Eriogonum kennedyi var. *austromontanum*
(Southern mountain wild buckwheat)

5-Year Review:
Summary and Evaluation

Photo by USFWS/Joanna Gilkeson

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

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5-YEAR REVIEW

Eriogonum kennedyi var. *austromontanum* (Southern mountain wild buckwheat)

GENERAL INFORMATION

Species: *Eriogonum kennedyi* var. *austromontanum* (Southern mountain wild buckwheat), a plant variety.
Date listed under the Endangered Species Act: October 14, 1998.
Federal Register citation: USFWS 1998 (63 FR 49006).
Classification: Threatened.
Recovery Plan: There is no recovery plan for this species.
Recovery Priority Number: 9.
Critical Habitat Designation: USFWS 2007 (72 FR 73092).

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 2015. *Eriogonum kennedyi* var. *austromontanum* (Southern Mountain Wild Buckwheat) 5-Year Review: Summary and Evaluation. Prepared by the Carlsbad Fish and Wildlife Office, Carlsbad, California. 49 pp.

We initiated a status review for *Eriogonum kennedyi* var. *austromontanum* on May 25, 2011. The review was finalized on May 8, 2015 and recommended no change in status.

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

Species Overview and Habitat: *Eriogonum kennedyi* var. *austromontanum* (southern mountain wild buckwheat) is a woody-based, cushion-like, perennial plant in the buckwheat family (*Polygonaceae*). This species occurs in pebble plain habitat in the San Bernardino Mountains at elevations from 6,557 to 7,213 feet (ft) [2,000 to 2,200 meters (m)] in San Bernardino County, California (USFWS 2015, p. 2) and near the Lockwood Valley area in the Los Padres National Forest in Ventura County, California (CCH2 2020; Elvin 2022, pers. comm.). There are also

records from several localities of *E. k.* var. *austromontanum* in Kern County (Moe and Twisselmann 1995, p. 219).

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 May 20, 2021. We also contacted the U.S. Forest Service (USFS) 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 2015

At the time of listing in 1998, *Eriogonum kennedyi* var. *austromontanum* was known from seven pebble plain complexes in the San Bernardino Mountains (USFWS 1998, p. 49008). An additional complex was not identified in the final listing rule, though we consider it to be occupied based on pre-listing occupancy records. Therefore, *E. k.* var. *austromontanum* occurred in eight pebble plain complexes at the time of listing. At the time of the last 5-year review in 2015, we considered *E. k.* var. *austromontanum* extant at 37 occurrences across 10 pebble plain complexes. Additionally, the Rattlesnake Canyon pebble plain complex was listed as undetermined, and the Coxey pebble plain complex was listed as erroneous (USFWS 2015, p. 7). The California Natural Diversity Database (CNDDB) is an inventory of the status and locations of rare plants and animals in California. The CNDDB assigns “Element Occurrence” (EO) numbers to unique locations of rare taxa. In this document, we use the term “occurrence” to refer to EOs delineated by the CNDDB, or locations not in the CNDDB that are greater than 0.25 miles (0.40 kilometers) apart.

Since 2015, we have no new studies that examined *Eriogonum kennedyi* var. *austromontanum* biology, life history, or genetics. However, USFS site visits and California Department of Fish and Wildlife (CDFW) CNDDB records (CDFW 2022, entire) have resulted in updates to the number and status of *E. k.* var. *austromontanum* since our 2015 review.

At the time of listing, we were aware of specimens and floristic references (e.g., Hickman 1993, p.874) indicating the possibility of *Eriogonum kennedyi* var. *austromontanum* in the Mount Pinos-Lockwood Valley area of Ventura County, California. This was addressed in both the 1998 listing rule and 2015 5-year review where we maintained the view that plants from this area were *Eriogonum kennedyi* var. *kennedyi* and that *E. k.* var. *austromontanum* was restricted to the Big Bear region of the San Bernardino mountains (Reveal 2013, pers. comm.; USFWS 1998, p. 49008; USFWS 2015, p. 9). However, after completion of the 2015 5-year review, evaluation of these specimens by Jim Reveal (CCH2 2022; Elvin 2022, pers. comm.) determined samples from this location to be *E. k.* var. *austromontanum.* Specimens from Ventura County were also identified as *E. k.* var. *austromontanum* in the Consortium database at Grade Valley/Mutau Road [M.A. Elvin 7479 (LA); R. Burgess & M. Elvin 9686 (SBBG); R. Burgess & M. Elvin 9687 (SBBG); R. Burgess & M. Elvin 9685 (SBBG)], Frazier Mountain Road [R. Burgess 10344

(SBBG)], Lockwood Valley Road [R. Burgess 2383 (SBBG)], and southwest of Pine Springs Campground [R. Burgess 4869 (SBBG)]. In 2021, funding was awarded to the California Botanic Garden, part of which will provide resources to collect genomic information that will confirm the status of specimens in Ventura County currently recognized as *E. k.* var. *austromontanum* (Fraga 2021, entire).

Since 2015, we also received documentation that *Eriogonum kennedyi* var. *austromontanum* historically occurred in several localities in Kern County: (1) on the high ridge south of Purdy Canyon in the Tehachapi Mountains, (2) Lookout Point in the Piute Mountains, (3) Noonday Rest near Cache Peak, (4) the higher slopes of Mt. Owen at the head of Indian Wells Canyon, and on the (5) southern Kern Plateau (Moe and Twisselmann 1995). Documentation of these five historical *E. k.* var. *austromontanum* localities was published in 1967, 1995, and 2016 (Moe 2016). However, there is uncertainty about the identity and status of these localities, because *Eriogonum kennedyi* at Mt. Owen has been identified as another variety (Fraga 2008, p. 23), and there is no herbarium documentation for the other four localities.

Since the 2015 5-year review, the total number of *Eriogonum kennedyi* var. *austromontanum* occurrences known has increased from 37 to 48. A total of eleven occurrences—1 from the CNDDB (EO 47), one from the USFS records (USFS site ID 0512MT-JZ-0813A) (USFS 2021), four occurrences in Ventura County, and five historical occurrences in Kern County—were not included in the 2015 5-year review but are addressed in this review. CNDDB EO 20, its own occurrence in 2015, is now included within CNDDB EO 19. Lastly, while difficult to identify with good confidence, the USFS treats the occurrence at the Rattlesnake Canyon pebble plain complex as the listed entity, *E. k.* var. *austromontanum* (Eliason 2022, pers. comm.); we consider this occurrence at the Rattlesnake Canyon pebble plain complex to be *E. k.* var. *austromontanum.* Results from the California Botanic Garden's section 6 grant will provide more information regarding the status of this occurrence.

We reviewed the status of all known *Eriogonum kennedyi* var. *austromontanum* occurrences to identify whether the occurrences were extant, presumed extant, or possibly extirpated. Of the 37 occurrences known to us in 2015, we changed the current status of 24 occurrences due to the following new information:

1. Sixteen occurrences that were considered extant in 2015 are now considered to be presumed extant, because *E. k.* var. *austromontanum* plants have not been observed within the past 10 years.

2. Seven occurrences that were considered extant in 2015 are now considered to be possibly extirpated because *E. k.* var. *austromontanum* plants have not been observed within the past 20 years or habitat is degraded or partially developed.

3. One former CNDDB occurrence (EO 20) is now included within another CNDDB occurrence (EO 19).

In summary, there are now 48 *Eriogonum kennedyi* var. *austromontanum* occurrences across 11 pebble plain complexes in the San Bernardino Mountains, 4 occurrences in Ventura County,

and 5 historical occurrences in Kern County. A total of 16 occurrences are extant, 19 are presumed extant, 8 are possibly extirpated, and 5 are unknown. (Table 1, Table 2).

Table 1. Summary of occurrence status in 2015 and 2022.

Occurrence status[1]	Number of occurrences in 2015	Number of occurrences in 2022
Extant	37	16
Presumed extant	NA	19
Possibly extirpated	NA	8
Unknown	NA	5
Total number of occurrences	**37**	**48**

[1] We considered an occurrence "extant" if it has been observed within 10 years (since 2012). 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 or if the habitat has been degraded or partially developed.
NA – Not Applicable.

Threats

Our 2015 5-year review discussed Factor A threats to *Eriogonum kennedyi* var. *austromontanum* from urbanization, recreational activity, roads and trails, alteration of hydrology, nonnative plants, mining, trampling of habitat, fuel-wood harvesting, and fire suppression and Factor E threats from climate change. These factors continue to threaten *E. k.* var. *austromontanum*. This section summarizes new information about threats to *E. k.* var. *austromontanum* from urbanization, fire suppression, and climate change (now considered under Factor A).

In 2020, an unauthorized trenching incident within the western portion of EO 1 near Doble affected pebble plain habitat and approximately 4,000 individuals (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.

The CNDDB includes information about vandalism, dumping, and littering to EOs 1, 7, 14, and 24. Because this represents minimal impacts at four localized occurrences, we do not consider vandalism, dumping, and littering a threat to the species at this time.

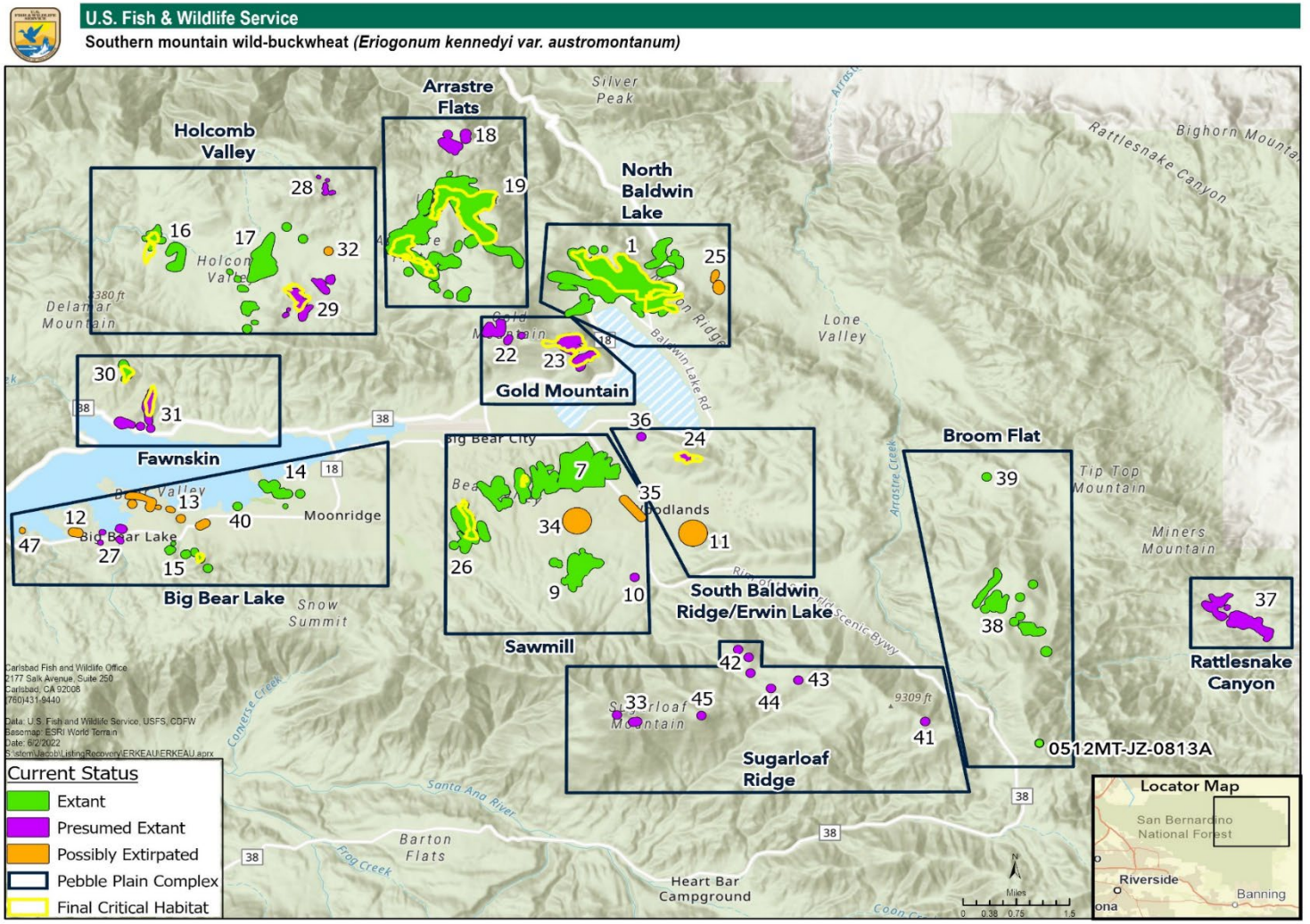

Figure 1. Map of *Eriogonum kennedyi* var. *austromontanum* occurrences in the San Bernardino Mountains, showing occurrence status. The numerical label indicates the CNDDB EO number of USFS site ID number.

Table 2. Occurrence information for *Eriogonum kennedyi* var. *austromontanum*, prepared for the 2022 5-year review.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Arrastre Flats	18	No	Extant	Presumed Extant	unk (2003)	USFS	A: Roads and Trails; Alteration of Hydrology; Fire Suppression; Climate Change	Because the EO has not been observed since 2003, it is presumed extant rather than extant. Fire Suppression was not listed as a threat at this pebble plain complex in 2015.
Arrastre Flats	19	Yes	Extant	Extant	15,100 (2019)	USFS, Private	A: Alteration of Hydrology; Nonnative Plants; Mining; Fire Suppression; Climate Change	Includes EO 20. Fire Suppression was not listed as a threat at this pebble plain complex in 2015. An eastern portion of this occurrence burned in the 2017 Holcomb Fire.
Big Bear Lake	12	No	Extant	Possibly Extirpated	unk (1981)	Private		Because the EO has not been observed since 1981, and the habitat is degraded or partially developed, it is possibly extirpated rather than extant.
Big Bear Lake	13	No	Extant	Possibly Extirpated	unk (1981)	Private		Because the EO has not been observed since 1981, and the habitat is degraded or partially developed, it is possibly extirpated rather than extant.
Big Bear Lake	14	No	Extant	Extant	unk (2012)	Private	A: Urbanization; Alteration of Hydrology; Nonnative Plants; Recreation; Climate Change	Nonnative plants were not listed as a threat to this pebble plain complex in 2015.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Big Bear Lake	15	Yes	Extant	Extant	500 (2018)	USFS, Private	A: Urbanization; Roads and Trails; Alteration of Hydrology; Climate Change	
Big Bear Lake	27	No	Extant	Presumed Extant	17 (2009)	Private	A: Urbanization; Roads and Trails; Alteration of Hydrology; Recreation; Climate Change	Because the EO has not been observed since 2009, it is presumed extant rather than extant.
Big Bear Lake	40	No	Extant	Extant	unk (2012)	Private	A: Urbanization; Alteration of Hydrology; Recreation; Climate Change	
Big Bear Lake	47	No	N/A	Possibly Extirpated	unk (2003)	Private		Because the EO has not been observed since 2003 and the habitat is degraded or partially developed, it is possibly extirpated. This occurrence was not included in the 2015 5-year review.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Broom Flat	38	No	Extant	Extant	unk (2015)	USFS, San Manuel Band of Mission Indians	A: Alteration of Hydrology; Nonnative Plants; Mining; Recreation; Fire Suppression; Climate Change	Parcel within EO is now owned by San Manuel Band of Mission Indians. Mining was not listed as a threat at this pebble plain complex in 2015. The EO was impacted by suppression and suppression repair activities during the 2015 Lake Fire, when bulldozer lines damaged pebble plain habitat and individual plants.
Broom Flat	39	No	Extant	Extant	1000+ (2012)	USFS	A: Recreation; Climate Change	
Broom Flat	NA	No	N/A	Extant	1 (2020)	USFS	N/A	This occurrence was not included in the 2015 5-year review. USFS Occurrence ID 0512MT-JZ-0813A (USFS 2021).
Fawnskin	30	Yes	Extant	Extant	200 (2012)	USFS	A: Nonnative Plants; Recreation; Climate Change	
Fawnskin	31	Yes	Extant	Presumed Extant	unk (2007)	USFS, Private	A: Urbanization; Roads and Trails; Alteration of Hydrology; Nonnative Plants, Recreation; Climate Change	Because the EO has not been observed since 2007, it is presumed extant rather than extant.
Gold Mountain	22	No	Extant	Presumed Extant	unk (2003)	USFS	N/A	Because the EO has not been observed since 2003, it is presumed extant rather than extant.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Gold Mountain	23	Yes	Extant	Presumed Extant	unk (2003)	USFS	A: Roads and Trails; Alteration of Hydrology; Nonnative Plants; Recreation; Fire Suppression; Climate Change	Because the EO has not been observed since 2003, it is presumed extant rather than extant. Because the EO is on land owned and managed by the USFS, urbanization is not considered a threat at this site. Fire Suppression was not listed as a threat at this pebble plain complex in 2015.
Holcomb Valley	16	Yes	Extant	Extant	3900 (2012)	USFS, Private	A: Roads and Trails; Alteration of Hydrology; Mining; Recreation; Climate Change	
Holcomb Valley	17	No	Extant	Extant	5700 (2012)	USFS, Private	A: Roads and Trails; Alteration of Hydrology; Mining; Recreation; Climate Change	
Holcomb Valley	28	No	Extant	Presumed Extant	unknown (2000)	USFS	N/A	Because the EO has not been observed since 2000, it is presumed extant rather than extant. Despite not being recorded for 22 years, the habitat is not degraded and should be surveyed in the near term.
Holcomb Valley	29	Yes	Extant	Presumed Extant	unk (2008)	USFS	N/A	Because the EO has not been observed since 2008, it is presumed extant rather than extant.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Holcomb Valley	32	No	Extant	Possibly Extirpated	unk (1979)	USFS		Because the EO has not been observed since 1979, it is possibly extirpated rather than extant.
North Baldwin Lake	1	Yes	Extant	Extant	100 in 2021	USFS, CDFW, Private	A: Urbanization; Roads and Trails; Alteration of Hydrology; Nonnative Plants; Mining; Recreation; Fire Suppression; Climate Change	Fire Suppression was not listed as a threat at this pebble plain complex in 2015. A western portion of this occurrence burned in the 2017 Holcomb Fire.
North Baldwin Lake	25	No	Extant	Possibly Extirpated	unk (1979)	USFS		Because the EO has not been observed since 1979, it is possibly extirpated rather than extant.
Rattlesnake	37	No	Undetermined	Presumed Extant	unk (2004)	USFS	A: Roads and Trails; Alteration of Hydrology; Recreation; Mining; Fire Suppression; Climate Change	This occurrence was listed as undetermined in 2015. No threats were listed for this occurrence in 2015.
Sawmill	7	Yes	Extant	Extant	400 (2019)	Private, USFS, Local (Big Bear Valley Recreation and Park District)	A: Urbanization; Alteration of Hydrology; Nonnative Plants; Recreation; Fire Suppression; Climate Change	Parcel within EO now owned by local government (Big Bear Valley Recreation and Park District). Fire Suppression was not listed as a threat at this pebble plain complex in 2015.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Sawmill	9	No	Extant	Extant	9870 (2016)	USFS	A: Urbanization; Alteration of Hydrology; Recreation; Climate Change	
Sawmill	10	No	Extant	Presumed Extant	unk (2006)	USFS	N/A	Because the EO has not been observed since 2006, it is presumed extant rather than extant.
Sawmill	26	Yes	Extant	Extant	unk (2017)	Private, USFS	A: Urbanization; Alteration of Hydrology; Recreation; Climate Change	
Sawmill	34	No	Extant	Possibly Extirpated	unk (1947)	Private		Because the EO has not been observed since 1947, and the habitat is degraded or partially developed, it is possibly extirpated rather than extant.
Sawmill	35	No	Extant	Possibly Extirpated	unk (1987)	Private		Because the EO has not been observed since 1987, and the habitat is degraded or partially developed, it is possibly extirpated rather than extant.
South Baldwin Ridge/Erwin Lake	11	No	Extant	Possibly Extirpated	unk (1979)	USFS, Private		Because the EO has not been observed since 1979, it is possibly extirpated rather than extant.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
South Baldwin Ridge/Erwin Lake	24	Yes	Extant	Presumed Extant	2000 (2008)	USFS	A: Alteration of Hydrology; Nonnative Plants; Mining; Recreation; Climate Change	Because the EO has not been observed since 2008, it is presumed extant rather than extant. Mining was not listed as a threat at this pebble plain complex in 2015.
South Baldwin Ridge/Erwin Lake	36	No	Extant	Presumed Extant	unk (2003)	USFS	N/A	Because the EO has not been observed since 2003, it is presumed extant rather than extant.
Sugarloaf Ridge	33	No	Extant	Presumed Extant	40+ (2010)	USFS	N/A	Because the EO has not been observed since 2010, it is presumed extant rather than extant.
Sugarloaf Ridge	41	No	Extant	Presumed Extant	1 (2010)	USFS	N/A	Because the EO has not been observed since 2010, it is presumed extant rather than extant.
Sugarloaf Ridge	42	No	Extant	Presumed Extant	10+ (2010)	USFS	A: Roads and Trails; Alteration of Hydrology; Climate Change	Because the EO has not been observed since 2010, it is presumed extant rather than extant. Fire Suppression and Trampling of Habitat were listed as threats at this pebble plain complex in 2015.
Sugarloaf Ridge	43	No	Extant	Presumed Extant	1 (2010)	USFS	N/A	Because the EO has not been observed since 2010, it is presumed extant rather than extant.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Sugarloaf Ridge	44	No	Extant	Presumed Extant	1 (2010)	USFS	N/A	Because the EO has not been observed since 2010, it is presumed extant rather than extant.
Sugarloaf Ridge	45	No	Extant	Presumed Extant	27 (2010)	USFS	N/A	Because the EO has not been observed since 2010, it is presumed extant rather than extant.
Grade Valley/Mutau Road, Ventura County	N/A	No	N/A	Extant	unk (2014)	USFS	N/A	These Ventura County specimens are identified as *E. k.* var. *austromontanum* in the Consortium database (M.A. Elvin 7479 (LA); R. Burgess & M. Elvin 9686 (SBBG); R. Burgess & M. Elvin 9687 (SBBG); R. Burgess & M. Elvin 9685 (SBBG).
Frazier Mountain Road, Ventura County	N/A	No	N/A	Extant	unk (2016)	USFS	N/A	R. Burgess 10344 (SBBG) "Ephemeral drainage off Frazier Mtn Rd"

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
Lockwood Valley Road, Ventura County	N/A	No	N/A	Presumed Extant	unk (1997)	USFS	N/A	R. Burgess 2383 (SBBG) "Upper Cuyama Valley, off south side Lockwood Valley Road, between mile markers 12 and 13." Because the locality has not been observed since 1997, it is presumed extant. Despite not being recorded for 25 years, the habitat is not degraded and should be surveyed in the near term.
SW of Pine Springs Campground, Ventura County	N/A	No	N/A	Presumed Extant	unk (2001)	USFS	N/A	R. Burgess 4869 (SBBG) Because the locality has not been observed since 2001, it is presumed extant. Despite not being recorded for 21 years, the habitat is not degraded and should be surveyed in the near term.

Pebble Plain Complex or locality	CNDDB EO	Critical Habitat	2015 Status	2022 Status (USFWS)	Most Recent Plant Counts	Ownership	Threats	2015 - 2021 Change Summary
5 localities in Kern County	N/A	No	N/A	Unknown	Unk (1967)	USFS, BLM, Private	N/A	Historically reported at five localities in Kern County: south of Purdy Canyon in the Tehachapi Mountains, Lookout Point in the Piute Mountains, Noonday Rest near Cache Peak, Owen Peak at the head of Indian Wells Canyon, and on the southern Kern Plateau (Moe and Twisselmann 1995). The identity and status of these localities is unknown because *Eriogonum wrightii* at Mt. Owen has been identified as var. *purpusii* (Fraga 2008, p. 23), and there is no herbarium documentation for the other localities.

Unk – Unknown.
N/A – Not Applicable.

Fire suppression

Since the 2015 5-year review, fire suppression activities for the 2015 Lake Fire and 2017 Holcomb Fire have impacted *Eriogonum kennedyi* var. *austromontanum*.

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 *Eriogonum kennedyi* var. *austromontanum* plants in the Broom Flat pebble plain complex. Specifically, dozer lines damaged pebble plain habitat and individual plants within EO 38. The pebble plain was also affected by suppression repair activities (USFS 2015, pp.73–74).

In 2017, the Holcomb Fire burned 1,503 ac (608 ha) in the San Bernardino Mountains northeast of Baldwin Lake (USFS 2017, p. 6). Emergency consultation was initiated by the USFS for 11 species, including *Eriogonum kennedyi* var. *austromontanum.* The fire burned areas occupied by *E. k.* var. *austromontanum* (USFS 2017, pp. 3, 13–19), including portions of EO 1 and 19, which were within the perimeter of the fire. The USFS determined that Holcomb Fire suppression and suppression repair activities adversely affected individual *E. k.* var. *austromontanum* plants and critical habitat. However, post-fire Burned Area Emergency Response treatments, such as fencing, were expected to have beneficial effects for *E. k.* var. *austromontanum* plants and critical habitat by reducing the likelihood of off-highway vehicle (OHV) 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). Since 2015, new projections of future climate across the range of *E. k.* var. *austromontanum* have become available (CEC 2019) and impacts to the habitat are described below (Factor A).

Future climate projections are developed under four Representative Concentration Pathways (RCPs) of 21st century greenhouse gas emissions, air pollutant emissions, and land use (IPCC 2014, p. 8, 57). RCP 4.5 is an intermediate scenario where warming increases before stabilizing by 2100. RCP 8.5 is a "business as usual" scenario with high human population, high energy demand, and modest improvements in energy intensity (Riahi *et al*. 2011, p. 43; IPCC 2014, p. 57).

<u>Temperature changes</u>

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 RCP 4.5, and 7.7 °F [4.3 °C] under RCP 8.5 (CEC 2019, 2022).

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; Kalanksy *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 (45 to 89 centimeters). 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). Average snow levels 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 *Eriogonum kennedyi* var. *austromontanum*

The effects of climate change on *Eriogonum kennedyi* var. *austromontanum* 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 *E. k.* var. *austromontanum*. 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 *E. k.* var. *austromontanum* rangewide. Many of these factors—record high temperatures, multi-year drought, precipitation extremes, and high wind events—are conditions for large fires, which may become more common in the future (Westerling *et al*. 2018, p.23). With fire suppression activities already a threat for *E. k.* var. *austromontanum*, increased fires due to climate change could potentially increase this threat further.

Consultation on U.S. Forest Service activities

In 2019, we issued a biological opinion for the ongoing San Bernardino National Forest (SBNF) actions affecting 12 mountain plant species, including *Eriogonum kennedyi* var. *austromontanum* (USFWS 2019, entire). We discussed the general effects of nine USFS management programs on listed plants (USFWS 2019, pp.18–26), including specific effects to *E. k.* var. *austromontanum* (USFWS 2019, pp. 74–78) and determined implementation of the USFS's Revised Land Resource Management Plan was not likely to jeopardize the continued existence of *Eriogonum kennedyi* var. *austromontanum* (USFWS 2019, pp. 77–78).

This conclusion was supported because: (1) USFS has developed a Pebble Plain Habitat Management Guide, which describes specific management strategies to promote the recovery of pebble plain plants, and (2) USFS will avoid and minimize impacts from management activities (USFWS 2019, p. 78). To avoid and minimize those impacts, the biological opinion incorporated multiple protective measures (USFWS 2019, pp. 9–13), in addition to measures already being implemented by USFS (USFWS 2019, Enclosure).

In 2022, we issued a biological opinion based on our review of the USFS's proposed special-use permit application to upgrade and rebuild the existing Doble 33-kilovolt overhead distribution line (USFWS 2022, entire). We discussed the general and specific effects of the proposed project on 11 federally listed species and designated critical habitat for 8 species. Project activities would permanently remove 0.05 ac (0.02 ha) and temporarily disturb 1.55 ac (0.63 ha) of *Eriogonum kennedyi* var. *austromontanum* occupied habitat and remove 0.05 ac (.02 ha) and temporarily disturb 2.3 ac (0.93 ha) of critical habitat. We determined that the proposed activities are not likely to jeopardize the continued existence of *Eriogonum kennedyi* var. *austromontanum* (USFWS 2022, pp. 54–55).

Summary of Threats

Since the 2015 5-year review, we received new information from the CNDDB and USFS about ongoing threats at *Eriogonum kennedyi* var. *austromontanum* occurrences. The new information relates to the threats of (1) urbanization, (2) fire suppression, and (3) climate change. However, the new information does not alter the analysis or conclusions of our 2015 5-year review (USFWS 2015, pp. 10–33).

CONCLUSION

In the 2015 5-year review, we considered *Eriogonum kennedyi* var. *austromontanum* extant at 37 occurrences. Since then, we received new survey, monitoring, and threats information for this species. We updated the status of occurrences described in our previous status review, merged 1 former CNDDB occurrence into part of an existing occurrence, added 1 new USFS, 1 new CNDDB occurrence, 4 Ventura County occurrences, and 5 historical Kern County occurrences that were not considered in the 2015 review, and updated the determination of the Rattlesnake Canyon pebble plain complex occurrence, bringing the total number of occurrences to 48 (Table 1). Of the 48 occurrences, 16 are extant, 19 are presumed extant, 8 are possibly extirpated, and 5 are unknown.

Eriogonum kennedyi var. *austromontanum* continues to be threatened by urbanization, roads and trails, alteration of hydrology, fire suppression, nonnative plants, and climate change. The new information and updated occurrence status do not substantially alter the species' status or the results of our five-factor analysis in the 2015 5-year review. Therefore, we conclude that *Eriogonum kennedyi* var. *austromontanum* remains a federally threatened species and do not recommend a change in status at this time.

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 *Eriogonum kennedyi* var. *austromontanum* 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 future restoration efforts.

1. Work with USFS land managers to reduce impacts to *E. k.* var. *austromontanum* and its habitat from recreation and unauthorized OHV use. Provide comment on biological assessments for proposed activities to support SBNF program of road closures and assistance in securing resources for the placement of more effective barriers in the areas that receive the highest recreational uses from OHV. Coordinate with USFS on implementation of the Pebble Plains Habitat Management Guide (USFS 2002).

2. Work with private landowners, local governments, and conservation organizations to conserve and manage habitat. Continue to work with state and local groups to purchase *E. k.* var. *austromontanum* habitat from willing sellers. Use resources from USFWS' Partners for Fish and Wildlife Program and Section 6 Grants as a tool to conserve, manage, or purchase habitat.

3. Continue to monitor *E. k.* var. *austromontanum* occurrences to provide early detection of downward trends in the population numbers, quality of pebble plain habitat, or both, particularly in areas that have not been surveyed for over 10 years. Historical locations in Kern County should be included in survey efforts as there have been no observations in over 50 years, and surveys identifying *E. k.* var. *austromontanum* in Kern County

could expand the species' range. Regular monitoring can also help with early detection of increasing threats to specific areas such as OHV trails. Monitoring may include remote sensing and mapping of unauthorized OHV trails.

4. Evaluate reproductive life history characteristics such as seed germination requirements, mechanism of seed dispersal, and seed viability. Collect *E. k.* var. *austromontanum* seed and conserve seed in an *ex-situ* conservation seed bank to preserve the genetic diversity in the species. Determine the distribution of genetic diversity in the species occurrences.

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FIELD OFFICE APPROVAL

Lead Field Supervisor, Fish and Wildlife Service

☒ Approve

SCOTT SOBIECH

Digitally signed by SCOTT SOBIECH
Date: 2022.08.30 09:30:40 -07'00'

Scott A. Sobiech
Field Supervisor