

Lyon's pentachaeta (*Pentachaeta lyonii*)

5-Year Review: Evaluation and Summary



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

July 2024

5-YEAR REVIEW

Lyon's pentachaeta (*Pentachaeta lyonii*)

GENERAL INFORMATION:

Species: *Pentachaeta lyonii* A. Gray

Date listed: January 29, 1997

Federal Register (FR) citation: 62 FR 4172

Classification: Endangered

Critical Habitat Designation:

[Service] U.S. Fish and Wildlife Service. 2006. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Astragalus brauntonii* and *Pentachaeta lyonii*. Federal Register 71: 66374–66423.

State Listing: California State Endangered (CNDDDB 2024, p. 16).

BACKGROUND:

Species overview:

Lyon's pentachaeta (*Pentachaeta lyonii*) is an annual forb in the sunflower family (Asteraceae; Keil and Meredith 2012). The plant grows maximally to about 50 centimeters (18 inches) tall, but is usually much shorter. The yellow-flowered inflorescences are about 0.75 inches (2 centimeters) across. The plant is generally found in open areas with thin soils and little vegetation cover, on open ridges or in gaps in chaparral, coastal sage scrub, or grasslands. Sometimes it occurs on or along trails. It can flower from March to August, but is usually most visible in late spring and early summer.

Lyon's pentachaeta currently occurs in the mountains of southern Ventura and southwestern Los Angeles Counties, ranging over a distance of about 30 kilometers (19 miles), and on Santa Catalina Island. Based on historical records, the species once occurred on the Palos Verdes Peninsula and in Wilmington (Los Angeles County), but it has not been seen at those locations for over 100 years and is possibly extirpated there (Consortium of California Herbaria [CCH2] 2024, California Natural Diversity Database [CNDDDB] 2024).

The primary threat to the species on the mainland is the encroachment of development on natural habitat, with many associated effects (Service 1997 p. 4171). The primary threat on Santa Catalina Island is the past and continued effects of non-native ungulate herbivores, particularly non-native mule deer (*Odocoileus hemionus*).

Most recent status review:

[Service] U.S. Fish and Wildlife Service. 2019. Lyon's pentachaeta (*Pentachaeta lyonii*). 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Ventura Field Office, Ventura, California. 10 pp.

In our 2019 status review, we recommended no status change from endangered for Lyon's pentachaeta.

FR notice citation announcing this status review:

[Service] U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 47 Species in California, Nevada, and Oregon. Federal Register 88:56042–56044.

ASSESSMENT:

Information acquired since the last status review:

The U.S. Fish and Wildlife Service's (Service) Ventura Fish and Wildlife Office (VFWO) conducted this 5-year review. We announced the review through a Federal Register notice on August 17, 2023 (Service 2023). We did not receive any information from the public in response to our Federal Register Notice announcing this 5-year review. We conducted a literature search, a review of information in our files, and contacted botanists at the Catalina Island Conservancy (CIC), Santa Monica Mountains National Recreation Area (SMMNRA), Santa Barbara Botanic Garden (SBBG), the U.S. Fish and Wildlife Service Carlsbad Field Office, and other botanists to request any data or information we should consider in our review.

The species has updated information on distribution and abundance, and new information on recovery planting plans, conservation seed banking, and threats.

Distribution and abundance:

The California Natural Diversity Database (CNDDDB) defines an Element Occurrence (EO) as a group of plants separated from the next group of conspecifics by at least ¼ mile (400 meters, CNDDDB 2018, entire). We call a group of plants that fits the definition of an EO, but is not recorded by CNDDDB, simply an *occurrence*, and for simplicity call occurrences or EOs taken together *occurrences*.

Appendix A lists all Lyon's pentachaeta EOs and occurrences that are not EOs. The EOs for Lyon's pentachaeta in CNDDDB (2024) have not been updated since before the last 5-yr review (Service 2019). Three non-EO occurrences were added since the 2019 5-year review, all on Santa Catalina Island. One (Tower Peak North) was found near the known EO at Tower Peak South (EO #8). These two occurrences are about 500 meters apart, which is just greater than the ¼ mile occurrence separation; with additional observations and mapping, it is possible that the two occurrences will be combined.

The Consortium of California Herbaria (CCH2, 2024) lists two records for Baja California, south and west of Ensenada (LA37937, Lewis s.n., 1940; IRVC103087, Ackerman 82-324,1982). Lyon's pentachaeta is not listed for Baja California in the most recent monograph on *Pentachaeta* (Van Horn 1973), the most recent flora of Baja California (Wiggins 1980), or the most recent checklist of Baja California (Rebman et al. 2016). There is an online image of the Ackerman specimen, but it was annotated in 1987 as a different species, *Pentachaeta aurea*. It is almost certain that the Lewis specimen is also *P. aurea* (Jon Rebman in litt.). We do not consider these collections from Baja California to represent Lyon's pentachaeta.

Because soil seed banks can persist over a long time, it is prudent to consider the occurrence to be extant even if occurrence sites have not been surveyed in many years or plants have not been seen at an occurrence since the initial discovery. While long-term persistence of Lyon’s pentachaeta seeds in the soil seed bank is not known, seeds of the Asteraceae in general can remain viable in the soil seed bank for many years (Baskin and Baskin 2023 entire). Until other evidence is presented, we presume that Lyon’s pentachaeta seed can be viable in the soil at an occurrence for many years.

Given the likely persistence of soil seed banks, there were 48 total occurrences in 2019 (Service 2019, p. 3) with 7 either extirpated or possibly extirpated (because of likely development), and 41 presumed extant. Of the presumed extant occurrences, 4 were considered declining, 10 were considered increasing or stable, and 27 were in unknown condition. Currently, because of the three additional Santa Catalina Island occurrences, there are 51 occurrences (Figure 1), with 44 presumed extant occurrences. Of these 44 presumed extant occurrences, four appear to be declining, 12 appear to be increasing or stable, and 28 are in unknown condition (Appendix A).

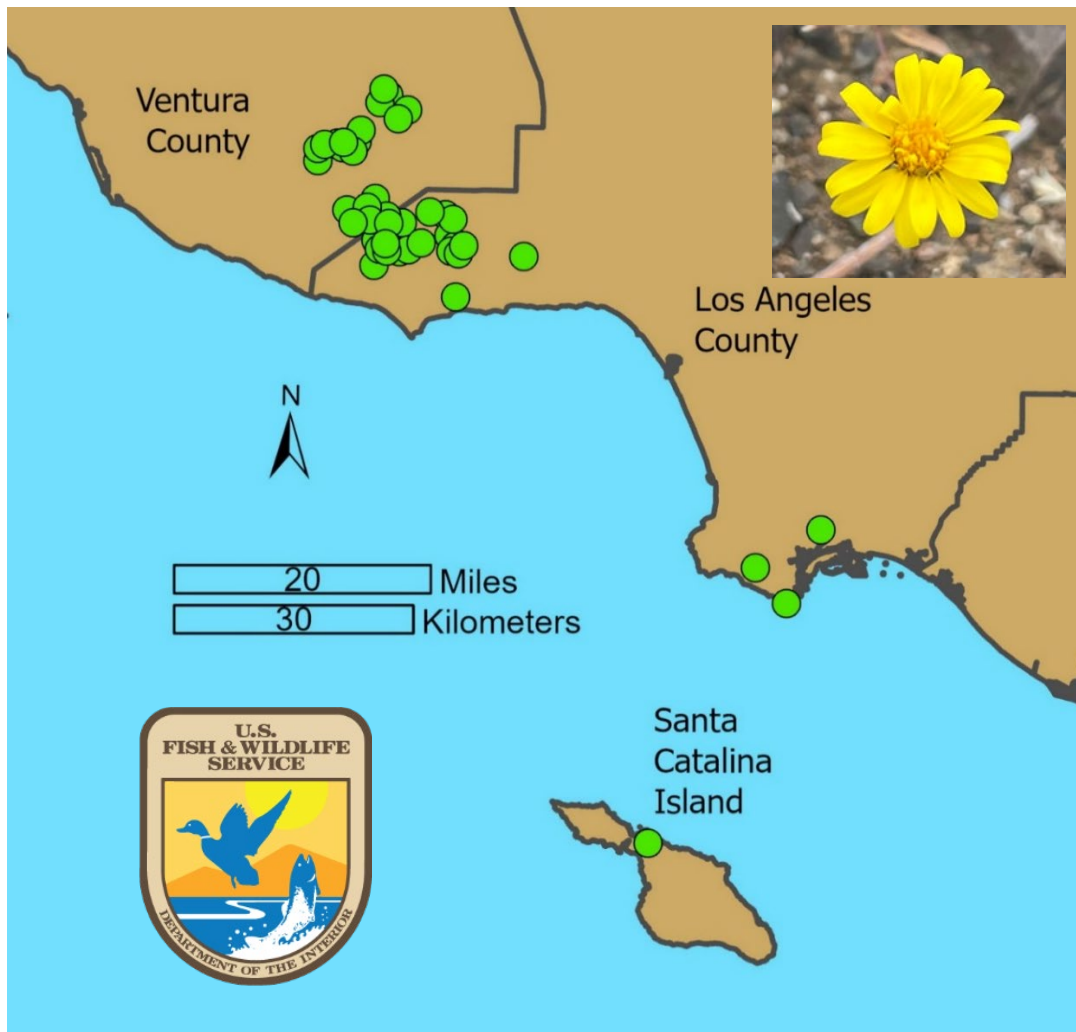


Figure 1. Distribution of *Pentachaeta lyonii* CNDDDB Element Occurrences (2024).

Most occurrences have no, few, vague, incomplete, or irregular repeat measurements of abundance (Appendix 1), and survey methods and completeness are generally unreported. It is also difficult to interpret abundance over time because weather conditions are highly variable from year to year and germination requirements are unknown. For the few mainland occurrences which have had abundance estimates since the 2019 5-year review, most estimates have been of thousands of plants. Abundances on Santa Catalina Island, however, have been considerably smaller (zero or ≤ 50).

Our overall conclusion is that there is likely little change in distribution since the 2019 5-year review, and because of sparse and inconsistent site visits, there is little understanding of abundance or the trajectory of change of abundance for the species overall.

Recovery planting:

The Santa Monica Mountains Recreation Area is implementing a 3-year Lyon’s pentachaeta recovery project at two existing occurrences in the Santa Monica Mountains (SMMRA 2024). Both occurrences had successful and continuing establishment by seed during a similar project in 2005. The current project aims to increase the area of Lyon’s pentachaeta, as well as improve habitat quality by reducing non-native annual plants and increasing a suite of native herbs. By 2024, SMMNRA established the planting areas, treated them to reduce non-native plants, and collected seeds of Lyon’s pentachaeta and seeds and plugs of native herbs for planting. They expect to plant into 2025, after which they will assess the results.

Conservation seed banking:

Currently there are five Lyon’s pentachaeta conservation seed accessions listed in the California Plant Rescue (CaPR) online database (Table 1, CaPR 2024). These are all at the California Botanical Garden, a facility approved by the Center for Plant Conservation (CPC). Seed accessions only represent three occurrences, and the most recent accessions are almost 20 years old.

Table 1. *Pentachaeta lyonii* seed in the California Plant Rescue online database (CaPR 2024)

Location	CNDDDB EO #	Year collected	By maternal lines or bulked	# seeds
Lake Sherwood Southwest	19	1988	bulked	37,188
West Side of Westlake Boulevard	10	1992	unknown	7,500
West Side of Westlake Boulevard (Lake Eleanor Hills)	10	1998	unknown	133,176
Baldwin Westlake (Pentachaeta Trail)	27	2005	bulked	3,069
Baldwin Westlake (Pentachaeta Trail)	27	2005	maternal lines	703

In 2020, under a Section 6 grant, SBBG received nine seeds from the Tower Peak South occurrence (EO #8) on Santa Catalina Island, one from one plant (wild plant 1) and eight from another (wild plant 2; Schneider and Carson 2022, pp. 66-67). SBBG germinated and brought to reproductive maturity the one seed and six of the eight seeds, and the mature plants produced 146 from offspring of wild plant 1 and 811 seeds from offspring of wild plant 2, for a total of 957 seeds. The seeds are in conservation storage at SBBG. Plants grown for only a few successive generations in the nursery are quickly selected to be successful under nursery

conditions and differ from plants in the field; to prevent this, SBBG will not use these first-generation nursery-produced seeds to produce more nursery-grown plants. Additional collections of Santa Catalina Island seeds are needed to for both conservation seed banking and future recovery outplanting.

Land management:

Lyon's pentachaeta has not been recorded on the Palos Verdes Peninsula for more than 100 years and is possibly extirpated there (CCH2 2024, CNDDDB 2024). The location of Lyon's pentachaeta on the Palos Verdes Peninsula was not well documented, so we do not know if the historical location is currently suitable for the species or if it has been developed. The City of Rancho Palos Verdes has a Natural Community Conservation Plan/Habitat Conservation Plan that protects about 1,500 acres (Palos Verdes Peninsula Land Conservancy 2023, pp. 1-3). While Lyon's pentachaeta is not explicitly included in the Plan, there may be locations within the existing protected lands in which the species could be found in the future, or in which reintroduction could occur.

Threats:

At the time of listing (Service 1997), we described primary threats to Lyon's pentachaeta as the destruction of habitat by urban development and the indirect effects of urban development on the surrounding environment, such as the introduction of competitive weeds and altered ecosystem processes. We reiterated these threats in the 1999 recovery plan (Service 1999 p. 20). In the 2008 5-year review (Service 2008), we additionally recognized the stochastic extirpation of small and isolated populations, fire, climate change, and human recreation as threats to Lyon's pentachaeta. The 2019 5-year review (Service 2019) discussed the preceding threats, adding no new threats. For this 2024 5-year review, all the preceding threats remain largely unchanged. We briefly discuss these threats below, discuss in more detail the possible effects of recreation, and introduce the threat of non-native ungulate herbivores on Santa Catalina Island.

As discussed in the 2019 5-year review (Service 2019 p. 5), most Lyon's pentachaeta occurrences are on, or at least partly on, private land or land of unknown ownership. This exposes these occurrences to the threat of direct impacts of the activities of development, and the indirect impacts of changes in the landscape resulting in changed topography, increased risk of fire, and increased competition from non-native plants, especially annual grasses (Moroney et al. 2011, pp. 71–73). The actual magnitudes of the indirect impacts are unknown and could be substantial for an affected occurrence.

Occurrences of Lyon's pentachaeta have small numbers of observed individuals over small areas that are separated geographically, and thus the occurrences may be subject to extirpation by stochastic events. However, extirpation of an annual plant occurrence with potentially long-lived seeds in a soil seed bank is difficult to determine. Stochastic extirpation of occurrences remains a threat, although the magnitude remains unknown.

The threats of human activities, fire, climate change, and competitive non-native plants are all linked together. Human-induced fires have increased in frequency, with potential direct effects on Lyon's pentachaeta. Before the development of southern California, fires generally did not occur during the time of year when Lyon's pentachaeta plants are above ground, and fires had relatively little impact on the sparsely vegetated areas where the species mostly grows. Now,

with repeated fires and climate change, flammable annual grasses may increase in cover (Sandel and Dangremond 2012, entire; Syphard et al. 2019, pp. 97–99). Additionally, fires can occur when Lyon’s pentachaeta plants are above ground, and thus the plants can be killed before producing seeds. The actual impact of these threats on the species is unknown but is likely to increase over time as the predicted future climate becomes hotter and possibly drier (Hall et al. 2018, entire).

In the 2008 5-year review (Service 2008, pp. 8–9), we included that some light recreation (hiking) was compatible with and even beneficial to Lyon’s pentachaeta by keeping vegetation appropriately sparse, but higher intensity uses such as equestrian or vehicle use were considered threats. We agreed with this in the 2019 5-year review, but the situation is not straightforward. During the COVID lockdown, recreational hiking was initially severely curtailed in the spring of 2020. It was noted in early May of that year that trails and unpaved roads in areas where Lyon’s pentachaeta occur (Rocky Oaks, Pentachaeta Trail, “Wildwood”) were carpeted by flowering Lyon’s pentachaeta plants (Devlin Gandy in litt.). As lockdown measures relaxed by late May, these trails received more hikers, and the plants in the trails and roads were quickly trampled. This suggests that in some cases, seasonal closures or trail rerouting may be appropriate to reduce impacts for some occurrences with high recreation intensity.

While most non-native ungulate herbivores have been removed or eradicated from Santa Catalina Island (McEachern et al. 2016, pp. 758–760), mule deer (*Odocoileus hemionus*) and bison (*Bison bison*) remain and are potential sources of herbivory and trampling. Mule deer scat, bison tracks, browsing, and grazing have been noted within the locations of Tower Peak South (EO #8) and Tower Peak North (no EO#) in 2023 (Kevin Alison in litt.). While direct effects on Lyon’s pentachaeta have not been shown, mule deer have been shown to negatively affect another federally listed plant, *Crocantemum (Helianthemum) greenei*, on the island (Dvorak and Catalano 2016, entire). Currently, there is an effort by the CIC to remove mule deer from Santa Catalina Island (CIC 2023) in support of the CIC rare plant conservation program (Dennhardt et al. 2022). Bison are a tourist attraction on Santa Catalina Island, and while they have been reduced to fewer than 100 individuals, they are unlikely to be completely removed from the island. Currently, both animal species remain threats to the small occurrences on Santa Catalina Island.

Evaluation of Recovery Criteria:

Recovery criteria are from the Recovery Plan. (Service 1999, pp. 41–42). Note that “current sites” and “all populations” refer to those listed in the recovery plan.

Downlisting criteria for Lyon’s pentachaeta:

1. *Ten populations of 10,000 or more plants from current sites are*
 - a. *fully protected and managed with the primary intention of preserving the populations in perpetuity.*
 - b. *shown to be self-sustaining over a minimum of 15 years (or longer depending on whether the data continue to suggest large fluctuations in population size are characteristic of the species).*

Only five of the occurrences at listing have ever had more than 10,000 plants, and only two of those have had that many plants since 2015. Four of those occurrences are at least partly on private land, and only one is completely of public land. No occurrences are

currently appropriately monitored to evaluate these criteria. These criteria have not been met.

2. *Seed collected from all populations is stored at a certified Center for Plant Conservation botanic garden.*

This criterion has not been met. There are few collections from few occurrences in conservation seed banking.

3. *Reliable seed germination and propagation techniques for the species are understood.*

This criterion has been met, as recognized by the 2008 5-year review (Service 2008, p. 4), and recent work by the Santa Barbara Botanic Garden (Schneider and Carson 2022, pp. 66-67).

Delisting criterion for Lyon's pentachaeta:

1. *Delisting can be considered when 20 populations meet the same criteria (as downlisting criteria 1a and 1b).*

This criterion has not been met, because downlisting criteria 1a and 1b have not been met.

Conclusion:

After reviewing the best available scientific information, evaluating threats affecting the species under the factors in 4(a)(1) of the Endangered Species Act, and analyzing the status of the species, we conclude that Lyon's pentachaeta remains an endangered species. While there are ongoing recovery efforts by Santa Monica Mountains Recreation Area staff and surveys by the Catalina Islands Conservancy, there is insufficient active monitoring and management of enough populations to warrant changing listing status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

1. Explore private land acquisition to conserve Lyon's pentachaeta occurrences and habitat. Work with private, local, state, and federal partners to identify and leverage funding.
2. Monitor mainland occurrences, especially larger occurrences, for better understanding of population trends.
3. Manage the habitat for the species on Santa Catalina Island to provide protected suitable habitat. This should include removal or effective exclusion of deer and bison, and appropriate landscape recovery efforts.
4. Monitor the Santa Catalina Island occurrences for better understanding of occurrence sizes, trends, and geographic extents.
5. Collect additional seed and increase the number of occurrences represented in conservation seed banks, especially for Santa Catalina Island.

6. When possible, augment existing occurrences with seed derived from within those occurrences.
7. Search for additional suitable mainland outplanting locations on protected lands and establish new occurrences.

Lead Field Supervisor, Ventura Fish and Wildlife Office

Approved _____

LITERATURE CITED:

- Baskin, C.C. and J.M. Baskin. 2023. Seed dormancy in Asteraceae: a global vegetation zone and taxonomic/phylogenetic assessment. *Seed Science Research* 33: 135–169.
- [CaPR] California Plant Rescue. 2024. Online seed collection database. Retrieved April 17, 2024, from <https://www.caplantrescue.org/collections-database.html#memberssearch>.
- [CCH2] Consortium of California Herbaria. 2024. CCH2, Specimen Data from the Consortium of California Herbaria. Retrieved May 21, 2024, from <https://www.cch2.org/portal/index.php>.
- [CIC] Catalina Island Conservancy. 2023. Catalina Island restoration project. Deer removal methodologies: pros and cons. Pamphlet, 2 pp.
- [CNDDDB] California Natural Diversity Database. 2018. How to read CNDDDB quad overlays. California Department of Fish and Wildlife. Sacramento, California. 3 pp.
- [CNDDDB] California Natural Diversity Database. 2024a. Occurrence reports for *Pentachaeta lyonii*. Downloaded from California Department of Fish and Wildlife RareFind ver. 5.3.0, May 20, 2024. 51 pp.
- [CNDDDB] California Natural Diversity Database. 2024b. Spatial data for *Pentachaeta lyonii*, Downloaded from the California Department of Fish and Wildlife Biogeographic Information and Observation System (BIOS 6) on May 21, 2024, from <https://apps.wildlife.ca.gov/cnddb-subscriptions/downloads>
- [CNDDDB] California Natural Diversity Database. 2024. State and Federally Listed Endangered, Threatened, and Rare Plants of California, April 2024. California Department of Fish and Wildlife. Sacramento, CA. 26 pp.
- Dennhardt, L., C. Lanzone, K. Alison, and R. Miller. 2022. Rare plant conservation plan for Catalina Island. Catalina Island Conservancy, Avalon, California. Draft manuscript. 43 pp.
- Dvorak, T.M. and A.E. Catalano. 2016. Exclusion of introduced deer increases size and seed production success in an island-endemic plant species. *Ecology and Evolution*. Open Access. doi: 10.1002/ece3.1885. 6 pp.
- Hall, A., N. Berg, K. Reich. (University of California, Los Angeles). 2018. Los Angeles Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCA4-2018-007. 97 pp.
- McEachern, K., T. Atwater, P.W. Collins, K. Faulkner, D.V. Richards. 2016. Managed Island Ecosystems. pp 755-778 in H. Mooney and E. Zavaleta (eds.) *Ecosystems of California*. University of California Press. 984 pp.
- Moroney J.R., P.M. Schiffman, and C.A. Brigham. 2011. Invasive European annuals impact a rare endemic sunflower. *Madroño* 58: 69–77.
- Palos Verdes Peninsula Land Conservancy. 2023. 2022 Palos Verdes Nature Preserve Annual Report. Unpublished report prepared for The Rancho Palos Verdes Natural Community Conservation Plan and Habitat Conservation Plan, in collaboration with the City of

- Rancho Palos Verdes, California Department of Fish and Wildlife, and U.S. Fish and Wildlife Service. 339 pages, including appendices.
- Rebman, J.P., J. Gibson, and K. Rich. 2016. Annotated checklist of the vascular plants of Baja California, Mexico. *Proceedings of the San Diego Society of Natural History* 45:1–352.
- Sandel, B., and E.M. Dangremond. 2012. Climate change and the invasion of California by grasses. *Global Change Biology* 18: 277–289.
- Schneider, H.E. and S.A. Carson. 2022. A comprehensive collaborative project to recover 14 listed plant species on the Channel Islands – Final Report. Unpublished report prepared for California Department of Fish and Wildlife by Santa Barbara Botanic Garden, Santa Barbara, CA. 196 pp, with geodatabase.
- [Service] U.S. Fish and Wildlife Service 1997. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Two Plants and Threatened Status for Four Plants from Southern California. *Federal Register* 62:4172–4183.
- [Service] U.S. Fish and Wildlife Service. 1999. Recovery Plan for Six Plants from the Mountains Surrounding the Los Angeles Basin. Portland, Oregon. 63 pp.
- [Service] U.S. Fish and Wildlife Service. 2008. Lyon’s pentachaeta 5-Year Review. Ventura, California. 15 pp.
- [Service] U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 47 Species in California, Nevada, and Oregon. *Federal Register* 88:56042–56044.
- [SMMNRA] Santa Monica Mountains National Recreation Area. 2024. USFWS Recovery Permit for *Astragalus brauntonii* and *Pentachaeta lyonii* 2023 Annual Report, Permit Number: TE-069171. Unpublished report to U.S. Fish and Wildlife Service. Ventura, CA. 10 pp.
- Syphard, A., T. Brennan, and J. Keeley. 2019. Drivers of chaparral type conversion to herbaceous vegetation in coastal Southern California. *Diversity and Distributions* 25: 90–101.
- Van Horn, G.S. 1973. The taxonomic status of *Pentachaeta* and *Chaetopappa*, with a revision of *Chaetopappa*. *University of California Publications in Botany* 65:1-41, with plates.
- Wiggins, I.L. 1980. *Flora of Baja California*. Stanford University Press, Stanford, California. 1025 pp.

IN LITTERIS:

- Abby, Zack. Biologist/Project Manager. Padre Associates, Inc. Email communication, February 1, 2024.
- Alison, Kevin. Rare Plant Ecologist, Catalina Island Conservancy. Email communication, February 1, 2024.
- Elvin, Mark. Section 7 Coordinator, U.S. Fish and Wildlife Service, Ventura. Email communication May 23, 2024.
- Gandy, Devlin. PhD. Candidate, University of Oxford. Email communication, February 1, 2024

Mendelsohn, Mark. Biologist, Santa Monica Mountains National Recreation Area. Email communications, August 24, 2023, February 1, 2024, and May 23, 2024.

Ratay, Sarah. 2011. Graduate Student, University of California at Los Angeles. Email communication to C. Rutherford, June 6, 2011.

Rebman, Jon. Curator of Botany, San Diego Museum of Natural History. Email communication, May 21, 2024.

Schneider, Heather. Senior Rare Plant Conservation Scientist, Santa Barbara Botanic Garden. Email communication, February 1, 2024.

APPENDIX A: *Pentachaeta lyonii* occurrences, with table adapted from the 2019 5-Year Review (Service 2019) and updated using sources cited within the table. All 2019 presumed extant occurrences are considered to remain presumed extant, as are the three Santa Catalina Island occurrences added in 2024. The 2024 Trend is assumed to be the same as the 2019 Trend unless information obtained since 2019 indicates otherwise.

CNDDDB EO #	Location	First Seen	Last Seen	Last Checked	CNDDDB Number of Individuals (Year and source if not CNDDDB)	2008 5-Year Review Status	2019 CNDDDB Status	2019 CNDDDB Trend	2024 Trend	Notes	Site Owner/Manager
1	Point Fermin	1908	1910	1997	present (1899, 1908), 0 (1989, 1994, 1997)	possibly extirpated (before listing)	possibly extirpated	unknown	unknown	includes former EO #41	Unknown
2	Mount Palos Verdes (Palos Verdes Mountain, Palos Verdes Hill)	1884	1884	1994	present (1884, 1889, 1910), 0 (1989, 1994)	extirpated (before listing)	possibly extirpated	unknown	unknown		Unknown
3	Stunt Ranch	1982	2017	2017	<1,000 (1982), <100 (1984), 6 (1987), 12 (1988), 3 (1989), 0 (1990, 1994, 1995, 1996, 1997, 2003, 2004, 2005), 12 (2008), 10* (2010), 3 (2017)	extirpated (before listing)	presumed extant	declining	declining	*0 in NPS survey, 10 S. Ratay in litt. 6/1/2011	University of California Natural Reserve System
4	Saddle Rock Ranch	1963	1964	1997	present (1963, 1964), 0 (1989, 1997)	extirpated (before listing)	extirpated	gone	gone		Private
5	Westlake Boulevard	1982	2015	2015	<100 (1982), <50 (1984), 100s (1993), <1,000 (1994), 1,000 (1998), 200 (2001), 50 (2012), 400 (2015)	extirpated (before listing)	presumed extant	stable	stable	includes former EO #17	Private
6	Rocky Oaks	1982	2024	2024	5,500-10,000 (1982), <10,000 (1984), <100 (1987), <1,000 (1988), 450 (2003), present (2004, 2005), 635 (2012), present (2020, D. Gandy in litt. 2/1/2024), 2,500-5,000 (2023, M. Mendelsohn in litt. 8/24/2023), several thousand (2024, M. Mendelsohn in litt 5/23/2024)	declining	presumed extant	declining	stable		National Park Service
7	Wilmington	~1900	~1900	1997	present (~1900), 0 (1997)	possibly extirpated (before listing)	possibly extirpated	unknown	unknown		Unknown
8	Santa Catalina Island (Tower Peak South)	1931	2020	2023	present (1885, 1931), 0 (1989, 1997), 112 (2011), 0 (2012), 15 (2015), 0 (2019, Schneider and Carson 2022), ~50 (2020, Schneider and Carson 2022), 0 (2022, Schneider and Carson 2022), 0 (2023, K. Alison in litt. 2/1/2024)	possibly extirpated (before listing)	presumed extant	stable	stable	includes former EO #42	Catalina Island Conservancy
9	Malibu Creek State Park	1983	1990	1997	<100 (1983), <50 (1984), 3 (1988), 11 (1989), 40 (1990), 0 (1992, 1993, 1994, 1997)	extirpated (before listing)	possibly extirpated	unknown	unknown		California Department of Parks and Recreation

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10	West side of Westlake Boulevard	1983	2012	2012	>1,000 (1983), 1000 (1987, 1988, 1989), >1,000 (1990), 6,000-9,000 (1991, 1992), 14,000 (1995), 80,000 (1998), 20 (2006), 0 (2012)	stable	presumed extant	declining	declining	includes former EO #28	Conejo Open Space Conservation Agency, Private
11	Ridge above Lake Eleanor	1983	2016	2016	1,000 (1998), <100 (1983), 0 (1987), <100 (1992), 8,000-9,000 (1999), 69,230 (2015), 9,136 (2016)	stable	presumed extant	stable	stable		Conejo Open Space Conservation Agency, Private
12	Wildwood Park	1984	1997	1997	>1,000 (1984, 1987, 1988), 1,200 (1997)	stable	presumed extant	unknown	unknown	data combined with EO #46	Conejo Open Space Conservation Agency
13	Hills above Malibu	1926	1926	1926	present (1926)	not in 2008 5-year review	presumed extant	unknown	unknown		Private
14	Wood Ranch	1989	1992	1992	400 (1989), present (1992)	stable or declining	presumed extant	unknown	unknown		Calleguas Municipal Water District
15	Lake Sherwood	1990	1998	1998	3,700-4,400 (1990), <4,000 (1993), <10 (1994), 3,300-3,600 (1998)	stable	presumed extant	unknown	unknown		Private
16	Lake Sherwood, North	1990	2003	2003	330 (1990), 110 (2001), 113 (2002), 387 (2003)	stable	presumed extant	unknown	unknown		Private
17	Upper Carlisle									now included in EO #5	
18	Eagles Nest Mulholland Highway	1989	1989	1989	200 (1989)	stable	possibly extirpated	unknown	unknown		Private
19	Lake Sherwood Southwest	1987	1994	1994	>3,200 (1987), 200 (1988), 40 (1992), 7 (1993), 1 (1994)	unknown or extirpated after listing	possibly extirpated	unknown	unknown		Murdock Development Company
20	South of Olsen Road	1988	1988	1988	225 (1988)	stable	presumed extant	unknown	unknown		Unknown
21	North of Olsen Road	1991	1994	1994	35 (1991), present (1992), 200 (1994)	extirpated	presumed extant	unknown	unknown	includes former EO #25	California Lutheran University
22	Seventh-day Adventist	1991	2016	2024	250-300 (1991), >1,200 (1993), present (1998), 4,000 (2010), present (2014), 10,000s (2016), 10,000s (2024, K. Niessen pers. obs).	extirpated	presumed extant	increasing	increasing	includes former EO #23	Private, City of Thousand Oaks
23	Newbury Park Academy									now included in EO #22	
24	Lynnmere	1991	2012	2012	500 (1991), present (1997), 384 (2003), 450 (2012)	stable	presumed extant	stable	stable		Conejo Open Space Conservation Agency
25	Monclef Peak									now included in EO #21	
26	Baldwin Westlake	1992	1992	1992	>5,000 w/EO #27 (1992)	declining or extirpated	presumed extant	unknown	unknown	sometimes combined with EO #27	National Park Service, Private

CNDDDB EO #	Location	First Seen	Last Seen	Last Checked	CNDDDB Number of Individuals (Year and source if not CNDDDB)	2008 5-Year Review Status	2019 CNDDDB Status	2019 CNDDDB Trend	2024 Trend	Notes	Site Owner/Manager
27	Baldwin Westlake (Pentachaeta Trail)	1992	2024	2024	>5,000 w/EO #26 (1992), present (1997), 5,000 (2005), 18,600 (2012), 1,000 (2017), present (2020, D. Gandy in litt. 2/1/2024), >10,000 (2024, M. Elvin in litt. 5/23/2024)	stable	presumed extant	stable	stable	sometimes combined with EO #26	National Park Service, Private
28	Lake Eleanor Hills									now included in EO #10	
29	Reagan Library	1994	1994	1994	500 (1994)	extirpated	presumed extant	unknown	unknown		Private
30	Carlsberg	1991	2024	2024	1,000 (1991), 230,000 (1997), present (2004, 2005), <1,000 (2007), 4 (2008), uncommon (2011), present (2024, K. Niessen pers. obs.)	stable	presumed extant	declining	declining		Mountain Recreation and Conservation Authority
31	Clovercast	1991	1991	1991	60 (1991)	unknown	presumed extant	unknown	unknown		Private
32	Bridgeway	1991	1991	1991	11,050 (1991)	unknown	presumed extant	unknown	unknown		Conejo Open Space Conservation Agency
33	Triangle Ranch (Fire Station Cornell Rd)	1988	2020	2020	present (1988) 4,000 w/ EO #33 (1992), 1,458 w/EO #33 (2016), 50+ (2020, Z. Abbey in litt. 2/1/2024)	stable	presumed extant	stable	declining	data combined with EO #34 in some years	Private.
34	North and East Ladyface	1988	2106	2016	present (1988), 4,000 w/ EO #33 (1992), 1,000s (2014), 7,630 (2015), 1,458 w/EO #33 (2016)	not treated separately from EO #33	presumed extant	stable	stable	data combined with EO #33 in some years	Private, City of Agoura Hills
35	Malibu Lake (Malibou Lake)	1996	2020	2020	~2,000 (1996), 1,340 (2012), ~500 (2020, D. Gandy in litt. 2/1/2024)	stable	presumed extant	stable	stable		California Department of Parks and Recreation, Private
36	Hill Canyon	1996	2000	2000	30 (1996), present (2000)	unknown or extirpated after listing	presumed extant	unknown	unknown		Private
37	North	1995	1995	1995	1,200 (1995)	unknown or extirpated after listing	presumed extant	unknown	unknown		Private
38	Conejo Ridge	1996	1996	1996	3,000 (1996)	unknown	presumed extant	unknown	unknown		Conejo Parks and Recreation District
39	Conejo Ridge	1998	1998	1998	43 (1998)	unknown	presumed extant	unknown	unknown		City of Thousand Oaks
41	San Pedro									now included in EO #01	
43	Mulholland Crest	2003	2004	2004	>10,000 (2003), 14 (2004)	unknown	presumed extant	unknown	unknown	first "Mulholland Crest" in 2008 5-yr review	Tree People
44	Brookins Trail	2006	2006	2006	3 (2006)	not in review	presumed extant	unknown	unknown		Private

CNDDB EO #	Location	First Seen	Last Seen	Last Checked	CNDDB Number of Individuals (Year and source if not CNDDB)	2008 5-Year Review Status	2019 CNDDB Status	2019 CNDDB Trend	2024 Trend	Notes	Site Owner/Manager
45	Potrero Road	1992	1992	1992	present (1992)	not in review	presumed extant	unknown	unknown		Unknown
46	Wildwood Park	1984	2020	2020	>1,000 (1984, 1987, 1988), 1,200 (1997)	not in review	presumed extant	stable	stable	data combined with EO #12	Conejo Open Space Conservation Agency
47	Hacienda Trail (Paramount Ranch)	2012	2024	2024	300 (2012), <50 (2015), 2,000-2,500 (2023, M. Mendelsohn in litt. 2/1/2024), 3,000 (2024, M. Elvin in litt. 23/5/2024)	not in review	presumed extant	unknown	stable		National Park Service
48	Malibu Creek (Lost Cabin)	2015	2020	2020	100 (2015), ~80 (2020. D. Gandy in litt. 2/1/2024)	not in review	presumed extant	unknown	stable		California Department of Parks and Recreation
49	Bodle Peak	2015	2016	2016	400 (2015), 370 (2016)	not in review	presumed extant	unknown	unknown		Private
50	Trancas Canyon	1944	1944	1944	present (1944)	not in review	presumed extant	unknown	unknown		Unknown
51	Modoc Trail	2016	2016	2016	<1,000 (2016)	not in review	presumed extant	unknown	unknown		California Department of Parks and Recreation
52	Ladyface Mountain	2017	2017	2017	38 (2017)	not in review	presumed extant	unknown	unknown		Private
none	Central	unknown	unknown	unknown	present	unknown	presumed extant*	unknown	unknown	*In 2008 5-Year Review, not in CNDDB	Private
none	Mulholland Crest	unknown	unknown	unknown	present	unknown	presumed extant*	unknown	unknown	*In 2008 5-Year Review, not in CNDDB	Private
none	Mulholland Crest	2003	2005	2005	5,000 (2003), 1,130 (2004), 16,200 (2005)	stable	presumed extant*	unknown	unknown	*In 2008 5-Year Review, not in CNDDB	Private
none	Tower Peak North	2020	2020	2023	25 (2020), 0 (2022), 0 (2023, K. Alison in litt. 2/1/2024)	not in review	not in review	not in review	unknown	2020 and 2022 from Schneider and Carson 2022. Added 2024.	Catalina Island Conservancy
none	Big Springs	unknown	unknown	unknown	unknown	not in review	not in review	not in review	unknown	From Schneider and Carson 2022. Added 2024.	Catalina Island Conservancy
none	Sheep Chute	unknown	unknown	2020	0 (2019), 0 (2020)	not in review	not in review	not in review	unknown	From Schneider and Carson 2022. Added 2024.	Catalina Island Conservancy