5-YEAR REVIEW

Castilleja cinerea
(Ash-gray paintbrush)

GENERAL INFORMATION

Species: *Castilleja cinerea* (ash-gray paintbrush), a plant species
Date listed under the Endangered Species Act: September 14, 1998
Federal Register citation: USFWS 1998 (63 FR 49006–49022)
Classification: Threatened
Recovery Priority Number: 8

BACKGROUND

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

Most recent status review: USFWS. 2013. *Castilleja cinerea* (Ash-gray paintbrush) 5-year review: Summary and Evaluation. Carlsbad Fish and Wildlife Office, Carlsbad, California. 45 pp.

We initiated a status review for *Castilleja cinerea* in 2011. The review was finalized on March 27, 2013 (USFWS 2013) and recommended no change in listing status. This and other reviews can be viewed at the species page on the Environmental Conservation Online System (ECOS).

Federal Register Notice citation announcing this status review: On January 27, 2020, 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 (USFWS 2020, pp. 4692–4694). We received no information about *Castilleja cinerea.*

ASSESSMENT

Information acquired since the last status review

This 5-year review was conducted by the USFWS Carlsbad Fish and Wildlife Office. Data for this review were solicited from the public and interested parties through a *Federal Register* notice announcing this review on January 27, 2020 (USFWS 2020, pp. 4692–4694). We also contacted State and Federal partners and 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.

SUMMARY OF NEW INFORMATION SINCE 2013

Biology and occurrence status

At the time of listing in 1998, *Castilleja cinerea* was known from 33 occurrences across 12 pebble plain complexes within the San Bernardino Mountains (CNDDB 1997, entire). In our 1998 listing rule we stated that *C. cinerea* was known from fewer than 20 "localities" and generally encompassed within nine pebble plain complexes and other habitats (USFWS 1998, p. 49007–49008). At the time of the last 5-year review in 2013, we considered *C. cinerea* extant at 48 occurrences across 13 pebble plain complexes (USFWS 2013, Appendix 1).

Since 2013, no studies have examined *Castilleja cinerea* biology, life history, or genetics. U.S. Forest Service (USFS) site visits and California Natural Diversity Database (CNDDB) records (CDFW 2021, entire) have resulted in updates to the number and status of *C. cinerea* occurrences since our 2013 review.

Since the 2013 5-year review, the total number of *Castilleja cinerea* occurrences known has increased from 48 to 55. A total of 10 occurrences—8 from the CNDDB [Element Occurrences (EO) 42, 64, 70, 71, 72, 73, 74, 76], 1 from the USFS records (USFS site ID 0512MT-KAW-E136), and 1 record from a municipal project in Big Bear Lake (location south of Cameron Drive)—were not included in the 2013 5-year review, but are addressed in this review. Two CNDDB occurrences were first reported in 2014 (EOs 71 and 74), and six reported to the CNDDB or USFS before 2013 but were not included in our 2013 review. Of the 10 occurrences, 3 are extant, 6 presumed extant, and 1 possibly extirpated.

We also reviewed the status of all known *Castilleja cinerea* occurrences to identify whether the occurrences were extant, presumed extant, or possibly extirpated. Of the 48 occurrences known to us in 2013, we have changed the status of 22 occurrences due to the following new information:

1. Seventeen occurrences that were presumed extant in 2013 are now extant, because *C. cinerea* plants have been observed within the past 10 years.

2. Two occurrences that were presumed extant in 2013 (CNDDB EOs 33 and 38) are now possibly extirpated due to development.

3. Three former CNDDB occurrences are now included within other CNDDB occurrences (CDFW 2021, pp. 6, 23).

In summary, 10 occurrences have been reported to us since 2013. However, because three 2013 occurrences were included in other CNDDB EOs, the number of occurrences has increased by 7, from 48 to 55. A total of 19 occurrences are extant, 33 presumed extant, and 3 possibly extirpated (Table 1, Table 2).

Table 1. Summary of *Castilleja cinerea* occurrences at listing, in 2013, and in 2021, indicating whether the occurrence is extant, presumed, extant, or possibly extirpated.[1]

Occurrence status	Count of occurrence status at listing	2013 count of occurrence status	2021 count of occurrence status
Extant	NA	1	19
Presumed extant	33	47	33
Possibly extirpated	NA	NA	3
Total	**33**	**48**	**55**

[1] We considered an occurrence "extant" if it has been observed within 10 years (since 2011). We considered an occurrence "presumed extant" if it has not been observed for over 10 years, but suitable habitat is present. We considered an occurrence "possibly extirpated" if it has not been observed for over 20 years despite surveys, or if habitat has been degraded or partially developed.

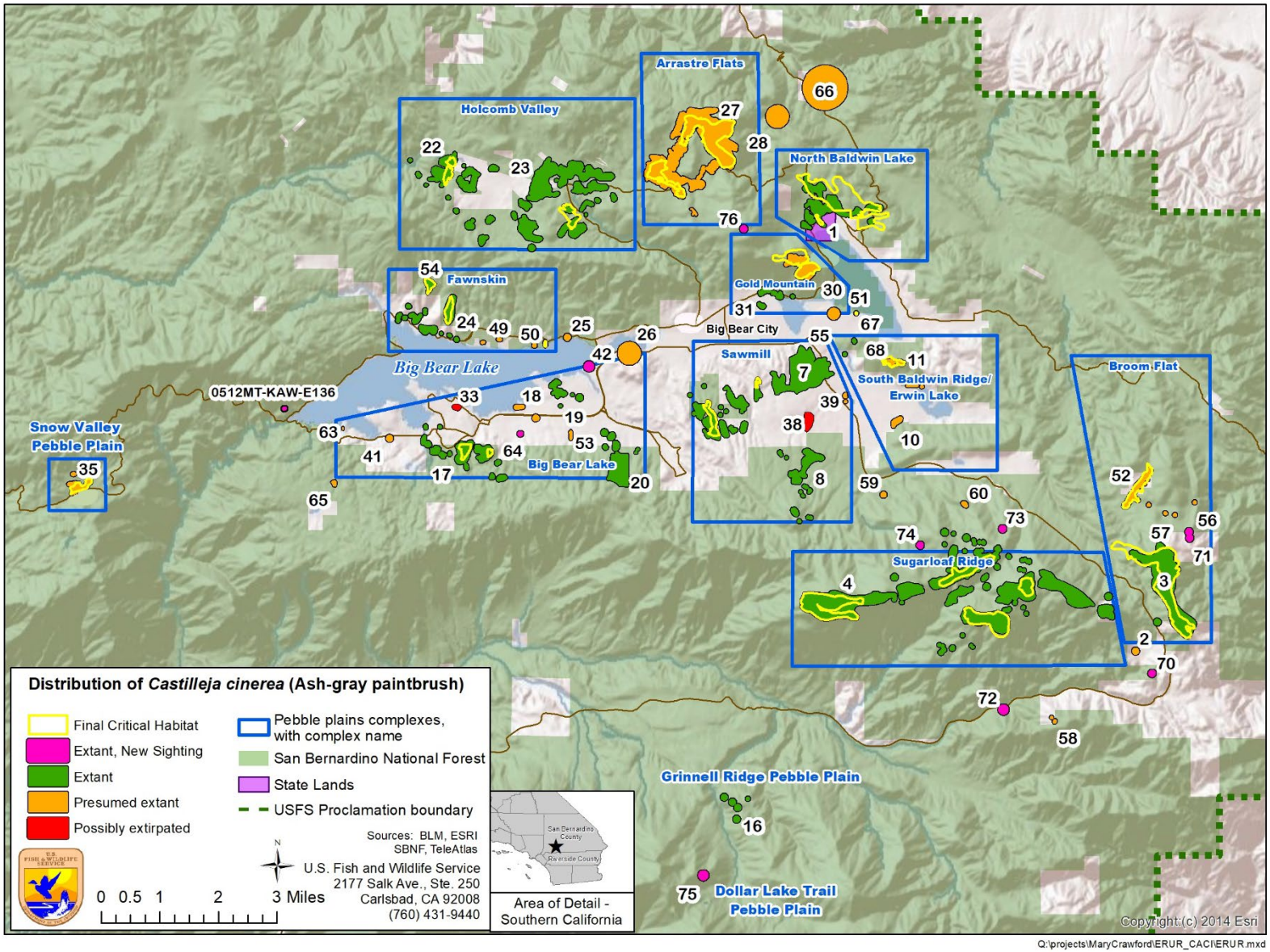

Figure 1. Map of *Castilleja cinerea* occurrences, showing occurrence status and identifying whether the occurrence is new since the 2013 5-year review. The numerical label indicates the CNDDB EO number or USFS site ID number.

Table 2. Occurrence information for *Castilleja cinerea*, prepared for the 2021 5-year review.

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Arrastre Flats (including Cactus Flats)	27	Yes	Presumed extant	Presumed extant	Presumed extant	2000 (100), 2008 (unknown)	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants; Mining E: Climate change	USFS	The eastern part of this occurrence burned in the 2017 Holcomb Fire. Aerial fire retardant was applied to pebble plain habitat, and suppression repair activities also occurred in this pebble plain (USFS 2017, pp. 13–15). However, because of sparse fuel within pebble plain habitat, the fire was spotty, and no plants showed evidence of burning (USFS 2017, p. 14).	USFS 2017, pp. 13–15; USFS 2020; CDFW 2021, pp. 29–30)
Big Bear Lake	17	No	Presumed extant	Presumed extant	Extant	2016 (13,400 plus)	A: Urban Development; Roads and Trails; Trampling; Nonnative plants; Alteration of hydrology E: Climate change	USFS, Private	Because the EO was observed in 2016, it is extant rather than presumed extant.	CDFW 2021, p. 17
Big Bear Lake	18	No	Presumed extant	Presumed extant	Presumed extant	2003 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 19
Big Bear Lake	19	No	Presumed extant	Presumed extant	Extant	2014 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative plants E: Climate change	Private	Because the EO was observed in 2014, it is extant rather than presumed extant.	CDFW 2021, p. 20
Big Bear Lake	20	No	Presumed extant	Presumed extant	Extant	2016 (217)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Recreational activity E: Climate change	USFS, Private	Because the EO was observed in 2016, it is extant rather than presumed extant. There are additional threats from camping/recreation.	CDFW 2021, p. 22
Big Bear Lake	26	No	Presumed extant	Presumed extant	Extant	1979 (unknown), 2016 (21)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	Private	In 2016, 21 plants were detected approximately 0.55 kilometers (km) [0.34 miles (mi)] east of this polygon, adjacent to Big Bear Boulevard. In 2017, the plants were impacted by a road widening project (Brandt 2017, pers. comm.). Although the impacted plants were outside of this CNDDB polygon, we attributed the disturbance to this EO because the distance is less than 0.4 km (0.25 mi).	USFS 2020, CDFW 2021, p. 28

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Big Bear Lake	33	No	Presumed extant	Presumed extant	Possibly extirpated	1990s (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	Private	This EO is now considered possibly extirpated, because habitat in the area has been developed, and plants have not been observed onsite for over 20 years.	CDFW 2021, p. 34
Big Bear Lake	41	No	Presumed extant	Presumed extant	Presumed extant	1979 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 38
Big Bear Lake	42	No	NA	NA	Possibly extirpated	1980 (unknown)	A: Urban Development; Roads and Trails	Private	This occurrence was not included in our 2013 5-year review. The EO is now considered possibly extirpated, because habitat in the area has been developed, and plants have not been observed onsite for over 20 years.	CDFW 2021, p. 39
Big Bear Lake	53	No	Presumed extant	Presumed extant	Presumed extant	2001 (common in patches)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	Private	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 44
Big Bear Lake	63	No	Presumed extant	Presumed extant	Presumed extant	2003 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	Private	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 52
Big Bear Lake	64	No	NA	NA	Presumed extant	NA	A: Urban Development	Private	This occurrence was not included in our 2013 5-year review.	CDFW 2021, p. 53
Big Bear Lake	65	No	Presumed extant	Presumed extant	Presumed extant	2004 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology E: Climate change	USFS	No change in EO or conservation status since 2013.	CDFW 2021, p. 54
Big Bear Lake (south of Cameron Drive)	NA	No	NA	NA	Extant	2020 (900)	A: Development	Private	This occurrence was not included in our 2013 5-year review. It was reported by Jacobs Engineering Group (2020) in a Biological Resources Assessment for a 1.32-acre Big Bear Lake development.	Jacobs Engineering Group 2020, pp. 13–14
Broom Flat (including Onyx Peak)	3	Yes	Presumed extant	Presumed extant	Extant	2003 (uncommon), 2010 (23), 2015 (unknown)	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS, Private	This EO was impacted by suppression and suppression repair activities during the 2015 Lake Fire, when dozer line damaged an area of critical habitat approximately 30 to 80 feet wide (USFS 2015, pp. 71–72).	CDFW 2021, p. 4; USFS 2015 pp. 70–74, 92; USFS 2020

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Broom Flat (including Onyx Peak)	52	Yes	Presumed extant	Presumed extant	Presumed extant	2000 (unknown), 2001 (unknown), 2010 (20)	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS	No change in EO or conservation status since 2013. Individual plants and pebble plain habitat were affected by fire suppression activities during the 2015 Lake Fire (USFS 2015, pp. 73–74).	USFS 2020; CDFW 2021, p. 43
Broom Flat (including Onyx Peak)	56	No	Presumed extant	Presumed extant	Presumed extant	2010 (7)	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS	No change in EO status since 2013. In 2013, we erroneously listed The Wildlands Conservancy as a landowner at this occurrence.	USFS 2020; CDFW 2021, p. 47
Broom Flat (including Onyx Peak)	57	No	Presumed extant	Presumed extant	Presumed extant	2010 (10)	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 48
Broom Flat (including Onyx Peak)	71	No	NA	NA	Extant	2014 (~50), 2015 (6)	NA	USFS, Private	This occurrence was not included in our 2013 5-year review.	USFS 2020; CDFW 2021, p. 59
Dollar Lake	75	No	NA	Extant	Extant	2012 (50)	NA	USFS	This occurrence was included in our 2013 5-year review but had not been assigned a CNDDB EO number. This occurrence was within the 2015 Lake Fire perimeter, but no known suppression activities occurred in the area.	USFS 2020; CDFW 2021, p. 63; USFS 2015, p. 61
Fawnskin	24	No	Presumed extant	Presumed extant	Extant	2018 (unknown)	A: Urban Development; Roads and Trails; Nonnative Plants E: Climate change	USFS, Private	Because the EO was observed in 2018, it is extant rather than presumed extant.	CDFW 2021, p. 26
Fawnskin	25	No	Presumed extant	Presumed extant	Presumed extant	1979 (unknown)	A: Urban Development; Roads and Trails; Nonnative Plants E: Climate change	Big Bear Municipal Water District, USFS	No change in EO or conservation status since 2013.	CDFW 2021, p. 27
Fawnskin	49	No	Presumed extant	Presumed extant	Presumed extant	2000 (hundreds), 2008 (unknown)	A: Urban Development; Roads and Trails; Nonnative Plants E: Climate change	USFS	No change in EO or conservation status since 2013.	CDFW 2021, p. 40
Fawnskin	50	No	Presumed extant	Presumed extant	Presumed extant	2000 (0), 2008 (154)	A: Urban Development; Roads and Trails; Nonnative Plants E: Climate change	USFS	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 41

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Fawnskin	54	No	Presumed extant	Presumed extant	Extant	2012 (40)	A: Urban Development; Roads and Trails; Nonnative Plants E: Climate change	USFS	This occurrence is considered extant, because plants have been observed within 10 years.	USFS 2020; CDFW 2021, p. 45
Gold Mountain	30	Yes	Presumed extant	Presumed extant	Presumed extant	1979 (unknown), 1988 (unknown), 2008 (unknown)	A: Urban Development; Roads and Trails, Alteration of Hydrology; Nonnative Plants E: Climate change	USFS	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 32
Gold Mountain	31	No	Presumed extant	Presumed extant	Extant	2000 (24), 2005 (32), 2006 (22), 2016 (2) (all plant counts are partial surveys)	A: Urban Development; Roads and Trails, Alteration of Hydrology; Nonnative Plants E: Climate change	Big Bear Community Services District, USFS, Private	Because the EO has been observed within 10 years, it is extant rather than presumed extant.	USFS 2020; CDFW 2021, p. 31
Gold Mountain	51	No	Presumed extant	Presumed extant	Presumed extant	2000 (20)	A: Urban Development; Roads and Trails, Alteration of Hydrology; Nonnative Plants E: Climate change	USFS, Private	No change in EO or conservation status since 2012.	CDFW 2021, p. 42
Gold Mountain	55	No	Presumed extant	Presumed extant	Presumed extant	1999 (locally common)	A: Urban Development; Roads and Trails, Alteration of Hydrology; Nonnative Plants E: Climate change	Big Bear Area Regional Wastewater Agency, Big Bear City Community Services District, USFS, Private	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 46
Gold Mountain	76	No	NA	NA	Presumed extant	2009 (5)	NA	USFS	This occurrence was known to USFS but was not included in our 2013 5-year review.	USFS 2020; CDFW 2021, p. 64
Grinnell Ridge	16	No	Presumed extant	Presumed extant	Extant	1989 (50–100), 1994 (50–75), 2008 (50), 2009 (unknown), 2016 (30)	E: Climate change	USFS	Because the EO has been observed within 10 years (in 2016), it is extant rather than presumed extant. This occurrence is within the 2015 Lake Fire perimeter, but no site visits occurred immediately post-fire and no dozer or hand lines were mapped near the occurrence (USFS 2015, p. 80).	USFS 2015, p. 80; CDFW 2021, p. 15

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Holcomb Valley	22	Yes	Presumed extant	Presumed extant	Extant	2012 (2,000)	A: Roads and Trails; Alteration of Hydrology; Mining; Trampling; Recreation E: Climate change	USFS, Private	Because the EO has been observed within 10 years (in 2012), it is extant rather than presumed extant. There are impacts from recreational use.	CDFW 2021, p. 23
Holcomb Valley	22	NA	Presumed extant	Presumed extant	Included in another EO	NA	NA	NA	This EO is now included in CNDDB EO 22.	CDFW 2021, p. 23
Holcomb Valley	23	Yes	Presumed extant	Presumed extant	Extant	2012 (3,380)	A: Roads and Trails; Alteration of Hydrology; Mining; Recreational activities E: Climate change	USFS, Private	Because the EO was observed in 2012, it is extant rather than presumed extant. There are additional threats from recreation.	CDFW 2021, p. 25
NA (West Big Bear Lake)	NA	No	NA	NA	Presumed extant	2008 (250)	NA	USFS	This occurrence was not included in our 2013 5-year review.	USFS 2020
Near Highway 38	58	No	Presumed extant	Presumed extant	Presumed extant	2008 (5), 2010 (35)	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS, Private	No change in EO status since 2013. In 2013, we erroneously listed The Wildlands Conservancy as a landowner at this occurrence.	USFS 2020; CDFW 2021, p. 49
Near Highway 38	72	No	NA	NA	Presumed extant	2010 (5)	NA	USFS	This occurrence was not included in our 2013 5-year review.	USFS 2020; CDFW 2021, p. 60
Near Sugarloaf Ridge (including Wildhorse Meadow)	2	No	Presumed extant	Presumed extant	Presumed extant	1983 (less than 50)	A: Roads and Trails; Alteration of Hydrology E: Climate change	Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 3
Near Sugarloaf Ridge (including Wildhorse Meadow)	70	No	NA	NA	Presumed extant	2009 (6)	NA	USFS	This occurrence was not included in our 2013 5-year review.	USFS 2020; CDFW 2021
Near Sugarloaf Ridge (including Wildhorse Meadow)	73	No	NA	NA	Presumed extant	2010 (33)	NA	USFS	This occurrence was not included in our 2013 5-year review.	USFS 2020; CDFW 2021, p. 61

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
North Baldwin	1	Yes	Presumed extant	Presumed extant	Extant	1985 (20,000, partial survey), 2005 (315), 2009 (205), 2016 (unknown), 2017 (unknown), 2018 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants; Mining E: Climate change	CDFW, USFS	The northwestern part of this occurrence burned in the 2017 Holcomb Fire, and pebble plain habitat was affected by suppression repair activities (USFS 2017, pp. 13–15). However, because of sparse fuel within pebble plain habitat, the fire was spotty, and no plants showed evidence of burning (USFS 2017, p. 14). In 2020, the northwestern portion of the occurrence was affected by unauthorized cable trenching (Eliason 2020, pers. comm.)	Eliason 2020, pers. comm.; CDFW 2021, pp. 1–2; USFS 2021;
North Baldwin	28	No	Presumed extant	Presumed extant	Presumed extant	1979 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants; Mining E: Climate change	USFS	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 31
North Baldwin	66	No	Presumed extant	Presumed extant	Presumed extant	NA	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants; Mining E: Climate change	USFS, Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 55
Sawmill	7	Yes	Presumed extant	Presumed extant	Extant	1987 (thousands), 2005 (1,200), 2007 (100 plus), 2012 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	San Bernardino Mountains Land Trust, USFS, Private	Since 2013, parcels in this area have been acquired by the San Bernardino Mountains Land Trust.	USFS 2020, CDFW 2021, pp. 9–10,
Sawmill	8	No	Presumed extant	Presumed extant	Extant	2005 (1,200), 2006 (205), 2007 (100 plus), 2010 (1,024), 2012 (unknown), 2016 (478)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS	The EO has been observed since 2013, so it is extant rather than presumed extant. Some plant counts are for partial surveys.	USFS 2020, CDFW 2021, pp. 11–12,

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Sawmill	38	No	Presumed extant	Presumed extant	Possibly extirpated	1979 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	Private	This EO is now considered possibly extirpated, because habitat in the area has been developed, and plants have not been observed onsite for over 20 years.	CDFW 2021, p. 36
Sawmill	39	No	Presumed extant	Presumed extant	Presumed extant	2007 (12)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 37
Snow Valley	35	Yes	Presumed extant	Presumed extant	Presumed extant	1975 (7 patches), 1999 (10,500), 2000 (unknown)	E: Climate change	USFS	Because the EO is owned and managed by the USFS, urban development is not considered a threat at this site. There have been no other changes in EO or conservation status since 2013.	CDFW 2021, p. 35
South Baldwin Ridge/Erwin Lake	10	No	Presumed extant	Presumed extant	Presumed extant	1970s (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS, Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 13
South Baldwin Ridge/Erwin Lake	11	No	Presumed extant	Presumed extant	Presumed extant	2005 (350)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS, Private	No change in EO or conservation status since 2013.	CDFW 2021, p. 14
South Baldwin Ridge/Erwin Lake	67	No	Presumed extant	Presumed extant	Extant	2005 (8), 2013 (unknown)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	Big Bear Community Services District, USFS	Since an unknown number of plants were observed in 2013, this occurrence is extant rather than presumed extant.	USFS 2020; CDFW 2021, p. 56
South Baldwin Ridge/Erwin Lake	68	Yes	Presumed extant	Presumed extant	Presumed extant	2000 (unknown), 2005 (1,400), 2008 (72)	A: Urban Development; Roads and Trails; Alteration of Hydrology; Nonnative Plants E: Climate change	USFS	No change in EO or conservation status since 2013.	CDFW 2021, p. 57

Pebble Plain Complex	2021 CNDDB EO	Critical Habitat	Status at Listing	2013 Status	2021 Status	Plant counts (Year, Count)	2021 Threats	2021 Ownership	2013–2021 Change Summary	2021 References
Sugarloaf Ridge (including Wildhorse Meadow)	4	Yes	Presumed extant	Presumed extant	Extant	1983 (unknown), 2008 (3,000), 2009 (2,100 plus), 2010 (1,570 plus), 2014 (2,261)	A: Roads and Trails; Alteration of Hydrology E: Climate change	USFS	The EO has been observed since 2011, so it is extant rather than presumed extant.	USFS 2020; CDFW 2021, pp. 5–8
Sugarloaf Ridge (including Wildhorse Meadow)	4	NA	Presumed extant	Presumed extant	Included in another EO	NA	NA	NA	This EO is now included in CNDDB EO 4.	CDFW 2021, p. 6
Sugarloaf Ridge (including Wildhorse Meadow)	4	NA	Presumed extant	Presumed extant	Included in another EO	NA	NA	NA	This EO is now included in CNDDB EO 4.	CDFW 2021, p. 6
Sugarloaf Ridge (including Wildhorse Meadow)	59	No	Presumed extant	Presumed extant	Presumed extant	6	A: Roads and Trails; Alteration of Hydrology E: Climate change	USFS	No change in EO or conservation status since 2013.	USFS 2020; CDFW 2021, p. 50
Sugarloaf Ridge (including Wildhorse Meadow)	60	No	Presumed extant	Presumed extant	Presumed extant	NA	A: Roads and Trails; Alteration of Hydrology E: Climate change	USFS	No change in EO or conservation status since 2013.	CDFW 2021, p. 51
Sugarloaf Ridge (including Wildhorse Meadow)	74	No	NA	NA	Extant	2014 (15)	Horse, bike, and foot traffic is a threat per the CNDDB. The occurrences are along the Sugarloaf Trail. Some trampled plants were observed.	USFS	This occurrence was not included in our 2013 5-year review.	USFS 2020; CDFW 2021, p. 62

Threats

Our 2013 5-year review discussed Factor A threats to *Castilleja cinerea* from urban development, roads and trails, alteration of hydrology, trampling, nonnative invasive plants, mining, and fire suppression, and Factor E threats from climate change. This section summarizes new information about threats to *C. cinerea* from urban development, roads and trails, fire suppression, and climate change. We do not have new information about other threats identified in the 2013 5-year review, so refer to USFWS 2013 (pp. 12–31) for discussion of those threats.

In 2020, an unauthorized trenching incident in the northwestern portion of EO 1 affected pebble plain habitat and areas of designated *Castilleja cinerea* critical habitat (Eliason 2020, pers. comm.). Because the damage occurred at a portion of only one occurrence, we do not consider trenching a threat to the species at this time.

Development

In 2013, urban development was a threat to *Castilleja cinerea* within 8 of 13 pebble plain complexes (USFWS 2013, p. 13). The highest level of threat was present on private lands in the Big Bear Lake area (USFWS 2013, p. 14).

Our assessment of occurrence status for this review found that three occurrences (CNDDB EOs 33, 38, and 42) are possibly extirpated due to residential development. These occurrences are considered possibly extirpated because most habitat in the area has been developed, and plants have not been observed onsite for over 20 years.

We also have new information about a development project at one newly reported *Castilleja cinerea* occurrence. In 2020, Jacobs Engineering Group reported 900 plants on the site of a planned condominium development within the City of Big Bear Lake (Jacobs Engineering Group 2020, pp. 13–14). The Service reviewed the project Biological Resources Assessment and recommended measures to minimize impacts to *C. cinerea*, including long-term monitoring of translocated plants, and seed collection to conserved genetic diversity from the site (James 2021, pers. comm.).

We have no other new information about the threat of development to any other *Castilleja cinerea* occurrences.

Roads and trails

In the listing rule and our 2013 5-year review, we discussed the impacts of roads and trails to *Castilleja cinerea.* Since 2013, we have received one report of impacts to *C. cinerea* plants from road construction activities. In 2017, a road widening project impacted an area directly north of Big Bear Boulevard, where 21 plants had been detected in 2016. The impacted area is approximately 0.55 km (0.34 mi) east of CNDDB EO 26, but was included with that EO in the occurrence table (Table 2).

We have no other new information about the threat of roads or trails to *Castilleja cinerea*.

Fire suppression

Since the 2013 5-year review, fire suppression activities for the 2015 Lake Fire and the 2017 Holcomb Fire have impacted *Castilleja cinerea* plants or habitat (or both) within two pebble plain complexes.

In 2015, the Lake Fire burned approximately 31,359 acres (ac) [12,691 hectares (ha)] in the San Bernardino Mountains (USFS 2015, p. 2). Fire suppression activities affected *C. cinerea* plants and critical habitat in the Broom Flat/Onyx Peak pebble plain complex. Specifically, dozer lines and suppression repair activities damaged pebble plain habitat and uprooted plants within CNDDB EO 3 (USFS 2015, pp. 70–74, 92). The Grinnell Ridge (EO 16) and Dollar Lake (EO 75) pebble plains were within the Lake Fire perimeter, but no known fire suppression activities occurred at these sites (USFS 2015, pp. 61, 80).

In 2017, the Holcomb Fire burned 1,503 ac (608 ha) in the San Bernardino Mountains northeast of Baldwin Lake (USFS 2017, p. 6). The USFS initiated emergency consultation with us for 11 species, including *Castilleja cinerea* and the fire burned areas occupied by *C. cinerea* (USFS 2017, pp. 3, 13–19). Specifically, portions of EO 1 burned in the fire, but because of sparse fuel within pebble plain habitat, the fire was spotty, and no plants showed evidence of burning (USFS 2017, p. 15). The USFS determined that fire suppression and suppression repair activities adversely affected individual plants and critical habitat (USFS 2017, p. 27). Post-fire Burned Area Emergency Response treatments (e.g., fencing) were expected to be beneficial by reducing the likelihood of off-highway vehicle incursions and allowing vegetation recovery (USFS 2017, pp. 27–28).

Climate change

The term “climate change” refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2013, p. 1450). In 2013, we considered changes in temperature and hydrological conditions from climate change a rangewide threat to *Castilleja cinerea* (USFWS 2013, p. 31). Since 2013, new projections of future climate across the range of *C. cinerea* have become available (CEC 2019) and are described below.

Temperature changes

Southern California has already experienced a warming trend from 1951 to 2006 (Hall *et al*. 2018, p. 9). In the San Bernardino Mountains, Cal-Adapt models project increases in annual average maximum and minimum temperatures between a baseline time period (1961 to 1990) and an end of century period (2070 to 2090) (CEC 2019). Specifically, between 2070 and 2090, annual average maximum temperatures are projected to increase by 6.1 degrees Fahrenheit (°F) [3.4 degrees Celsius (°C)] under Representative Concentration Pathway (RCP) 4.5 (a scenario of stabilizing emissions), and by 8.9 °F (4.9 °C) under RCP 8.5 (a scenario of increasing emissions) (CEC 2019). The frequency, duration, and intensity of heat waves is also expected to increase (Hall *et al*. 2018, p. 12; Kalansky *et al*. 2018, p. 21).

Precipitation changes

Precipitation in southern California is highly variable from year to year (Hall *et al*. 2018, p. 12; Kalansky *et al*. 2018, p. 24). Models of future precipitation generally project small mean changes relative to the historical variability, and the overall direction of future precipitation is unclear (Hall *et al*. 2018, p. 13). Models do project increases in extreme precipitation frequency and intensity (Polade *et al*. 2017, p. 7; Swain *et al*. 2018, p. 428), including increases in the frequency of atmospheric-river storms, which deliver intense precipitation and can cause severe flooding (Dettinger 2011, p. 519). However, droughts are also projected to become more frequent and intense and will be exacerbated by higher temperatures (Kalansky *et al*. 2018, p. 25).

In Big Bear Valley (San Bernardino Mountains), average annual precipitation ranges from 18 to 35 inches. Due to a rain shadow effect, precipitation generally decreases from west to east across the valley (USGS 2012, p. 4). Therefore, the effects of changing precipitation amount and timing will also likely differ at a relatively small scale in the San Bernardino Mountains (Tank *et al*. 2009).

Snowpack changes

Warming trends have already driven declines in mountain snowpack across the western United States (Mote *et al*. 2018, p. 4). Snowpack is affected by temperature and precipitation. In a warmer climate, a higher proportion of precipitation is expected to fall as rain rather than snow, and snowpack is expected to melt earlier and more quickly (Viers *et al*. 2013, p. 9; Dettinger *et al*. 2018, p. 21). Snow lines are also expected to rise (Dettinger *et al*. 2018, p. 21).

Sun *et al*. (2016, p. 93) used downscaled general circulation models under two scenarios to predict future snowfall and snowpack in the southern California mountains. Their models included the San Bernardino, San Jacinto, and Los Angeles County Mountains. They projected that under RCP 8.5, midcentury mean snowfall would be 30 percent lower than baseline snowfall, and that snowfall loss would be greatest at lower and mid-elevations (Sun *et al*. 2016, pp. 106–107). Projections of timing of snow-free date (i.e., how much earlier snow melts compared to baseline) differed depending on the model used, but on average, the snow-free date occurred 16 days earlier (Sun *et al*. 2016, p. 108).

Potential effects of climate change on *Castilleja cinerea*

The effects of climate change on *Castilleja cinerea* and its habitat have not been directly studied, and there is uncertainty in the predictions of downscaled climate models. However, the projected abiotic pressures resulting from climate change—increased temperature, changes in precipitation, and reduced snowpack and earlier runoff—could alter the hydrology of pebble plain and other habitats occupied by *C. cinerea*. Changing hydrology may result in erosion of the clay soil, exposing the roots of pebble plain plants and resulting in plant desiccation and death. Additionally, increased temperatures may reduce the extent of frost heaving—the upwards swelling of soil in below-freezing temperatures—which helps pebble plain habitat persist by pushing stone fragments to the soil surface and limiting encroachment of trees and shrubs. Over time, an increase in erosion events and earlier thawing may reduce the amount or quality (or both) of pebble plain habitat that supports *C. cinerea*.

Consultation on U.S. Forest Service activities

In 2019, we issued a biological opinion for the ongoing activities affecting 12 mountain plant species on the San Bernardino National Forest, including *Castilleja cinerea* (USFWS 2019, entire). We discussed the general effects of nine USFS management programs on listed plants (USFWS 2019, pp. 18–26), and specific effects to *C. cinerea* (USFWS 2019, pp. 67–73).

We determined that the implementation of the U.S. Forest Service's Revised Land Resource Management Plan was not likely to jeopardize the continued existence of *Castilleja cinerea* (USFWS 2019, p. 73). We reached that conclusion because 1) USFS has developed a Pebble Plain Habitat Management Guide, which describes specific management strategies to promote recovery of pebble plain plants, and 2) USFS will avoid and minimize impacts from management activities (USFWS 2019, p. 67). To avoid and minimize those impacts, the biological opinion incorporated multiple protective measures (USFWS 2019, pp. 9–12), in addition to measures already being implemented by USFS (USFWS 2019, Enclosure Appendix A).

Summary of threats

Since the 2013 5-year review, we have received new information about ongoing threats at *Castilleja cinerea* occurrences. The new information relates to the threats of (1) urban development, (2) roads and trails, (3) fire suppression activities, (4) and climate change. However, the new information does not alter the analysis or conclusions of our 2013 5-year review (USFWS 2013, pp. 11–34).

CONCLUSION

In the 2013 5-year review, we considered *Castilleja cinerea* extant or presumed extant at 48 occurrences. Since then, we have received some new survey, monitoring, and threats information for this species. We have updated 22 of our 2013 occurrence status determinations, recognized 3 former CNDDB occurrences as part of other CNDDB occurrences, and added 10 occurrences that were not considered in the 2013 review, bringing the total number of occurrences to 55 (Table 1). Of the 55 occurrences, 19 are extant, 33 are presumed extant, and 3 are possibly extirpated.

Castilleja cinerea continues to be threatened by urban development, roads and trails, altered hydrology, fire suppression, and climate change. The new threats information received since 2013 does not appreciably alter our understanding of the species' status.

After reviewing the best available scientific information, we conclude that *Castilleja cinerea* remains a threatened 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 2013 5-year review remains an accurate reflection of the species' current status.

RECOMMENDATIONS FOR FUTURE ACTIONS

The recommended actions listed below are to be completed over the next 5 years. Successful implementation of these actions will reduce threats to *Castilleja cinerea* and provide information to better understand the biological and physical factors limiting the population growth and distribution. We recognize that conservation of this taxon will require cooperation and coordination with partners to minimize impacts from current threats and aid with future restoration efforts.

1. Work with USFS land managers to reduce impacts to *C. cinerea* and its habitat from recreational and unauthorized Off-highway vehicle (OHV) use. Coordinate with USFS on implementation of the Pebble Plains Habitat Management Guide (USFS 2002).

2. Reach out to private landowners to identify opportunities for conservation on private lands. Work with private landowners, local governments, and conservation organizations to conserve and manage habitat.

3. Continue to monitor *C. cinerea* occurrences to provide early detection of downward trends in population numbers or quality of pebble plain habitat, or both. Regular monitoring of pebble plain complexes can also help with early detection of increasing threats to specific areas (e.g., unauthorized OHV trails).

4. Study *C. cinerea* population genetics, including levels of genetic diversity and differentiation among and within occurrences. Determine levels of inbreeding, relatedness, and ploidy. This information will help us assess current levels of genetic diversity and gene flow and determine if genetic management is needed and assess appropriate seed sources for potential future reintroduction or augmentation activities.

5. Collect *C. cinerea* seed and conserve seed in an *ex-situ* (off-site) conservation seed bank, to preserve the genetic diversity in the species.

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