

Lyon's pentachaeta (*Pentachaeta lyonii*)

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



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Ventura Fish and Wildlife Office
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5-YEAR REVIEW

Lyon's pentachaeta (*Pentachaeta lyonii*)

GENERAL INFORMATION:

Species: *Pentachaeta lyonii*
Date listed: January 29, 1997
FR citation: 62 FR 4172
Classification: Endangered

BACKGROUND:

Most recent status review: U.S. Fish and Wildlife Service. 2008. Lyon's pentachaeta (*Pentachaeta lyonii*) 5-Year Review: Summary and Evaluation. USFWS. Ventura Field Office. Ventura, California.

FR Notice citation announcing this status review: U.S. Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 58 Species in California, Nevada, and the Klamath Basin of Oregon. Federal Register 84:36116-36118.

ASSESSMENT:

Information acquired since the last status review:

This 5-year review was conducted by the U.S. Fish and Wildlife Service (Service) Ventura Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on July 26, 2019. We also contacted the Carlsbad Fish and Wildlife Office, the Santa Monica Mountains National Recreation Area, the Catalina Island Conservancy, Mountains Restoration Trust, and other species experts 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.

Population Data

Pentachaeta lyonii currently occurs in the Santa Monica Mountains in eastern Ventura and western Los Angeles Counties, ranging over a distance of about 30 kilometers (19 miles), and on Santa Catalina Island, the result of a recent rediscovery (S. Ratay 2011 *in litt.*). Based on historical records, the species once occurred on the Palos Verdes Peninsula and in Wilmington, but has not been seen in those locations for over 100 years and is presumed extirpated there (Consortium of California Herbaria 2019, CNDDDB 2019).

Appendix A lists all occurrences from the 2008 5-year review and recent CNDDDB (2019) data. The 2008 5-year review listed 42 occurrences, 38 that had assigned CNDDDB Element Occurrence (EO) numbers, and 4 that did not. This 2019 5-year review lists 48 occurrences, with 45 that have CNDDDB EO numbers, and 3 from the 2008 5-year review that still do not have EO numbers. These 2008 and 2019 totals are not directly comparable. Five of the EOs of 2008 have

been combined with other EOs before the 2019 data was released (see “Notes” in Appendix A), reducing the effective number of 2008 occurrences to 36. Thus, the numbers of occurrences are 36 in 2008 and 48 in 2019.

The 2019 occurrences are assigned a “status” (*extirpated, possibly extirpated, presumed extant*) by CNDDDB (Appendix A). This 2019 5-year review also assigns a “trend” to each 2019 occurrence (Appendix A). The single extirpated occurrence is given a trend of *gone*. The possibly extirpated occurrences all have a trend of *unknown*. The presumed extant occurrences have trends of *decreasing* (population counts decreasing by about an order of magnitude over the last 15 years), *stable* (population counts staying within an order of magnitude over the last 15 years), *increasing* (population counts increasing by about an order of magnitude over the last 15 years), or *unknown* (one or two population counts, or no counts in the last 15 or more years). These data are summarized in Table 1. Of the total 48 occurrences, there are 41 presumed extant occurrences in 2019. Of those 41 presumed extant occurrences, 4 are declining, 9 are stable, 1 is increasing, and 27 are unknown.

In the 2008 5-year review, the occurrences were also given a “status”, which was effectively a combination of CNDDDB “status” and “trend”. These status values are accepted as reported, except where there is ambiguity (two status values linked with an “or”), in which case the status was assigned *unknown*. These data are also summarized in Table 1.

Table 1. Status and Trends of occurrences of *Pentachaeta lyonii* in 2008 and 2019.

Status and Trend	2008	2019
<i>Extirpated: gone</i>	8 (22%)	1 (2%)
<i>possibly extirpated: unknown</i>	3 (8%)	6 (13%)
<i>presumed extant: declining</i>	1 (3%)	4 (8%)
<i>presumed extant: stable</i>	13 (36%)	9 (19%)
<i>presumed extant: increasing</i>	0 (0%)	1 (2%)
<i>presumed extant: unknown</i>	11 (31%)	27 (56%)
total	36	48

Table 1 shows that there were fewer occurrences in 2008 (36) than in 2019 (48), with fewer presumed extant occurrences in 2008 (25) than in 2019 (41). The percentage of extirpated plus possibly extirpated occurrences is greater in 2008 (30%) than in 2019 (15%). These changes are largely because four occurrences considered extirpated in 2008 actually were extant in 2015 or later (EOs 3, 5, 8, and 22), and nine newly reported presumed extant occurrences (EOs 44 – 52) were added to the CNDDDB database between 2008 and 2019.

There are no strong patterns in status change of *Pentachaeta lyonii* occurrences from 2008 to 2019. There has been yearly monitoring of some occurrences, but not enough to discern particular trends over the range of the species in the last 10 years. While there are more occurrences in 2019 than 2008, the status of most of them in 2019 is unknown. In both years, there are substantial percentages of stable and unknown status occurrences. There is a minority of stable and increasing occurrences; however, monitoring of unknown status occurrences could increase that number. In some cases, occurrences that were listed as extirpated or presumed

extirpated in 2008 (Appendix A: Stunt Ranch EO3, Santa Catalina Island EO8, Seventh Day Adventist EO22) have had sizable population counts since the 2008 5-year review. This demonstrates the importance of yearly monitoring over long time periods.

While some occurrences are newly identified and some have been reassigned, the basic geographic distribution of the species remains unchanged since the 2008 5-year review, except for the rediscovery of the species on Santa Catalina Island (EO8). The Santa Catalina Island occurrence was last seen in 1931, and rediscovered in 2011 after an absence of 80 years (S. Ratay 2011 *in litt.*).

Recovery criteria for *Pentachaeta lyonii* (Service 1999, p. 41) state that “the species should be evaluated for reclassification to threatened status when 10 populations of 10,000 or more plants from current sites are fully protected and shown to be self-sustaining over a minimum of 15 years”. The species currently does not meet these criteria.

Seed Banking and Plant Propagation

Recovery criteria state that seed should be collected from all *Pentachaeta lyonii* populations and stored at a certified Center for Plant Conservation botanic garden (Service 1999, p. 42). Currently, there is minimal seed that has been banked. Rancho Santa Ana Botanical Garden has banked seed from 4 wild populations collected between 1988 and 2005 (C. Birker *in litt.*), which is the seed discussed in the 2008 5-year review (Service 2008, p. 4). This recovery criterion has not yet been met.

An additional downlisting criterion is that reliable seed germination and propagation techniques for the species are understood (Service 1999, p. 42). The 2008 5-year review (Service 2008, p. 4) found that the current knowledge of these techniques satisfies this downlisting criterion.

Recent Research

Several recent studies have addressed aspects of *Pentachaeta lyonii* biology related to reproduction and recruitment. Zung (2012, p. 10), working at a scale of kilometers, found that *Pentachaeta lyonii* has low genetic variation within sites, but high genetic variation between sites. Holt *et al.* (2014, pp. 97-99), working at a scale of meters, investigated effects of patch density and plant dispersion on seed set. They found that there was no pollinator limited seed production within patches, but that there was low seed set in isolated plants greater than 10 meters from the nearest conspecifics. Moroney *et al.* (2011, pp. 71-73) found that non-native annual plants, particularly *Centaurea melitensis*, had negative effects on the number of inflorescences for *Pentachaeta lyonii*, and that dense non-native annual grass and thatch was correlated with local extirpation. These studies will be used as guidance for a currently funded National Park Service grant to the Santa Monica Mountains National Recreation Area (Tiszler 2017, entire) to recover *Pentachaeta lyonii* by augmenting existing occurrences, establishing a new occurrence, and reestablishing a possibly extirpated occurrence.

Threats

At the time of listing, primary threats to *Pentachaeta lyonii* were destruction of habitat from urban development and the indirect effects of urban development on the surrounding

environment, such as the introduction of competitive weeds and altered ecosystem processes. In our last 5-year review (USFWS 2008), we recognized development, stochastic extinction, fire, climate change, and human recreation as threats to *Pentachaeta lyonii*.

In 2008 (Service 2008, p.7), it was estimated that 70% (21 of 30) of occurrences were on private land; currently 63% (26 of 41) of presumed extant occurrences are either on, or at least partly on, unprotected private land, or on land of unknown ownership. Given that most occurrences remain on private lands near densely urban areas that may be desirable for development, direct and indirect threats from development remain. An important indirect impact of both development (Gavier-Pizarro *et al.* 2010, pp. 1920-1923) and fire (Syphard *et al.* 2019, pp. 97-99) may be increased numbers of competitive non-native invasive plants. While the potential negative impact of invasive plants on *Pentachaeta lyonii* has been discussed both in the previous 5-year review (Service 2008, p. 10) and in Moroney *et al.* (2011, pp. 73-76), the effect of invasive plants on the majority of the occurrences of the species has not been assessed, and the actual extent of the impacts is unknown.

As an annual plant, *Pentachaeta lyonii* can have large differences in population size between occurrences and within occurrences between years. Within the last 15 years, 21 of the 41 presumed extant occurrences have reported plant counts (Appendix A). Of the 21 occurrences, 4 had a maximum counted number of > 10,000 plants, 3 of 1,000 – 10,000 plants, 9 of 100 – 1,000 plants, 3 of > 100 of plants, and two unknown. None had a reported count of zero. Most of the counts are relatively small numbers, and small plant populations can be vulnerable to extirpation by stochastic events (Matthies *et al.* 2004, pp. 484-486). Stochastic events remain a threat to the species.

The geographic extent of the species is within a single mountain range and in one location on an island; therefore, it is possible that all occurrences in each of these places could be vulnerable to catastrophic events. Half (21 of 42) of all Santa Monica Mountain occurrences are within the footprints of the 2018 Woolsey and Hill fires. While there have been no reported post-fire surveys of any of these occurrences, the direct effects on *Pentachaeta lyonii* may be minimal. First, the fires burned in November, after the plants would have senesced and dispersed seed. Second, as stated in the 2008 5-year review (Service 2008, p. 5), the species generally is found in areas with mostly bare ground and low vegetative cover with small fuel loads that would burn with less intensity compared to surrounding chaparral.

As in our last 5-year review (Service 2008, pp. 9-10), we recognized that climate change is an important issue with potential effects on *Pentachaea lyonii* and its habitat. A recent synthesis for the Los Angeles area (Hall *et al.* 2018, entire) predicts increasing temperatures under all scenarios, and greater likelihoods of extreme storms, drought, and wildfire. However, adequate biological information to make accurate predictions regarding the effects of these and other aspects of climate change on this species is still lacking at this time.

From the last 5-year review (Service 2008, pp. 8-9), some light recreation (hiking) was thought to be compatible and even beneficial to the species, but higher intensity uses such as equestrian or vehicle use were considered to be threats. This remains unchanged.

Conclusion:

After reviewing the best available scientific information, we conclude that *Pentachaeta lyonii* remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(1) of the Act and analysis of the status of the species in our 2008 5-year review remains an accurate reflection of the species current status.

RECOMMENDATIONS FOR FUTURE ACTIONS:

- Increase monitoring of within and among mainland occurrences for better understanding of population trends.
- Monitor the Santa Catalina Island occurrence for better understanding of population numbers, trends, and geographic extents.
- Collect additional seed for banking from both mainland and Santa Catalina Island occurrences.
- Augment existing occurrences when possible.
- Search for additional suitable outplanting locations on protected lands and establish new occurrences.

APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approved  Date 10/4/19

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APPENDIX A: CNDDDB and other occurrences of *Pentachaeta lyonii* from the 2008 5-Year Review and August 8 2019 CNDDDB download

CNDDDB EO	Location	First Seen	Last Seen	Last Checked	CNDDDB Number of Individuals (Year)	2008 5-Year Review Status	2019 CNDDDB Status	2019 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	includes former EO41	Unknown
2	Mount Palos Verdes	1884	1884	1994	present (1884, 1889, 1910); 0 (1989, 1994)	Extirpated (before listing)	Possibly Extirpated	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	*0 in NPS survey, 10 Ratay in litt	University of California Natural Reserve System
4	Saddle Rock Ranch	1963	1964	1997	present (1963, 1964), 0 (1989, 1997)	Extirpated (before listing)	Extirpated	gone		Private
5	Westlake Boulevard	1982	2015	2015	<100 (1982), <50 (1984), 100s (1993), <1000 (1994), 1000 (1998), 200 (2001), 50 (2012), 400 (2015)	Extirpated (before listing)	Presumed Extant	stable	includes former EO17	Private
6	Rocky Oaks	1982	2012	2012	5,500-10,000 (1982), <10,000 (1984), <100 (1987), <1000 (1988), 450 (2003), present (2004, 2005), 635 (2012)	Declining	Presumed Extant	declining		National Park Service
7	Wilmington	~1900	~1900	1997	present (~1900), 0 (1997)	Possibly extirpated (before listing)	Possibly Extirpated	unknown		Unknown
8	Santa Catalina Island	1931	2015	2015	present (1885, 1931), 0 (1989, 1997), 112 (2011), 0 (2012), 15 (2015)	Possibly extirpated (before listing)	Presumed Extant	stable	includes former EO42	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		California Department of Parks and Recreation
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	includes former EO28	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		Conejo Open Space Conservation Agency, Private
12	Wildwood Park	1984	1997	1997	>1,000 (1984, 1987, 1988), 1,200 (1997)	Stable	Presumed Extant	unknown	data combined with EO46	Conejo Open Space Conservation Agency
13	Hills above Malibu	1926	1926	1926	present (1926)	not in 2008 5-Year Review	Presumed Extant	unknown		Private
14	Wood Ranch	1989	1992	1992	400 (1989), present (1992)	Stable or Declining	Presumed Extant	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		Private
16	Lake Sherwood, North	1990	2002	2002	330 (1990), 110 (2001), 113 (2002), 387 (2003),	Stable	Presumed Extant	unknown		Private

CNDDB EO	Location	First Seen	Last Seen	Last Checked	CNDDB Number of Individuals (Year)	2008 5-Year Review Status	2019 CNDDB Status	2019 Trend	Notes	Site Owner/Manager
17	Upper Carlisle								now included in EO5	
18	Eagles Nest Mullholland Highway	1989	1989	1989	200 (1989)	Stable	Possibly Extirpated	unknown		Private
19	Lake Sherwood Southwest	1987	1994	1994	>3200 (1987), 200 (1988), 40 (1992), 7 (1993), 1 (1994)	Unknown or Extirpated after listing	Possibly Extirpated	unknown		Murdock Development Company
20	South of Olsen Road	1988	1988	1988	225 (1988)	Stable	Presumed Extant	unknown		Unknown
21	North of Olsen Road	1991	1994	1994	35 (1991), present (1992), 200 (1994)	Extirpated	Presumed Extant	unknown	includes former EO25	California Lutheran University
22	Seventh-day Adventist	1991	2016	2016	250-300 (1991), >1200 (1993), present (1998) 4,000 (2010), present (2014), 10,000s (2016)	Extirpated	Presumed Extant	increasing	includes former EO23	Private, City of Thousand Oaks
23	Newbury Park Academy								now included in EO22	
24	Lynnmere	1991	2012	2012	500 (1991), present (1997), 384 (2003), 450 (2012)	Stable	Presumed Extant	stable		Conejo Open Space Conservation Agency
25	Monclaf Peak								now included in EO21	
26	Baldwin Westlake	1992	1992	1992	>5,000 w/EO26 (1992)	Declining or Extirpated	Presumed Extant	unknown	sometimes combined with EO27	National Park Service, Private
27	Baldwin Westlake	1992	2017	2017	>5,000 w/EO26 (1992), present (1997), 5,000 (2005), 18,600 (2012) 1,000 (2017)	Stable	Presumed Extant	stable	sometimes combined with EO26	National Park Service, Private
28	Lake Eleanor Hills								now included in EO10	
29	Reagan Library	1994	1994	1994	500 (1994)	Extirpated	Presumed Extant	unknown		Private
30	Carlsberg	1991	2011	2011	1,000 (1991), 230,000 (1997), present (2004, 2005), <1,000 (2007), 4 (2008), uncommon (2011)	Stable	Presumed Extant	declining		Mountain Recreation and Conservation Authority
31	Clovercast	1991	1991	1991	60 (1991)	Unknown	Presumed Extant	unknown		Private
32	Bridgeway	1991	1991	1991	11,050 (1991)	Unknown	Presumed Extant	unknown		Conejo Open Space Conservation Agency
33	Triangle Ranch	1988	2016	2016	present (1988) 4,000 w/ EO33, 1,458 w/EO33 (2016)	Stable	Presumed Extant	stable	data combined with EO34	Private.
34	North and East Ladyface	1988	2106	2016	present (1988) 4,000 w/ EO33 (1992), 1000s (2004), 7,630 (2015), 1,458 w/EO33 (2016)	n/a	Presumed Extant	stable	data combined with EO33	Private, City of Agoura Hills
35	Malibu Lake	1996	2012	2012	~2,000 (1996), 1,340 (2012)	Stable	Presumed Extant	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		Private

CNDDB EO	Location	First Seen	Last Seen	Last Checked	CNDDB Number of Individuals (Year)	2008 5-Year Review Status	2019 CNDDB Status	2019 Trend	Notes	Site Owner/Manager
37	North	1995	1995	1995	1,200 (1995)	Unknown or Extirpated after listing	Presumed Extant	unknown		Private
38	Conejo Ridge	1996	1996	1996	3,000 (1996)	Unknown	Presumed Extant	unknown		Conejo Parks and Recreation District
39	Conejo Ridge	1998	1998	1998	43 (1998)	Unknown	Presumed Extant	unknown		City of Thousand Oaks
41	San Pedro								now included in EO01	
43	Mullholland Crest	2003	2004	2004	>10,000 (2003), 14 (2004)	unknown	Presumed Extant	unknown	first "Mullholland Crest" in 2008 5-yr review	Mountains Restoration Trust
44	Brookins Trail	2006	2006	2006	3 (2006)	not in review	Presumed Extant	unknown		Private
45	Potrero Road	1992	1992	1992	present (1992)	not in review	Presumed Extant	unknown		Unknown
46	Wildwood Park	1984	1997	1997	>1,000 (1984, 1987, 1988), 1,200 (1997)	not in review	Presumed Extant	stable	data combined with EO12	Conejo Open Space Conservation Agency
47	Hacienda Trail	2012	2015	2015	300 (2012), <50 (2015)	not in review	Presumed Extant	unknown		National Park Service
48	Malibu Creek	2015	2015	2015	100 (2015)	not in review	Presumed Extant	unknown		California Department of Parks and Recreation
49	Bodle Peak	2015	2016	2016	400 (2015), 370 (2016)	not in review	Presumed Extant	unknown		Private
50	Trancas Canyon	1944	1944	1944	present (1944)	not in review	Presumed Extant	unknown		Unknown
51	Modoc Trail	2016	2016	2016	<1,000 (2016)	not in review	Presumed Extant	unknown		California Department of Parks and Recreation
52	Ladyface Mountain	2017	2017	2017	38 (2017)	not in review	Presumed Extant	unknown		Private
*	Central	unknown	unknown	unknown	present	Unknown	Presumed Extant*	unknown	*In 2008 5-Year Review, not in CNDDB	Private
*	Mullholland Crest	unknown	unknown	unknown	present	Unknown	Presumed Extant*	unknown	*In 2008 5-Year Review, not in CNDDB	Private
*	Mullholland Crest	2003	2005	2005	5,000 (2003), 1,130 (2004), 16,200 (2005)	stable	Presumed Extant*	unknown	*In 2008 5-Year Review, not in CNDDB	Private