of *Brodiaea filifolia* occurrences (94 percent) are located either on Federal land or within the planning area of a regional HCP. There are 62 occurrences (37 percent) that are afforded specific avoidance, minimization, and conservation measures because the species is specifically covered within a regional HCP. The number of occurrences currently under conservation and management exceeds the total number of occurrences known at the last 5-year review in 2009 (68 occurrences; Service 2009, p. 7). In addition, 38 percent of designated critical habitat is currently conserved (Table 9).

### **CONCLUSION**

In 2009, we recommended no status change for *Brodiaea filifolia* due to ongoing threats, including the predominant threat of development (Service 2009, p. 35). We recognized that threats from development were reduced since listing due to the implementation of regional HCPs but concluded that the species remained threatened (Service 2009, pp. 34–35).

In the 2009 5-year review, we were aware of 68 occurrences of *Brodiaea filifolia*: 57 were presumed extant and 11 were extirpated (Table 2). For this review, we reported 166 occurrences of *B. filifolia*, an increase of 91 occurrences compared to 2009. Currently, 84 occurrences are extant, 64 are presumed extant, 9 are possibly extirpated, and 9 are extirpated. *Brodiaea filifolia* continues to occupy its historical range across Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties.

Conservation efforts addressed threats at 51 of 68 occurrences in our 2009 5-year review (Service 2009, p. 35). Currently, approximately 84 percent of extant or presumed extant occurrences (119 of 141) have some degree of protection, management, or conservation to

ensure the species long term viability. There are also 13 occurrences that are anticipated to be conserved within the preserve design of the Orange County Southern Subarea Plan in the future. Additionally, a management plan has been implemented on MCBCP to ensure long-term species viability and restricts military training within three MUs.

We conclude that *Brodiaea filifolia* remains a federally threatened species and recommend no status change at this time. However, we recognize the increase in the number of extant occurrences since listing and the level of conservation that afford protections to this species. Therefore, we recommend a more thorough analysis to evaluate the current viability of *B. filifolia* through the development of a Species Status Assessment.

## **RECOMMENDATIONS FOR FUTURE ACTIONS**

To recover *Brodiaea filifolia*, we need to conserve additional 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 *B. filifolia*. We recognize that conservation of this species will require cooperation and coordination with partners.

1. Conduct a Species Status Assessment to analyze the species resiliency, redundancy, and representation in light on new occurrences and conservation efforts.
2. Monitor known and historical occurrences to determine presence and condition of *Brodiaea filifolia*. Evaluate threats and develop site-specific recommendations to prioritize management actions.
3. Model suitable habitat across the range of *Brodiaea filifolia* and prioritize areas for further survey.
4. Conduct further research to understand pollinator composition and availability, and the potential effects of low seed set on *Brodiaea filifolia* viability and recovery.
5. Characterize the genetic variation and population structure to understand the level of gene flow between occurrences. Evaluate the extent of hybridization. Conduct phylogenetic studies to determine the relationship to *Brodiaea santarosae*.
6. Develop a reintroduction, augmentation, and translocation program to improve connectivity between populations and enhance the resiliency of small populations. Outline techniques for successful restoration and translocation.
7. Collect *Brodiaea filifolia* seed and corms from occurrences throughout the range and conserve seed in an off-site conservation seed bank or botanic garden as appropriate.
8. Adaptively manage *Brodiaea filifolia* habitat to maintain, enhance, or restore habitat and maintain population viability over time. Use the site-specific recommendations developed under actions 1–3 above, including measures to enhance habitat for native pollinators and ameliorate threats.

9. At *Brodiaea filifolia* occurrences that are not conserved, identify opportunities to work with landowners to acquire lands or encourage conservation actions for *Brodiaea filifolia*. Work with local, State, and Federal partners to identify and leverage funding (i.e., section 6) to acquire occupied and potential habitat.
10. Identify adaptive management and monitoring approaches that could be applied range-wide, especially regarding invasive species management and promoting pollinator habitat.

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## APPENDIX A

### Table of potential pollinators

**Table A1.** List of potential *Brodiaea filifolia* pollinators (Kennedy 2021, in litt.; Prentice-Dekker 2020, p. 7; Niehas 1971, and Bell and Rey 1991).

Order	Family or subfamily	Scientific name	Common name
Coleoptera	Dermestidae	<i>Cryptorhopalum triste</i>	carpet beetle
Coleoptera	Melyridae	<i>Dasytinae</i> sp.	soft-wing flower beetle
Coleoptera	Melyridae	<i>Tanaops longiceps</i>	soft-wing flower beetle
Coleoptera	Mordellidae	-	tumbling flower Beetles
Dermpatera	Forficulidae	<i>Forficula auricularia</i>	European earwig
Diptera	Syrphidae	<i>Toxomerus marginatus</i>	calligrapher fly
Hymenoptera	Apidae	<i>Bombus californicus</i>	
Hymenoptera	Apidae	<i>Apis mellifera</i>	European honeybee
Hymenoptera	Halictidae	<i>Lasioglossum microlepoides</i>	metallic sweat bees
Hymenoptera	Halictidae	<i>Halictus</i> sp.	sweat bees
Hymenoptera	Megachilidae	<i>Hoplitis</i> sp.	-
Hymenoptera	Megachilidae	<i>Osmia</i> sp.	-
Hymenoptera	Anthophoridae	-	digger-bee
Hymenoptera	Formicidae	<i>Linepithema humile</i>	Argentine ant
Lepidoptera	Hesperiidae	<i>Hylephila phyleus</i>	fiery skipper
Thysanoptera	-	-	thrip

**APPENDIX B**  
**Occurrence Table**

**Table B1.** Occurrence table for *Brodiaea filifolia*<sup>1</sup>

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Riverside	EO 1	Possibly extirpated	1930		Western Riverside MSHCP		Yes	Western Riverside County Regional Conservation Authority Conserved Land, Western Riverside County Regional Conservation Authority
Riverside	EO 2	Presumed extant	2000	Medium	Western Riverside MSHCP	Case Road	Yes	Conatser Conservation Easement, Western Riverside County Regional Conservation Authority
Riverside	EO 5	Extant	2017	Large	Western Riverside MSHCP		Yes	Santa Rosa Plateau Ecological Reserve, California Department of Fish and Wildlife
San Bernardino	EO 7	Presumed extant	2005	Small		Arrowhead Hot Springs	No	
San Bernardino	EO 8	Presumed extant	1993	Very small			No	

<sup>11</sup> This column indicates whether the occurrence polygon area is at least partially conserved (i.e., mapped *B. filifolia* polygon area conserved was greater than zero). Conserved areas may not have a conservation easement and/or may not be managed to directly benefit *B. filifolia*. While an occurrence may have a “yes” in this column, there may be additional needs for an elevated level of conservation or management for the species or habitat. Occurrences on MCBCP are indicated separately in this column.



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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 10	Extant	2017	Very large	Multiple Habitat Conservation Program	Upham	No	
San Diego	EO 11	Extant	2017	Medium	Multiple Habitat Conservation Program	Rancho Santalina/Loma Alta	Yes	Valley View Park, City of San Marcos
San Diego	EO 12	Extant	2014	Very small	North County MSCP		No	
San Diego	EO 13	Possibly extirpated	1980	Very small	Multiple Habitat Conservation Program		No	
San Diego	EO 14	Extant	2019	Small	Multiple Habitat Conservation Program		Yes	Carlsbad Oaks North Habitat Conservation Area, Center for Natural Lands Management
San Diego	EO 15	Possibly extirpated <sup>2</sup>	2017	Very small	Multiple Habitat Conservation Program		No	
San Diego	EO 16, SDMMP ID BRFI_6L ECA012	Extant	2019	Medium	Multiple Habitat Conservation Program		Yes	Letterbox Canyon - Taylor Made/Carlsbad Highlands ER, Helix Community Conservancy
San Diego	EO 17	Extirpated			Multiple Habitat Conservation Program		No	

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San Diego	EO 18	Possibly extirpated <sup>1</sup>			Multiple Habitat Conservation Program		Yes	Brengle Terrace Park, City of Vista
Los Angeles	EO 20	Extant	2019	Small		Glendora	Yes	Brodiaea Reserve, Glendora Community Conservancy
San Diego	EO 21	Extant <sup>2</sup>	2011	Small	Multiple Habitat Conservation Program		Yes	Unknown or Unnamed
San Diego	EO 22, SDMMP ID BRFI_6R ACA017	Extant	2019	Very large	Multiple Habitat Conservation Program	Rancho Carrillo	Yes	Rancho Carrillo Master Association Easement, Rancho Carrillo Master Association
San Diego	EO 23	Extant	2019	Medium	Multiple Habitat Conservation Program		Yes	Calavera Hills And Robertson Ranch Habitat Conservation Area, Center for Natural Lands Management
Orange	EO 24	Presumed extant	1995	Small	Orange County Southern NCCP/MSAA/HCP		Yes	Ronald W. Caspers Wilderness Park, County of Orange
Riverside	EO 25	Extant	2015	Medium	Western Riverside MSHCP	Railroad Canyon	Yes	BLM, United States Bureau of Land Management

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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Riverside	EO 26	Presumed extant	2006	Small	Western Riverside MSHCP	Upper Salt Creek (Stowe Pool)	Yes	Western Riverside County Regional Conservation Authority Conserved Land, Western Riverside County Regional Conservation Authority
Riverside	EO 27	Extant	2012	Medium	Western Riverside MSHCP	San Jacinto Wildlife Area	Yes	San Jacinto Wildlife Area, California Department of Fish and Wildlife
Riverside	EO 30	Extant	2020	Small	Western Riverside MSHCP		Yes	Santa Rosa Plateau Ecological Reserve, California Department of Fish and Wildlife
Riverside	EO 31	Extant	2020	Small	Western Riverside MSHCP		Yes	Santa Rosa Plateau Ecological Reserve, California Department of Fish and Wildlife
San Diego	EO 32	Extirpated	1992		Multiple Habitat Conservation Program		No	
San Diego	EO 33	Extant	2019	Large	Multiple Habitat Conservation Program		Yes	Rancho La Costa Preserve, Center for Natural Lands Management
San Diego	EO 34	Extant	2009	Large	Multiple Habitat Conservation Program		Yes	Rancho La Costa Preserve, Center for Natural Lands Management

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 35	Presumed extant	1991		Multiple Habitat Conservation Program		No	
San Diego	EO 36	Presumed extant <sup>2</sup>	2003	Small	Multiple Habitat Conservation Program		No	
San Diego	EO 38, SDMMP ID BRFL_8D ECA020	Presumed extant	1992	Very small	Cleveland National Forest and North County MSCP		Yes	Cleveland National Forest, United States Forest Service
San Diego	EO 39, SDMMP ID BRFL_8D ECA020	Extant	2019	Small	Cleveland National Forest and North County MSCP	Devil Canyon	Yes	Cleveland National Forest, United States Forest Service
Los Angeles	EO 40	Extant	2020	Small		San Dimas	Yes	Gordon Highlands Conservation Easement, California Department of Fish and Wildlife
San Diego	EO 41	Presumed extant	2005	Medium	Multiple Habitat Conservation Program	Taylor/Darwin	Yes	Unknown or Unnamed, Montelena Owners Association
San Diego	EO 42	Possibly extirpated	1994	Very small	Multiple Habitat Conservation Program		Yes	Unknown or Unnamed,

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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Riverside	EO 43	Extant	2014	Small	Western Riverside MSHCP	San Jacinto Wildlife Area	Yes	San Jacinto Wildlife Area, California Department of Fish and Wildlife
San Diego	EO 44	Extant	2011	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 45	Extant	2015	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 46	Extant	2013	Large	MCBCP		MCBCP	Finch MU, MCBCP
San Diego	EO 50	Extant	2010	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 51	Presumed extant	2005	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 53	Presumed extant	2004	Medium	Multiple Habitat Conservation Program	Mission View/Sierra Ridge	Yes	Unknown or Unnamed, Standard Pacific Corp.
San Diego	EO 54	Extirpated	1997		Multiple Habitat Conservation Program		Yes	Unknown or Unnamed,
Orange	EO 55	Presumed extant	1998	Very small	Orange County Central Coastal HCCP/HCP		Yes	SCE Mitigation Bank
Orange	EO 56	Extant	2010	Medium	Orange County Central Coastal HCCP/HCP	Aliso Canyon	Yes	Aliso and Wood Canyons Wilderness Park, County of Orange
Orange	EO 57	Presumed extant <sup>2</sup>	2001	Small	Orange County Southern NCCP/MsAA/HCP		Future	Unnamed, Talega
Orange	EO 58	Extirpated <sup>2</sup>	1997	Small	Orange County Southern NCCP/MsAA/HCP		No	City of San Clemente

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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Orange	EO 59	Presumed extant <sup>1</sup>	2004	Large	Orange County Southern NCCP/MSAA/HCP		Future	City of San Clemente
Orange	EO 60	Extirpated <sup>2</sup>	1997	Medium	Orange County Southern NCCP/MSAA/HCP		No	City of San Clemente
Orange	EO 61	Extant	2011	Small	Orange County Southern NCCP/MSAA/HCP		No	Unnamed, Prima Deshecha
Orange	EO 62	Presumed extant	2003	Medium	Orange County Southern NCCP/MSAA/HCP	Cristianitos Canyon	Future	
Orange	EO 63	Presumed extant		Small	Orange County Southern NCCP/MSAA/HCP		No	City of San Clemente
Orange	EO 64	Presumed extant	1995	Small	Orange County Southern NCCP/MSAA/HCP	Canada Gobernadora/Chiquita Ridgeline	Future	
Riverside	EO 65	Extant	2017	Small	Western Riverside MSHCP	San Jacinto Avenue/Dawson Road	No	
San Diego	EO 66	Extant	2019	Small	Multiple Species Conservation Program		Yes	Artesian Trails, Centurion Artesian Trails Corp.

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 67	Extant	2015	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 70	Extant	2019	Small	Multiple Species Conservation Program	Artesian Trails	No	
San Diego	EO 71	Presumed extant	2005	Small	Multiple Habitat Conservation Program	Arbor Creek/Colucci	No	
San Diego	EO 72	Extant	2022	Medium	Multiple Habitat Conservation Program	Mesa Drive	No	Note: Not currently conserved or managed. Additional plants found in 2022.
San Diego	EO 73	Extant	2010	Large	Multiple Habitat Conservation Program	Alta Creek	No	
San Diego	EO 74	Extant	2008	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 75	Extant	2009	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 76	Extant	2011	Small	MCBCP		MCBCP	MCBCP
Los Angeles	EO 78	Presumed extant	1970				No	
San Diego	EO 79, SDMMP ID BRFL_6B VCR004	Extant	2019	Medium	Multiple Habitat Conservation Program		Yes	Buena Vista Creek Ecological Reserve, California Department of Fish and Wildlife
San Diego	EO 80	Extant	2010	Small	Multiple Habitat Conservation Program		Yes	Colony At Calavera Hills HOA Easement, Colony at Calavera Hills Homeowners Association

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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 81	Presumed extant	1993		MCBCP		MCBCP	MCBCP
San Diego	EO 82	Extant	2019	Medium	MCBCP		MCBCP	San Onofre State Beach, California Department of Parks and Recreation
San Diego	EO 83	Presumed extant	2009	Small	Multiple Habitat Conservation Program	Alta Creek	Yes	Eternal Hills, Mountain Olive Cemetery Association and City of Oceanside
San Diego	EO 84	Extant <sup>1</sup>	2017	Very small	Multiple Species Conservation Program		Yes	4-S Ranch Specific Plan Habitat Management Area, 4-S Ranch Masters Association
San Diego	EO 85	Extant	2009	Medium	MCBCP		MCBCP	MCBCP
Riverside	EO 87	Presumed extant	2008	Very small	Western Riverside MSHCP		No	
San Diego	EO 88	Extirpated <sup>2</sup>	2000	Very small	Multiple Species Conservation Program		No	
San Diego	EO 89, SDMMMP ID BRFL_6B MRA002	Extant	2020	Small	Multiple Species Conservation Program		Yes	Black Mountain Open Space Park, City of San Diego
San Diego	EO 90	Extant	2015	Large	Multiple Species Conservation Program		Yes	Heritage Bluffs site, Black Mountain Ranch Easement, Black Mountain Ranch LLC



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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 91	Extant <sup>1</sup>	2017	Medium	North County MSCP	Oleander/San Marcos Elementary	Yes	San Marcos Oleander Ave Conservation Easement, California Department of Fish and Wildlife
San Diego	EO 92	Presumed extant	2008	Very small	Multiple Habitat Conservation Program		No	
San Diego	EO 93	Extant	2016	Very small	Multiple Habitat Conservation Program		Yes	Lake Calavera Preserve, City of Carlsbad
San Diego	EO 94	Extant	2019	Medium	MCBCP		Yes/MCBCP	Cheatham Acquisition, Buena Vista Audobon Society/MCBCP
San Diego	EO 95	Presumed extant	2009	Very small	North County MSCP		Yes	Wilderness Gardens Preserve, County of San Diego
San Diego	EO 96	Extant	2017	Very large	MCBCP		MCBCP	Horse Pasture MU, MCBCP
San Diego	EO 97	Extant	2020	Large	MCBCP		MCBCP	Lima MU, MCBCP
San Diego	EO 98	Presumed extant	2000	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 99	Extant	2005	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 100	Extant	2012	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 102	Presumed extant	1997	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 103	Extant	2009	Large	MCBCP		MCBCP	MCBCP
San Diego	EO 104	Extant	2005	Large	MCBCP		MCBCP	MCBCP
San Diego	EO 105	Extant	2007	Small	MCBCP		MCBCP	MCBCP

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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 106	Presumed extant	2005	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 107	Presumed extant	2001	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 108	Extant	2005	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 109	Extant	2013	Very small	MCBCP		MCBCP	San Onofre State Beach, California Department of Parks and Recreation
Orange	EO 110	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP		Future	
Orange	EO 111	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP	Cristianitos Canyon	Future	
Orange	EO 112	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP	Cristianitos Canyon	Future	
Orange	EO 113	Extant	2010	Very small	Orange County Southern NCCP/MSAA/HCP		Future	City of San Clemente
Orange	EO 114	Extant	2010	Small	Orange County Southern NCCP/MSAA/HCP		No	Unnamed, Prima Deshecha
Riverside	EO 115	Extant	2012	Small	Western Riverside MSHCP		Yes	California State Lands Commission, California State Lands Commission

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Riverside	EO 116	Extant	2010		Western Riverside MSHCP		Yes	Cleveland National Forest, United States Forest Service
Orange	EO 117	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP		Future	
Orange	EO 118	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP	Cristianitos Canyon	Future	
Orange	EO 119	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP		Future	
Orange	EO 120	Possibly extirpated		Very small	Orange County Southern NCCP/MSAA/HCP		Future	
Orange	EO 121	Presumed extant	2003	Small	Orange County Southern NCCP/MSAA/HCP		Yes	O'Neill Regional Park, County of Orange
Los Angeles	EO 122	Extant	2013	Very small			Yes	Gordon Mull Preserve, City of Glendora
Los Angeles	EO 123	Presumed extant					Yes	Big Dalton Wilderness Park, City of Glendora
Los Angeles	EO 124	Presumed extant					No	

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 125	Presumed extant	1882		Multiple Species Conservation Program		Yes	Unknown or Unnamed, City of San Diego
San Diego	EO 126	Extirpated	1992		Multiple Habitat Conservation Program		Yes	Unknown or Unnamed,
San Diego	EO 127	Extant	2012	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 128	Extant	2019	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 129	Presumed extant	2009	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 130	Presumed extant	2009	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 131	Presumed extant <sup>1</sup>	1998	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 132	Presumed extant	2003	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 133	Extant	2011	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 134	Extant	2008	Large	MCBCP		MCBCP	MCBCP
San Diego	EO 135	Extant	2007	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 136	Extant	2010	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 137	Presumed extant	0		MCBCP		MCBCP	MCBCP
San Diego	EO 138	Extant	2011	Medium	MCBCP		MCBCP	MCBCP
San Diego	EO 139	Presumed extant	2007	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 140	Presumed extant	2007	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 141	Presumed extant	2007	Very small	MCBCP		MCBCP	MCBCP

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 142	Presumed extant	2007	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 143	Extant	2010	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 144	Presumed extant	2008	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 146	Extant	2011	Small	MCBCP		MCBCP	MCBCP
San Diego	EO 147	Extant	2001	Very large	MCBCP		MCBCP	MCBCP
Orange	EO 148	Extant	2014	Very small	Orange County Southern NCCP/MSAA/HCP		Future	City of San Clemente
San Diego	EO 149, SDMMP ID BRFI_6L ACA021	Extant	2019	Small	Multiple Habitat Conservation Program		Yes	Carlsbad Highlands Ecological Reserve, California Department of Fish and Wildlife
San Diego	EO 150	Presumed extant	2009		Cleveland National Forest and North County MSCP		Yes	Cleveland National Forest, United States Forest Service
Orange	EO 151	Extant	2016		Orange County Southern NCCP/MSAA/HCP		Yes	Thomas F Riley Wilderness Park, County of Orange
Riverside	EO 152	Extant	2011	Very small	Western Riverside MSHCP		Yes	San Jacinto Wildlife Area, California Department of Fish and Wildlife
Orange	EO 153	Extant	2017	Small	Orange County Southern NCCP/MSAA/HCP		Future	

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	EO 154	Extant	2018	Very small	MCBCP		MCBCP	MCBCP
San Diego	EO 155	Extant	2017		Multiple Species Conservation Program		Yes	Black Mountain Ranch LLC Western Clusters, Black Mountain Ranch LLC
San Diego	EO 156, SDMMP ID BRFI_6V DLV023	Extant	2019	Very small	Multiple Habitat Conservation Program		Yes (not currently managed)	El Camino Real Conservation Easement (Vista de la Valle), California Department of Fish and Wildlife
San Diego	EO 157, SDMMP ID BRFI_6M MOC022	Extant	2019	Medium	Multiple Habitat Conservation Program		Unknown (not currently managed)	Unknown if conservation easement recorded
Orange	EO 158	Extant	2019	Very small	Orange County Southern NCCP/MSAA/HCP		Yes	Starr Ranch, National Audubon Society
San Diego	EO 159, SDMMP ID BRFI_7P OST024	Extant	2019		Multiple Habitat Conservation Program		Yes	Poinsettia Lane Vernal Pools, North County Transit District
San Diego	CCH2 1052459	Presumed extant	1992		Cleveland National Forest and North County MSCP		Yes	Cleveland National Forest, United States Forest Service
Riverside	CCH2 1230695	Presumed extant	1968		Western Riverside MSHCP		Yes	Cleveland National Forest, United States Forest Service

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County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Los Angeles	CCH2 1339614	Presumed extant	2010				No	
Riverside	CCH2 141893	Presumed extant	1989		Western Riverside MSHCP		No	
San Diego	CCH2 1641969	Presumed extant	2006		North County MSCP		No	
San Bernardino	CCH2 3540708	Extirpated					No	
Orange	CCH2 3970471	Extant	2020				Yes	Cleveland National Forest, United States Forest Service
San Bernardino	CCH2 429763	Presumed extant	1953				Yes	San Bernardino National Forest, United States Forest Service
San Diego	CCH2 429808	Presumed extant			North County MSCP		Yes	Carlsbad Oaks North Habitat Conservation Area, Center for Natural Lands Management
San Diego	CCH2 702441	Presumed extant	1992		Cleveland National Forest and North County MSCP		Yes	Cleveland National Forest, United States Forest Service
Orange	CCH2 902186	Possibly extirpated	2011		Orange County Central Coastal HCCP/HCP		No	
Riverside	CCH2 924335	Presumed extant	2008		Western Riverside MSHCP		No	

County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
Riverside	CCH2 979925	Presumed extant	1966		Western Riverside MSHCP		Yes	Santa Rosa Plateau Ecological Reserve, California Department of Fish and Wildlife
Riverside	CCH2 990777	Presumed extant	1965		Western Riverside MSHCP		Yes	Santa Rosa Plateau Ecological Reserve, California Department of Fish and Wildlife
Riverside	CFWO 2	Presumed extant			Western Riverside MSHCP		Yes	Santa Rosa Plateau Ecological Reserve, Expansion 5, California Department of Fish and Wildlife, TNC
San Diego	REGSS 17603	Possibly extirpated	2001		Multiple Habitat Conservation Program		No	
San Diego	REGSS 7569	Presumed extant	1990		Multiple Habitat Conservation Program		Yes	Morning Ridge Easement, Morning Ridge Homeowners Association
San Diego	REGSS 8518	Presumed extant			Multiple Habitat Conservation Program		Yes	La Costa Valley Master Association Easement, La Costa Valley Master Association
San Diego	REGSS 9510	Presumed extant			North County MSCP		Yes	Ramona Grasslands CE, The Nature Conservancy
San Diego	MCBCP rp_2015_c ardno_02	Extant	2019	Large	MCBCP		MCBCP	MCBCP



County	CNDDDB EO number or other ID	2023 occurrence and translocation status	Year last observed	Abundance category	Plan area or MCBCP	Final critical habitat subunit	At least partially conserved? <sup>11</sup> (or MCBCP)	Site name and owner or manager
San Diego	MCBCP rp_2015_hdr_01	Extant	2015	Very small	MCBCP		MCBCP	MCBCP
San Diego	MCBCP rp_2017_pangea_016	Extant	2015	Very small	MCBCP		MCBCP	MCBCP
San Diego	MCBCP rp_2019_vern_2164	Extant	2019	Very large	MCBCP		MCBCP	MCBCP
San Diego	Showers 1	Extirpated			Multiple Habitat Conservation Program		No	
San Diego	Showers 2	Possibly extirpated			Multiple Habitat Conservation Program		No	

<sup>11</sup>Shows CNDDDB EO number, occurrence status in 2023, last year observed, abundance category, and land conservation status. All conservation status information references GreenInfo Network 2022a (California Conservation Easement database) and GreenInfo Network 2022b (California Protected Areas database). Under the 2023 occurrence and translocation status column, superscript "1" indicates translocated to, Superscript "2" indicates translocated from.

APPENDIX C

Maps of *Brodiaea filifolia* occurrences by county.

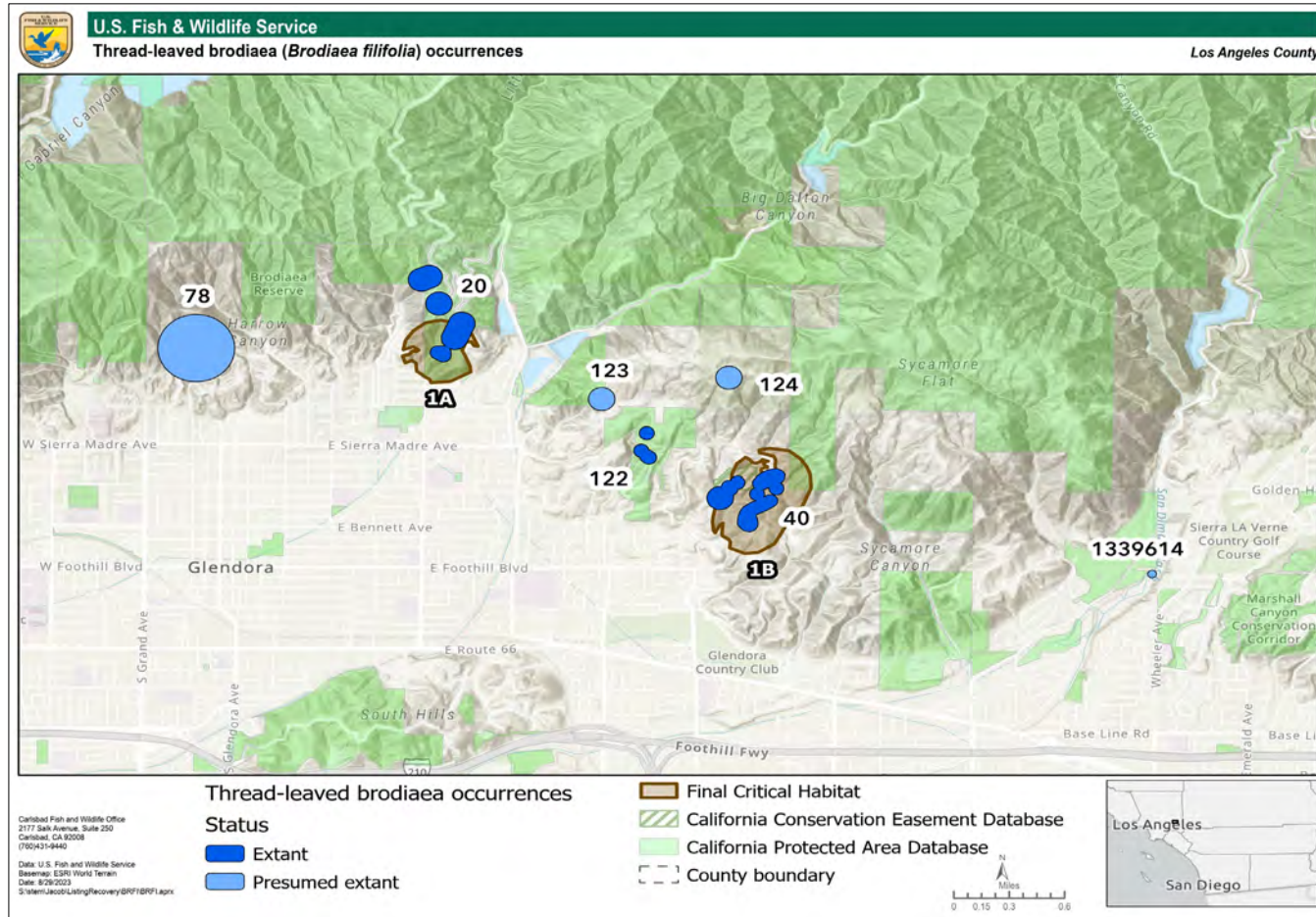
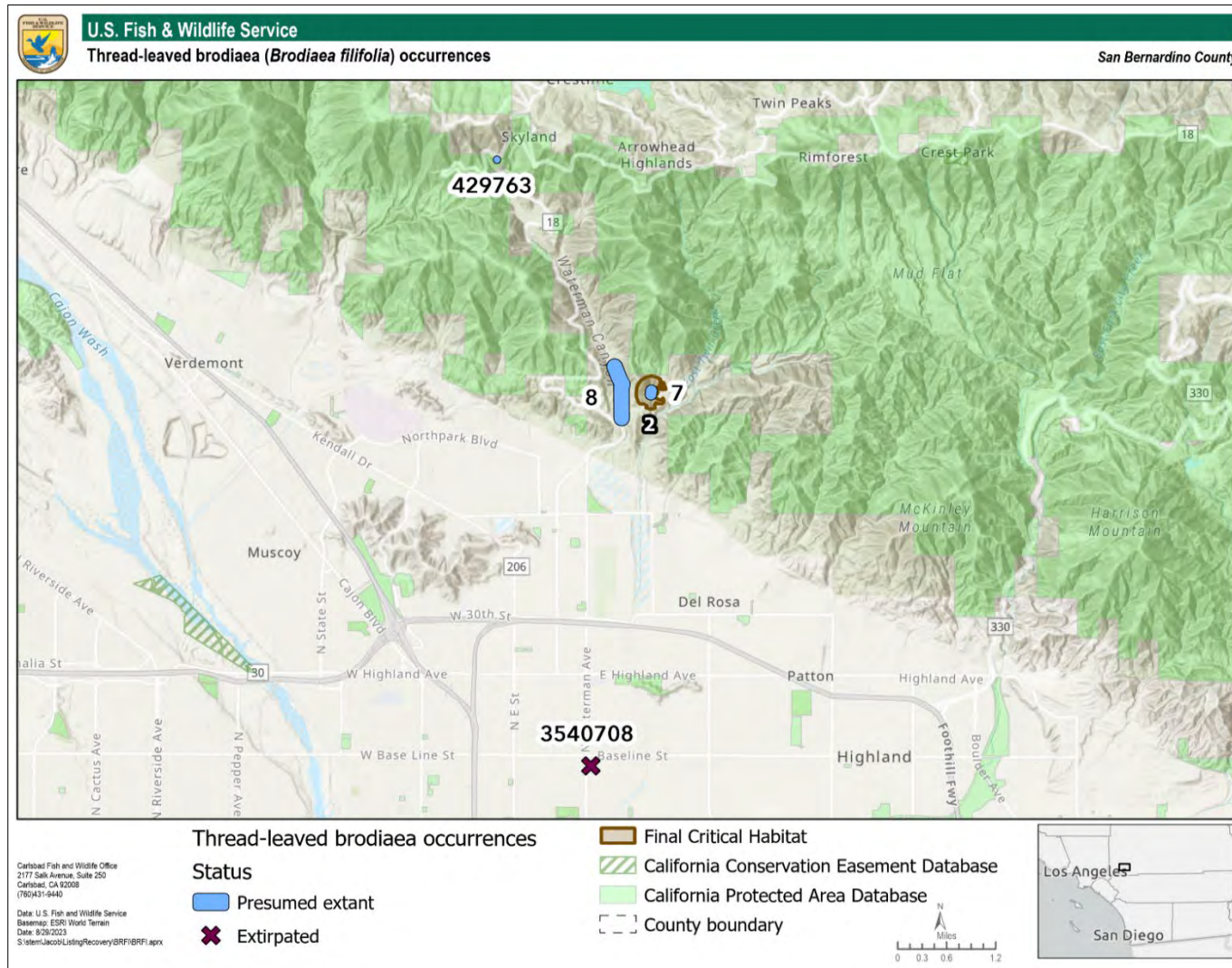
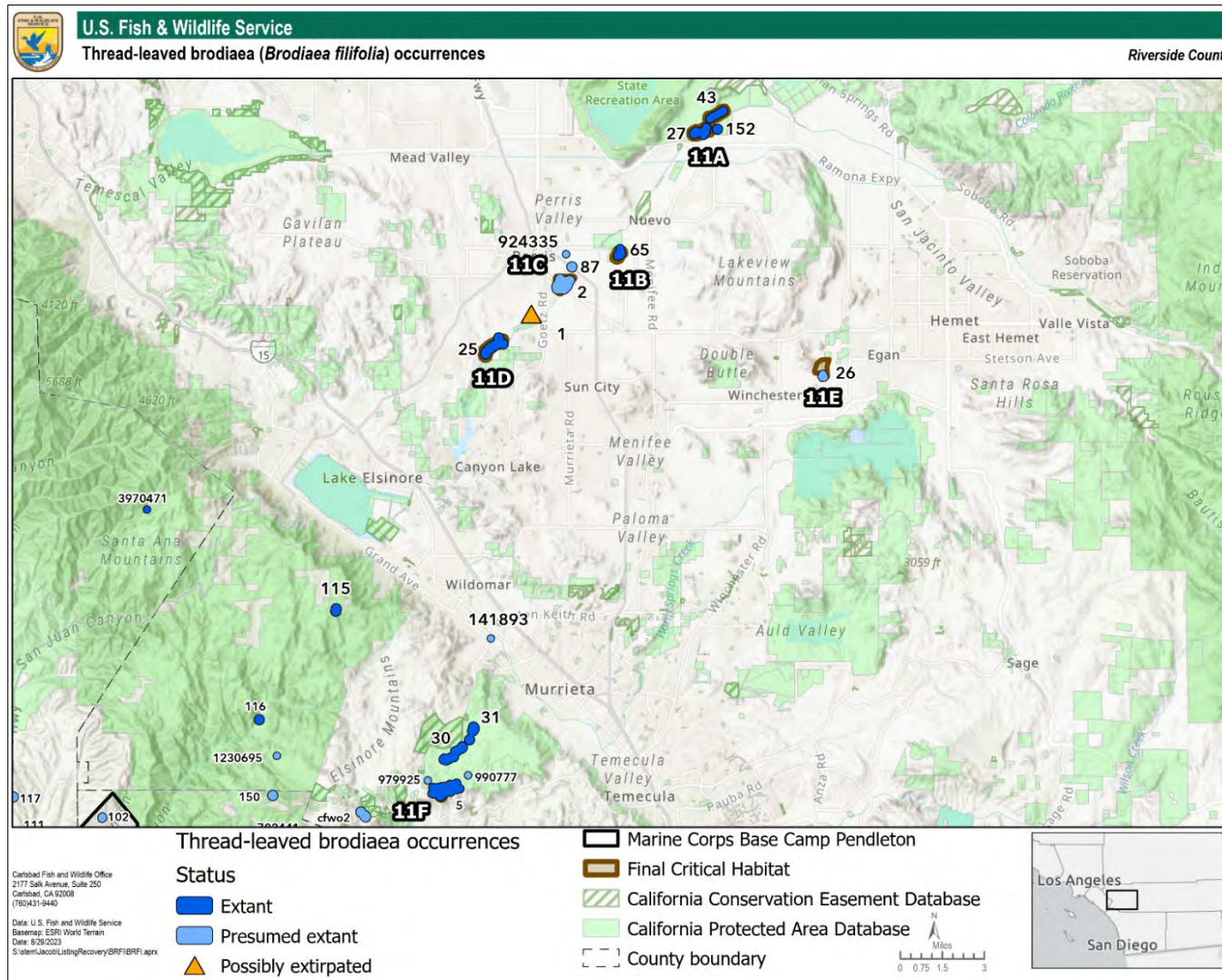


Figure C1. Occurrences of *Brodiaea filifolia* in Los Angeles County, showing designated critical habitat subunits, CNDDDB EOs, and EO status



**Figure C2.** Occurrences of *Brodiaea filifolia* in San Bernardino County, showing designated critical habitat subunits, CNDDDB EOs, and EO status.



**Figure C3.** Occurrences of *Brodiaea filifolia* in Riverside County, showing designated critical habitat subunits, CNDDB EOs, and EO status.

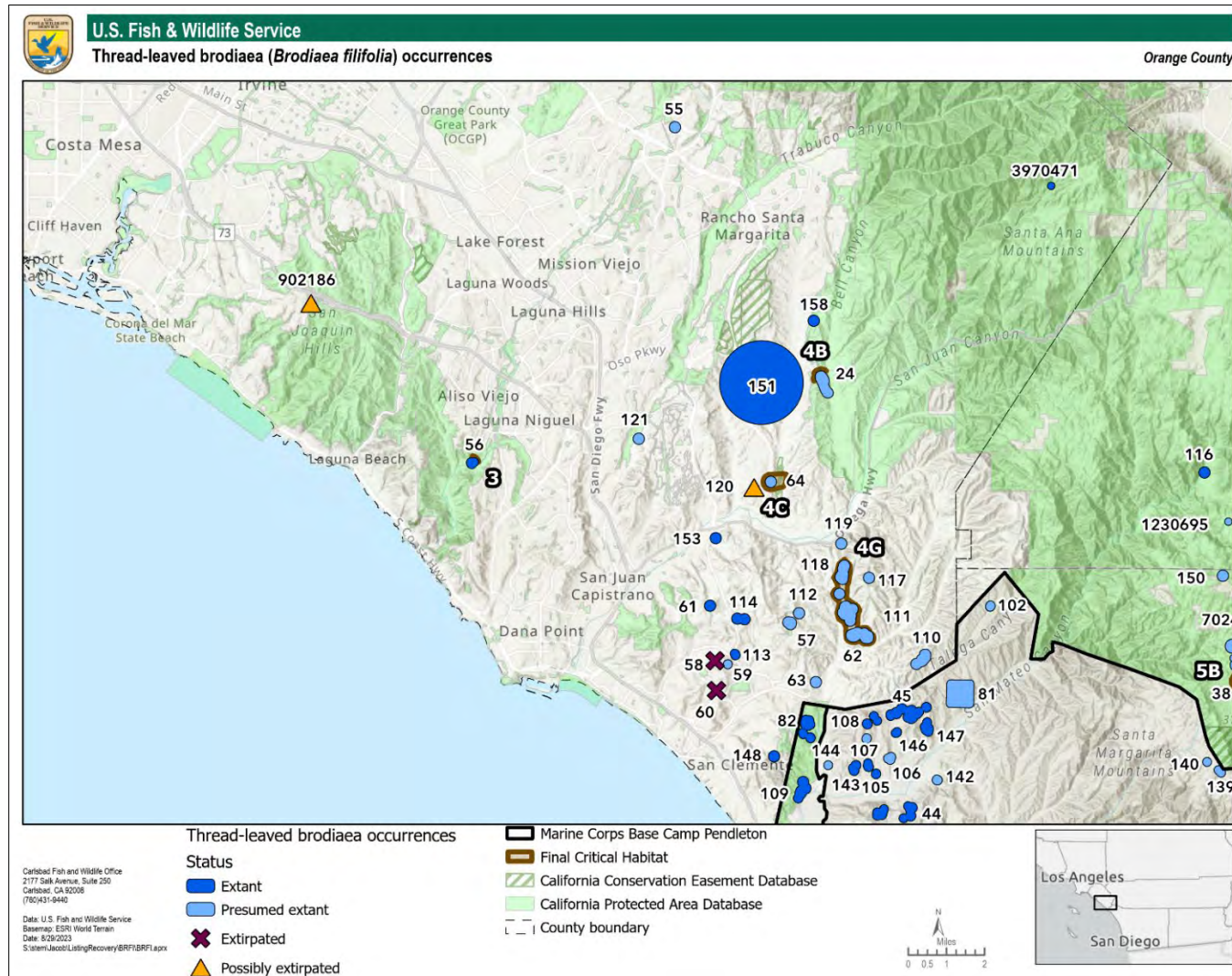
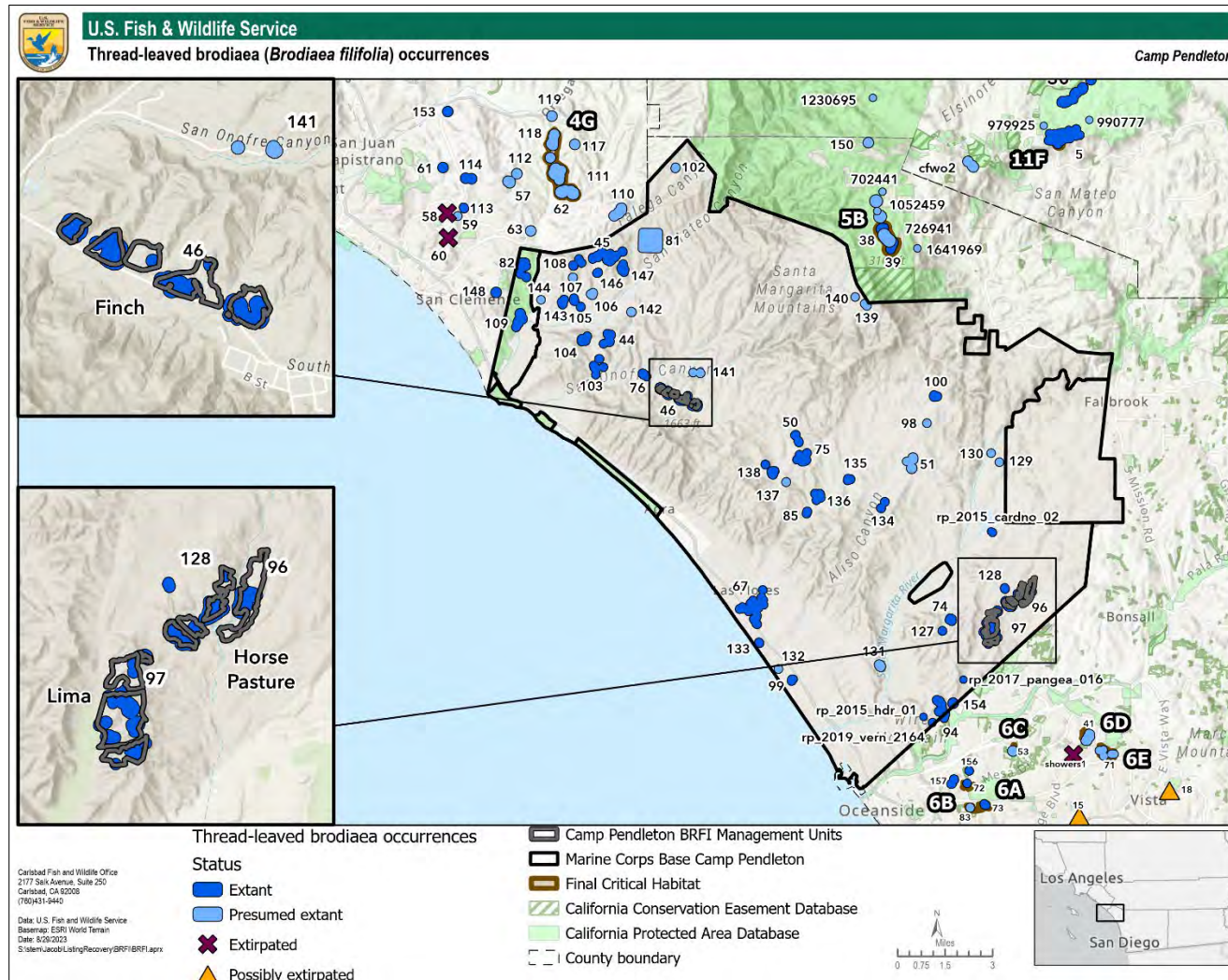
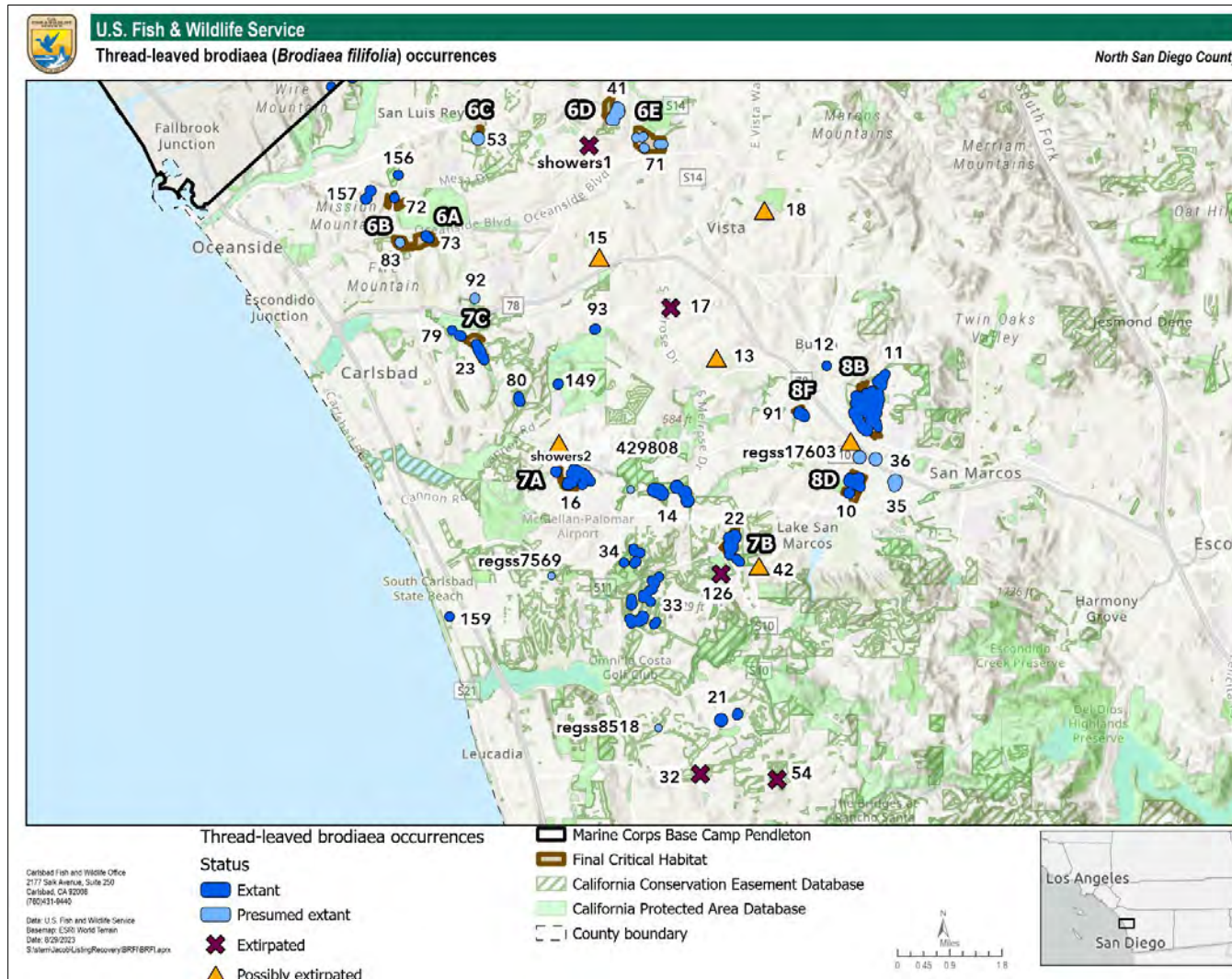


Figure C4. Occurrences of *Brodiaea filifolia* in Orange County, showing designated critical habitat subunits, CNDDDB EOs, and EO status.



**Figure C5.** Occurrences of *Brodiaea filifolia* on MCBCP in north San Diego County, showing CNDDDB EO, EO status, and the MCBCP MUs (Finch, Horse Pasture, and Lima).



**Figure C6.** Occurrences of *Brodiaea filifolia* in north San Diego County outside of MCBCP, showing designated critical habitat subunits, CNDDDB EO, and EO status.

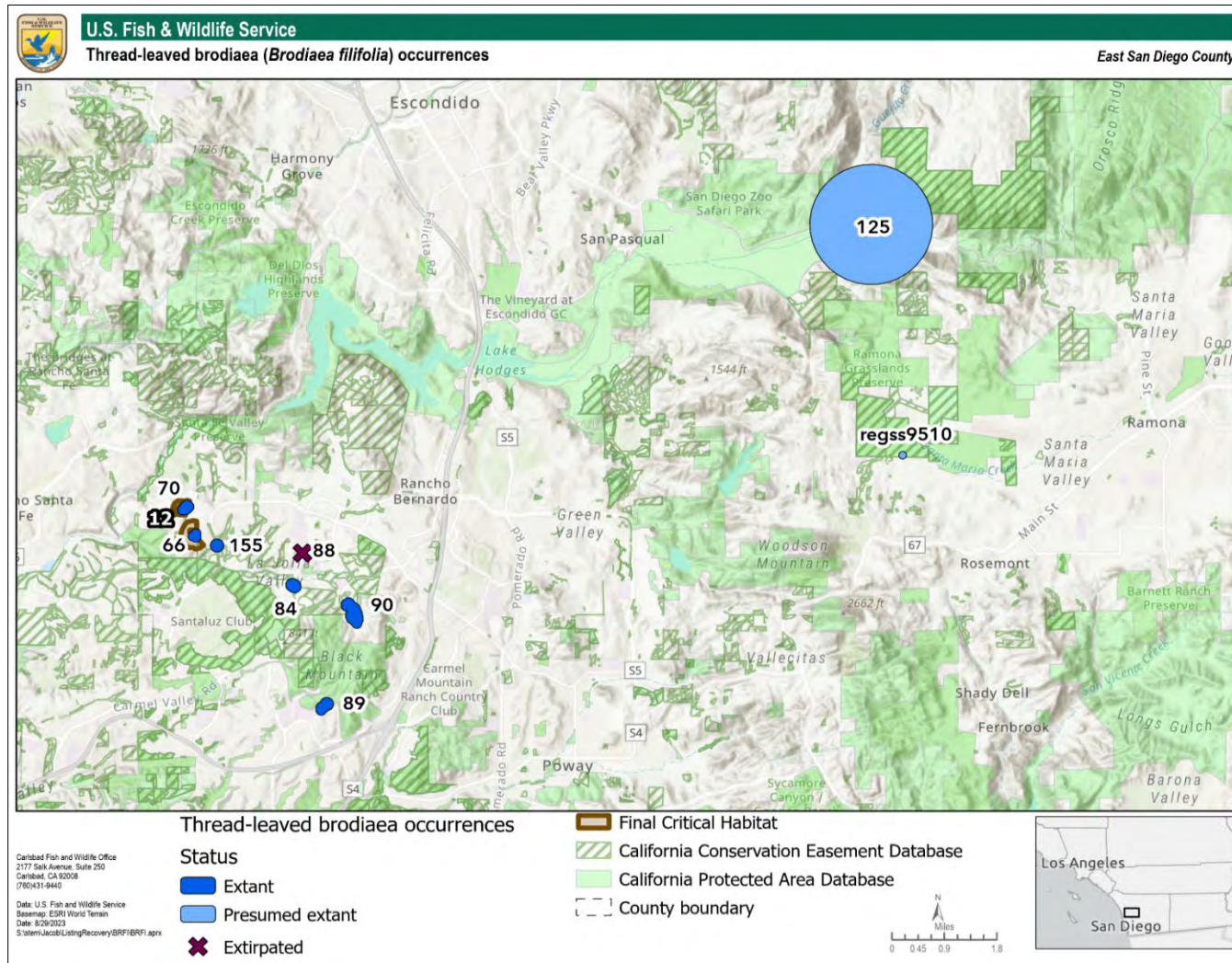


Figure C7. Occurrences of *Brodiaea filifolia* in San Diego County, showing designated critical habitat subunits, CNDDDB EOs, and EO status.



## APPENDIX D

**Table D1.** Summary of critical habitat units that provide conservation benefit to *Brodiaea filifolia*<sup>1</sup>

Unit Number	Location	Subunit letter	Subunit name	Subunit acreage	Subunit acres conserved	Percent conserved
1	Los Angeles County	A	Glendora	67.2	50.5	75.2%
1	Los Angeles County	B	San Dimas	138.4	26.2	18.9%
11	Western Riverside County	A	San Jacinto Wildlife Area	401.2	376.9	93.9%
11	Western Riverside County	B	San Jacinto Avenue/Dawson Road	116.7	15.6	13.4%
11	Western Riverside County	C	Case Road	179.7	27.4	15.3%
11	Western Riverside County	D	Railroad Canyon	257.2	55.9	21.7%
11	Western Riverside County	E	Upper Salt Creek (Stowe Pool)	145.1	91.5	63.0%
11	Western Riverside County	F	Santa Rosa Plateau-Mesa De Colorado	12.7	5.1	39.8%
12	Central San Diego County		Artesian Trails	105.5	6.7	6.3%
2	San Bernardino County		Arrowhead Hot Springs	61.3		0.0%
3	Central Orange County		Aliso Canyon	10.6	10.6	100.0%
4	Southern Orange County	B	Caspers Wilderness Park	12.3	11.7	94.9%
4	Southern Orange County	C	Canada Gobernadora/Chiquita Ridgeline	133.5	31.2	23.3%

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Unit Number	Location	Subunit letter	Subunit name	Subunit acreage	Subunit acres conserved	Percent conserved
4	Southern Orange County	G	Cristianitos Canyon	587.2		0.0%
5	Northern San Diego County	B	Devil Canyon	273.7	251.9	92.0%
6	Oceanside	A	Alta Creek	72.5	16.6	23.0%
6	Oceanside	B	Mesa Drive	16.9	9.4	55.7%
6	Oceanside	C	Mission View/Sierra Ridge	11.9	0.4	3.6%
6	Oceanside	D	Taylor/Darwin	35.5	14.1	39.8%
6	Oceanside	E	Arbor Creek/Colucci	94.1	10.4	11.0%
7	Carlsbad	A	Letterbox Canyon	42.6	21.1	49.5%
7	Carlsbad	B	Rancho Carrilo	37.4	37.4	99.9%
7	Carlsbad	C	Calaveras Hills Village H	26.0	19	73%
8	San Marcos And Vista	B	Rancho Santalina/Loma Alta	47.4	27.8	58.5%
8	San Marcos And Vista	D	Upham	53.5	0	0.0%
8	San Marcos And Vista	F	Oleander/San Marcos Elementary	7.3	7.1	97.9%
<b>Total</b>	–	–	–	<b>2947.5</b>	<b>1124.5</b>	<b>38%</b>

<sup>1</sup> Includes county, subunit name, acreage and percent conserved based (GreenInfo Network 2022a; GreenInfo Network 2022b).

**FIELD OFFICE APPROVAL**

**Lead Field Supervisor, Fish and Wildlife Service**

Approved

Scott A. Sobiech  
Field Supervisor