

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

# California Endangered Species Act



**PETITION AND RECOMMENDATION TO LIST BEAR  
LAKE BUCKWHEAT  
(*ERIOGONUM MICROTHECA* VAR. *LACUS-URSI*)  
AS AN ENDANGERED SPECIES UNDER  
THE CALIFORNIA ENDANGERED SPECIES ACT**

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Report to the Fish and Game Commission

July 2024



*Cover photo of Bear Lake buckwheat by Duncan Bell (2023).*

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**LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS**

- CAL FIRE – California Department of Forestry and Fire Protection
- CEQA – California Environmental Quality Act
- CESA – California Endangered Species Act
- CNDDDB – California Natural Diversity Database
- Commission – California Fish and Game Commission
- CRPR – California Rare Plant Rank
- Department – California Department of Fish and Wildlife
- ESA – Federal Endangered Species Act
- PRISM – Parameter-elevation Regression on Independent Slopes Model
- SBNF – San Bernardino National Forest
- USFS – United States Forest Service

- et al. – “and others”
- id. – “the same”
- pers. comm. – personal communication
- ssp. – subspecies
- var. – variety

**PETITION AND RECOMMENDATION TO THE CALIFORNIA FISH AND GAME COMMISSION**

For action pursuant to Section 670.1, Title 14, California Code of Regulations (CCR) and Sections 2072 and 2073 of the Fish and Game Code relating to listing and delisting endangered and threatened species of plants and animals.

**I. Species Being Petitioned:**

Common Name: Bear Lake buckwheat

Scientific Name: *Eriogonum microtheca* var. *lacus-ursi*

**II. Recommended Action:**

List as Endangered

**III. Author of Petition:**

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*I hereby certify that, to the best of my knowledge, all statements made in this petition are true and complete.*

Name: Jeff Drongesen

Title: Branch Manager, Habitat Conservation Planning Branch

Signature:



Date: 7/2/2024

## EXECUTIVE SUMMARY

The California Department of Fish and Wildlife's (Department) Native Plant Program hereby submits this petition and recommendation to the California Fish and Game Commission (Commission) to list Bear Lake buckwheat (*Eriogonum microtheca* var. *lacus-ursi*) as endangered pursuant to the California Endangered Species Act (CESA). CESA allows the Department to make a recommendation to the Commission to add a species to, or remove a species from, either the list of endangered species or the list of threatened species in the absence of a listing petition from an interested party (Fish & G. Code, § 2072.7). This report is both a Department-prepared petition and a recommendation to the Commission to accept and consider the petition (*id.*).

Bear Lake buckwheat is a subshrub in the buckwheat family with only a single known occurrence on the south shore of Big Bear Lake in San Bernardino County, California. Bear Lake buckwheat grows on a unique substrate of gray, silty, clay soil in a Jeffrey pine and juniper woodland. Bear Lake buckwheat occupies an area of less than 1.5 acres with 150 plants estimated in 2023. While Bear Lake buckwheat has been visited periodically over the years, no formal monitoring or research studies have been conducted on the species.

Bear Lake buckwheat is primarily threatened by habitat modification or destruction from the potential development of the private property where the species occurs. The property is owned by the Bear Valley Mutual Water Company and is being leased to the City of Big Bear Lake, who is exploring opportunities to further develop the property. Other significant threats to Bear Lake buckwheat include human disturbances (from off-road vehicle use, footpaths/trampling, and trash dumping), effects of small population size, and fire and fuel reduction activities. In addition, Bear Lake buckwheat is threatened by climate change, non-native plants, and overexploitation which could become increasingly significant in the future if the species is not monitored or adequately managed.

This petition and recommendation to list Bear Lake buckwheat as endangered under CESA meets the requirements set forth in Fish and Game Code sections 2072.3 and 2072.7 and the California Code of Regulations, title 14, section 670.1, subdivision (d)(1). The Department has determined that there is sufficient scientific information to indicate that the petitioned action may be warranted. Therefore, the Department recommends that the Commission accept the petition for further consideration pursuant to CESA (Fish & G. Code, § 2073.5, subd. (a)(2)).

## INTRODUCTION

This report, prepared and submitted by the California Department of Fish and Wildlife's (Department) Native Plant Program, constitutes a petition and recommendation to the California Fish and Game Commission (Commission) to list Bear Lake buckwheat (*Eriogonum microtheca* var. *lacus-ursi*) as endangered pursuant to the California Endangered Species Act (CESA).

### CESA Listing Petition Overview

CESA allows the Department to make a recommendation to the Commission to add a species to, or remove a species from, either the list of threatened species or the list of endangered species in the absence of a listing petition from an interested party (Fish & G. Code, § 2072.7). This report is both a Department-prepared petition and a recommendation to the Commission to accept and consider the petition (*id.*).

For the Commission to accept a petition, the petition must include sufficient scientific information to indicate that the petitioned action may be warranted. The petition must contain "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant" (Fish & G. Code, § 2072.3). Department-prepared petitions also include a recommendation to the Commission on whether the petition provides sufficient scientific information to indicate that the petitioned action may be warranted (Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)). Once the Department submits its petition and recommendation to the Commission, the Commission shall schedule the petition for consideration at its next available public meeting, but not sooner than 30 days after the Commission's receipt and public release of the petition (Fish & G. Code, § 2074). If the Commission finds that the petition provides sufficient information to indicate the petitioned action may be warranted, the Commission shall publish a notice of finding that the petition is accepted for consideration. The Commission shall include in the notice that the petitioned species is a candidate species under CESA (Fish & G. Code, § 2074.2, subd. (e)(2)).

The Department must produce, within 12 months of the Commission's acceptance of the petition, a peer-reviewed report based upon the best scientific information available that advises the Commission on whether the petitioned action is warranted (Fish & G. Code, § 2074.6). Based on that report and other information in the

administrative record, the Commission then determines whether the petitioned action is warranted (Fish & G. Code, § 2075.5).

### **Species Taxonomy and Description**

The Commission has the authority to list certain “species or subspecies” as endangered or threatened under CESA (Fish & G. Code, §§ 2062, 2067, 2068, 2070). The listing process is the same for species and subspecies (Fish & G. Code, §§ 2070-2079.1). Bear Lake buckwheat is a variety of the species *Eriogonum microtheca*; however, for convenience, the term “species” is used herein to refer to Bear Lake buckwheat.

### **Species Taxonomy**

Bear Lake buckwheat (*Eriogonum microtheca* Nutt. var. *lacus-ursi* Reveal & A. Sanders) was first collected as *E. microthecum* in Bear Valley, California by Samuel Bonsall Parish and William Fletcher Parish in August of 1882 (Reveal 2004); however, the species may have been known to Native Americans before that time. Bear Lake buckwheat was not formally described as a variety of *E. microthecum* until December of 2004 when James Reveal published several new species and varieties in *Eriogonum*, including Bear Lake buckwheat (*E. microthecum* var. *lacus-ursi*) (Reveal 2004).

There is some confusion as to the correct spelling of Bear Lake buckwheat's scientific name. *E. microtheca* was first published as a species by Thomas Nuttall in 1848 (Nuttall 1848). The spelling of *E. microtheca* was maintained by several additional publications in 1853 and 1856 before *E. microthecum* began to be used in 1857 (Williamson Expedition 1857, Reveal and Gandhi 2014). The change in spelling may have been a result of correcting what many believed to be a grammatical mistake. The usual practice for Latin scientific names is to have the genus and specific epithet endings agree in gender. *Eriogonum* is gender neuter suggesting the specific epithet should be the gender neuter *microthecum*, not the feminine *microtheca*. While *E. microthecum* is the most common spelling used in publications since 1858 and is still widely used today, recent publications and floras have reverted back to using *E. microtheca* (Reveal 2005, Reveal and Rosatti 2012, Reveal and Gandhi 2014). *E. microtheca* var. *lacus-ursi* is the currently accepted spelling for Bear Lake buckwheat based on the spelling published in recent floras and is the name used in this report (Reveal 2005, Reveal and Rosatti 2012).



## Species Description

Bear Lake buckwheat is a member of the buckwheat family (Polygonaceae). It is a subshrub with a woody stem at the base of the plant and herbaceous (i.e., non-woody) stems that die back seasonally (Reveal 2005, Baldwin et al. 2012, Reveal and Rosatti 2012). Bear Lake buckwheat is typically 15 to 20 cm (5.9 to 7.9 in) tall and 40 to 60 cm (15.7 to 23.6 in) in diameter (Reveal and Rosatti 2012). Leaf blades are narrowly elliptic measuring 0.7 to 1.5 cm (0.3 to 0.6 in) long and 0.07 to 0.3 cm (0.03 to 0.12 in) wide (Reveal 2005, Reveal and Rosatti 2012). Leaf margins are usually rolled under, with white, densely matted hairs on the lower surface of the leaves and no hairs on the upper surface of the leaves (Figure 1) (Reveal and Rosatti 2012).

Bear Lake buckwheat has groupings of flowers (inflorescences) that are 1 to 3 cm (0.4 to 1.2 in) long (Figure 1) (Reveal 2005, Baldwin et al. 2012, Reveal and Rosatti 2012). Flowering stems are 4 to 8 cm (1.6 to 3.1 in) long and generally hairless but may have some sparse hairs on them (Reveal 2004, 2005, Reveal and Rosatti 2012). Like most members of the buckwheat family, Bear Lake buckwheat has involucre (structures that grow under the flower or grouping of flowers, holding them together as a unit) (Baldwin et al. 2012). Involucre in Bear Lake buckwheat are 3 to 4 mm (0.12 to 0.16 in) long and generally hairless (Reveal and Rosatti 2012). Individual flowers are 2 to 2.5 mm (0.08 to 0.10 in) long and are cream colored (Reveal 2005, Reveal and Rosatti 2012). Bear Lake buckwheat produces dry one-seeded fruits called achenes that are 2 to 2.5 mm (0.08 to 0.10 in) long (Reveal 2005, Baldwin et al. 2012).



Figure 1. Photos of Bear Lake buckwheat including flowers (left), leaves (middle), and plants in their natural habitat (right). Photo credit for left and right photos: Duncan Bell 2023. Photo credit for middle photo: R.A. Chasey 2022.

## Similar Taxa

Bear Lake buckwheat is one of ten varieties of *E. microtheca* in California (Reveal and Rosatti 2012). In addition to Bear Lake buckwheat, three other varieties of *E. microtheca* have been documented to occur in the San Bernardino Mountains of California and are similar in appearance to Bear Lake buckwheat (Figure 2) (Reveal 2004, CCH 2024). Johnston's buckwheat (*E. m. var. johnstonii*), San Bernardino buckwheat (*E. m. var. corymbosoides*), and Simpson's buckwheat (*E. m. var. simpsonii*)<sup>1</sup> have all been reported as occurring in the same mountain range as Bear Lake buckwheat; however, Bear Lake buckwheat has a highly restricted distribution within the San Bernardino Mountains and does not directly co-occur with any other *E. microtheca* variety (CCH 2024).

Bear Lake buckwheat, Johnston's buckwheat, San Bernardino buckwheat, and Simpson's buckwheat can be distinguished from each other through a combination of characteristics related to plant size, leaf attributes, and stem hairs (Table 1). Bear Lake buckwheat can most easily be identified by its rolled-under leaf blade margins, no hairs on the upper surface of the leaf, and white, densely matted hairs on the lower surface of the leaf. These leaf characteristics, taken together, are not shared by any other variety of *E. microtheca* in the San Bernardino Mountains.

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<sup>1</sup> The Jepson eflora indicates Simpson's buckwheat does not occur in the San Bernardino Mountains and is restricted to the eastern Sierra Nevada and eastern Mojave Desert in California (Reveal and Rosatti 2012). However, several herbarium collections from the San Bernardino Mountains have been identified as Simpson's buckwheat, so that variety is included in this section (CCH 2024).

Table 1. Key traits to distinguish between *Eriogonum microtheca* varieties that grow in the San Bernardino Mountains (Reveal 2005, Reveal and Rosatti 2012).

	Bear Lake buckwheat	Johnston's buckwheat	San Bernardino buckwheat	Simpson's buckwheat
Variety	<i>lacus-ursi</i>	<i>johnstonii</i>	<i>corymbosoides</i>	<i>simpsonii</i>
Height	15-20 cm (5.9-7.9 in)	6-13 cm (2.4-5.1 in)	30-60 cm (11.8- 23.6 in)	10-150 cm (3.9-59 in)
Width	40-60 cm (15.7-23.6 in)	20-50 cm (7.9- 19.7 in)	60-150 cm (23.6-59 in)	40-160 cm (15.7-63 in)
Leaf shape	Narrowly elliptic	Elliptic to ovate	Elliptic to obovate	Narrowly elliptic
Leaf margins	Rolled-under	flat	flat	Rolled-under
Leaf hairs (upper surface /lower surface)	No hairs/ dense white hairs	Hairy or not/ dense white hairs	Hairy or not/ dense white hairs	Hairy/ dense white hairs
Stem hairs	Sparse hairs or no hairs	Hairy or not	Dense white hairs	Dense white hairs





Figure 2. Photos of *Eriogonum microtheca* varieties from the San Bernardino Mountains. Upper left photo is Bear Lake buckwheat (*Eriogonum microtheca* var. *lacus-ursi*). Upper right photo is Johnston's buckwheat (*E. m.* var. *johnstonii*). Lower left photo is San Bernardino buckwheat (*E. m.* var. *corymbosoides*). Lower right photo is Simpson's buckwheat (*E. m.* var. *simpsonii*). Photo credit: Duncan Bell 2023.

## **PETITION TO LIST BEAR LAKE BUCKWHEAT AS ENDANGERED UNDER CESA**

This petition includes discussion of each of the required components of a complete listing petition, as well as the Department's recommendation to the Commission on whether the petition provides sufficient scientific information to indicate that the petitioned action may be warranted (Fish & G. Code, §§ 2072.3, 2072.7, 2073.5; Cal. Code Regs., tit. 14, § 670.1, subds. (b), (d)(1)). A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant" (Fish & G. Code, § 2072.3). The Department's recommendation to the Commission must contain an evaluation of whether the petition provides such information (Fish & G. Code, § 2072.5, subd. (a); Cal. Code Regs., tit. 14, § 670.1, subds. (b), (d)(1)). To create a more cohesive and readable document, the Department has, in some instances, grouped similar components together and renamed components in this report.

### **Life History**

Bear Lake buckwheat has bisexual flowers that bloom between July and October, with fruiting likely lasting into November (Reveal 2005, Reveal and Rosatti 2012, Bell 2023). There have not been any studies specific to the life history of Bear Lake buckwheat, but some assumptions can be made based on characteristics shared by most buckwheat species. Buckwheat flowers tend to have an open flower morphology with easily accessible nectar and pollen, which has been shown to be the type of flower visited more often by generalist insect pollinators (McCall and Primack 1992, Ollerton et al. 2007). Therefore, while Bear Lake buckwheat may be pollinated by generalist insect pollinators based on its flower morphology, studies are needed to determine what kind of pollinators visit Bear Lake buckwheat and whether the species is dependent on certain pollinators to reproduce.

Observations of Bear Lake buckwheat in 2023 noted that nearly all the plants were in flower in July with abundant seeds produced in October (Bell pers. comm. 2024). In 2008, about 10% of the plants were presumed to be seedlings (not woody, and generally unbranched) (USFS 2008). No seedlings were observed in 2023 (Bell pers. comm. 2024). Several rare perennial buckwheat species that have very restricted ranges in other parts of California and other states, have been shown to have low seed set and high seedling mortality (Kaye et al. 1990, Morefield 1996, Dunwiddie et al. 2001,



Caplow 2005). Based on observations from 2023, Bear Lake buckwheat appears to have ample seed set with seeds viable when tested in a lab setting (Bell pers. comm. 2024, Birker pers. comm. 2024). Seedlings were observed on site in 2008 but no seedlings were observed in 2023. Additional data on presence or absence of seedlings over time is needed.

Dispersal of Bear Lake buckwheat seeds is likely similar to observed dispersal of other buckwheat species, with seeds dispersing through gravity, wind, and animals (such as ants) (Dunwiddie et al. 2001). Buckwheat seeds fall from the plant enclosed by light, papery flower parts, suggesting that wind may play an important role in seed dispersal (Morefield 1996). Ants have been shown to move seeds for other buckwheat species, but it is unclear if this plays a role for Bear Lake buckwheat seed dispersal (Dunwiddie et al. 2001).

No information is available on the typical growth rate and life span of Bear Lake buckwheat, which is a perennial species. In addition, studies are needed on ecological relationships with other organisms and the presence of seedlings, juveniles, reproductive adults, and senesced plants to better assess the long-term health and viability of Bear Lake buckwheat.

### **Range, Distribution, and Detailed Distribution Map**

A species' range for the purposes of CESA is the geographical area where the species occurs within California (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal. App. 4th 1535, 1551).

As documented in the Department's California Natural Diversity Database (CNDDDB), Bear Lake buckwheat is a species that has only ever been known from a single occurrence along Alden Road on the south shore of Big Bear Lake at the northeast end of the San Bernardino Mountains in San Bernardino County, California (Figure 3) (CNDDDB 2024). This occurrence is at an elevation of about 2,063 meters (6,770 feet) (CCH 2024). It is unknown if the species was once more common in the Big Bear Lake area, but it is likely that the species has always had a very restricted range, given that no other Bear Lake buckwheat occurrences have been reported.



Figure 3. Map of Bear Lake buckwheat's range. Detailed location information is available through the California Natural Diversity Database (CNDDDB). This figure shows the Bear Lake buckwheat occurrence as a more general shape (orange star) to adhere to the CNDDDB license agreement and to protect the species from harm.

The Bear Lake buckwheat occurrence is bisected by Alden Road, and for the purposes of this listing petition, the portions of this occurrence on the west side of Alden Road and on the east side of Alden Road are sometimes discussed as separate populations. The population on the west side of Alden Road has been extirpated (CNDDDB 2024). The population on the east side of Alden Road is extant. The current area occupied by Bear Lake buckwheat is less than 1.5 acres (CNDDDB 2024). The Big Bear Lake area has been surveyed extensively over many years and no other populations of Bear Lake buckwheat have been found. This single occurrence is therefore thought to be the only occurrence of the species in existence and constitutes the entire distribution of Bear Lake buckwheat.

### **Habitat**

This section discusses the best available scientific information regarding the kind of habitat necessary for Bear Lake buckwheat's survival as a species (Fish & G. Code, § 2072.3; see also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

Bear Lake buckwheat is endemic to the south shore of Big Bear Lake in the San Bernardino Mountains. Climatic patterns in this area have been modeled by the Parameter-elevation Regression on Independent Slopes Model (PRISM) Climate Group and provide a good indication of the type of weather conditions Bear Lake buckwheat experiences (Daly et al. 1994, PRISM Climate Group 2024). According to PRISM output from 1991 through 2020, daily maximum temperatures were highest in the month of July with an average high of 27°C (80.6°F), and lowest in the month of December with an average low of -5°C (23°F) (PRISM Climate Group 2024). Precipitation averaged 56.9 cm (22.4 inches) a year with most of the precipitation occurring in February (PRISM Climate Group 2024).

Bear Lake buckwheat occurs on a geologic formation classified as Quarternary alluvium and is adjacent to Quarternary clay (Dibblee 1964). Soils at the site are part of the Garloaf-Urban land complex soil series with four to nine percent slopes (Soil Survey Staff 2024). Garloaf soils are described as well drained, very cobbly, clay, loam soils that are comprised of alluvium derived from granitoid parent material (Soil Survey Staff 2024). While these types of soils are reported all along the south side of Big Bear Lake, Bear Lake buckwheat appears to be restricted to an outcrop of unique substrate that is not reflected in available soil surveys. In 2003, Michael Denslow reported that no other substrate like the kind Bear Lake buckwheat grows on has been seen in the area (CCH 2024). The unique substrate Bear Lake buckwheat grows on is a fine, gray, silty, clay soil with a dispersed scattering of quartzite rocks (Bell pers. comm. 2024, CCH 2024, Krantz pers. comm. 2024). Detailed studies are needed on the chemical and physical properties of this soil.



Bear Lake buckwheat grows in openings within a conifer woodland of Jeffrey pine (*Pinus jeffreyi*) and juniper (*Juniperus grandis*) (CCH 2024). Associates include Utah service-berry (*Amelanchier utahensis*), big sagebrush (*Artemisia tridentata*), June grass (*Koeleria macrantha*), bottlebrush squirreltail (*Elymus elymoides*), creeping wild rye (*Leymus triticoides*), blue sage (*Salvia pachyphylla*), Parish's umbrellawort (*Tauschia parishii*), fineleaf hymenopappus (*Hymenopappus filifolius*), broom snakeweed (*Gutierrezia sarothrae*), Indian rice grass (*Oryzopsis hymenoides*), yellow salsify (*Tragopogon dubius*), cheatgrass (*Bromus tectorum*), prickly lettuce (*Lactuca serriola*), spreading groundsmoke (*Gayophytum diffusum*), plain mariposa lily (*Calochortus invenustus*), southern mountain phlox (*Phlox austromontana*), Parry's fringed onion (*Allium parryi*), Mojave lomatium (*Lomatium mohavensis*), hawksbeard (*Crepis* sp.), birds beak (*Cordylanthus* sp.), knotweed (*Polygonum* sp.), and buttercup (*Ranunculus* sp.) (USFS 2008, CCH 2024).

Bear Lake buckwheat also occurs with several plant species of conservation concern. These include the federally threatened ash-gray paintbrush (*Castilleja cinerea*) and two plants listed by the California Native Plant Society as plants that are rare, threatened, or endangered in California and elsewhere (California Rare Plant Rank [CRPR] 1B plant species): Big Bear milkvetch (*Astragalus lentiginosus* var. *sierrae*) and Bear Valley pyrrocoma (*Pyrrocoma uniflora* var. *gossypina*) (CCH 2024, CNDDDB 2024). In addition, the federally threatened southern mountain buckwheat (*Eriogonum kennedyi* var. *austromontanum*) is reported to occur about 50 meters (164 feet) northeast of Bear Lake buckwheat (Bell pers. comm. 2024, CNDDDB 2024). Southern mountain buckwheat also reportedly occurred with Bear Lake buckwheat on the west side of Alden Road before both species were extirpated from that site by the late 1990s (Krantz pers. comm. 2024).

### **Abundance and Population Trend**

The abundance of Bear Lake buckwheat is very low. Only a single occurrence of Bear Lake buckwheat has ever been documented. The abundance of Bear Lake buckwheat in 2023 was about 150 individuals, all of them on the east side of Alden Road (Reveal 2004, Krantz pers. comm. 2023, CCH 2024, CNDDDB 2024). While there has not been any formal population monitoring conducted for Bear Lake buckwheat, the available information indicates that this species is experiencing a downward population trend.

The natural habitat in the Big Bear Lake area has been drastically altered by humans since the late 1800s, beginning with the installation of a dam and creation of Big Bear Lake, followed by an increase in development and recreation throughout the area. Given how close Bear Lake buckwheat grows to the lakeshore, it appears likely that the

species may have been more extensive in the area prior to the creation of Big Bear Lake and the addition of a dam in 1912 that was 20 feet taller than the original dam, which resulted in inundation of additional land around the lake (Holmes 1956, Hinckley 1983, Bellamy and Keller 2006).

The area has also been a popular tourist destination since the early 1900s when roads were constructed, leading to additional development and increased recreation (Holmes 1956, Bellamy and Keller 2006). The property that contains Bear Lake buckwheat's entire distribution has been heavily impacted over the years by the construction of restaurants, homes, roads, and parking lots, which have destroyed or disturbed much of the natural habitat. It is possible that Bear Lake buckwheat once occurred throughout the property and is now restricted to the only remaining habitat on the site.

Immediately south of the property containing Bear Lake buckwheat is a mobile home park (LandVision 2024b). The currently extant population of Bear Lake buckwheat is within 15 meters (49 feet) of the mobile home park; however, there is no appropriate habitat remaining for Bear Lake buckwheat on the mobile home park parcel (CNDDDB 2024, LandVision 2024b). The mobile home park has been located on the parcel since at least 1959 and it is possible the parcel once contained habitat for, or populations of, Bear Lake buckwheat.

The west side of Alden Road had a small population of about 25 Bear Lake buckwheat plants in 1986 but the species was extirpated from that site by 1998 or 1999 (CCH 2024, CNDDDB 2024, Krantz pers. comm. 2024). Bear Lake buckwheat plants were reportedly extirpated from the west side of Alden Road when soils were scraped and removed for expansion of the adjacent marina in 1998 and 1999 (Roberts 2008). This area is undeveloped and it is unknown if any habitat appropriate for Bear Lake buckwheat remains (Krantz pers. comm. 2024).

Rough estimates of population size on the east side of Alden Road have been noted by several collectors and observers over the years, with about 300 individuals in 2001, about 200 individuals in 2003, 310 individuals in 2008, about 100 individuals in 2022, and about 150 individuals in 2023 (Reveal 2004, USFS 2008, Krantz pers. comm. 2023, CCH 2024, CNDDDB 2024, USFS 2024). Since there has not been any formal population monitoring, it is unknown if these reported population sizes are for the entire Bear Lake buckwheat population or if they represent just a portion of the population.

Bear Lake buckwheat is experiencing a downward population trend as evidenced by the extirpation of all plants on the west side of Alden Road in the late 1990s. The population has likely experienced an even larger downward population trend given

the habitat destruction and disturbances that have occurred throughout the Big Bear Lake area since the late 1800s (CCH 2024, CNDDDB 2024).

## **Threats**

This section discusses the factors affecting the ability of the only known Bear Lake buckwheat population to survive and reproduce, and the degree and immediacy of threat (Fish & G. Code, § 2072.3; see also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

### ***Present or Threatened Modification or Destruction of Habitat***

The most significant and immediate threat to Bear Lake buckwheat is habitat modification and destruction. The species currently occupies a small area of undeveloped habitat on private property on the east side of Alden Road in the City of Big Bear Lake (CNDDDB 2024). The property is owned by the Bear Valley Mutual Water Company and the portion of the property containing Bear Lake buckwheat is zoned for commercial visitor use (City of Big Bear Lake 1999). While Bear Lake buckwheat occupies a small undeveloped area of the property (less than 1.5 acres), other portions of the property have experienced habitat destruction and modification from two restaurants (The Pines Lakefront and The Pines Tavern on The Lake), two single-family rental homes, paved and dirt roads, parking lots, and boat storage (City of Big Bear Lake 2021, LandVision 2024a).

In November of 2021, the City of Big Bear Lake announced it would be leasing a 19-acre area from the Bear Valley Mutual Water Company, including the property containing the Bear Lake buckwheat population, for 99 years with an option to extend for up to 30 additional years (City of Big Bear Lake 2021). The City of Big Bear Lake also announced plans to develop at least 10 acres of the 19-acre area into a new park for residents and visitors to Big Bear Lake (City of Big Bear Lake 2021, LandVision 2024a). The City of Big Bear Lake indicates that in addition to a park, they plan to explore development opportunities in the 19-acre area, including construction of new workforce housing units and commercial development (City of Big Bear Lake 2021). As of October 2023, the City of Big Bear Lake was preparing a master plan and engaging in assessment efforts to determine plans for the leased area moving forward (Sullivan pers. comm. 2023).

Since this area contains the only known population of Bear Lake buckwheat, development of, and disturbances to, the area could be detrimental to the population and could cause the species' extinction.

### **Other Human Disturbances**

Bear Lake buckwheat is significantly and immediately threatened by human disturbance from off-road vehicle (ORV) activities, footpaths, and trash dumping. The property containing Bear Lake buckwheat also has two restaurants and is easily accessible to the public, resulting in vehicular and foot traffic on the site. There is a chain link fence separating the property containing Bear Lake buckwheat from the mobile home park to the south, but the Bear Lake buckwheat population is not completely fenced off, making it relatively easy for people and vehicles to access and potentially harm the species.

Trespass ORV activity from dirt bikes, motorcycles, and other recreational vehicles is currently impacting the portion of the property that contains Bear Lake buckwheat (Bell pers. comm. 2024, Krantz pers. comm. 2024). ORV tracks have been observed to be within just a few yards of Bear Lake buckwheat plants (Bell pers. comm. 2024). ORVs are negatively impacting the quality of the site and could lead to a decline in the Bear Lake buckwheat population by crushing and uprooting individual plants. ORV activity has a high likelihood of destroying Bear Lake buckwheat plants and leading to the decline of the species if barriers are not installed to prevent vehicular access to the part of the property containing the population. Several unofficial foot paths have also been observed through the Bear Lake buckwheat population that could negatively impact the species through direct trampling or destruction of plants (Krantz pers. comm. 2024). In addition to direct impacts, both ORV activity and unofficial foot paths can have indirect negative impacts on Bear Lake buckwheat due to soil disturbance and compaction, reduced vegetative cover, and overall degradation of the habitat (Weaver and Dale 1978, Cole 1987).

Another human disturbance threatening Bear Lake buckwheat plants is trash dumping. Miscellaneous items such as spray paint cans, broken bottles, glass, and other plastic items have been seen among Bear Lake buckwheat plants (Bell pers. comm. 2024). Items dumped on top of plants could harm or kill Bear Lake buckwheat plants and lead to a further decline in the population.

### **Small Population Size**

Bear Lake buckwheat is extremely rare and has very low abundance, which makes it highly vulnerable to extinction from human activities, natural catastrophes, and environmental and genetic chance events (Shaffer 1981, Shaffer 1987, Menges 1991,

Matthies et al. 2004). The inherent vulnerability of such a small population is a significant and ongoing threat to Bear Lake buckwheat.

Genetic drift, inbreeding depression, and a reduced ability to adapt to changing environmental factors are some of the risks of small population size, and these could be affecting Bear Lake buckwheat, however no genetic or demographic studies on the population have yet been conducted.

### **Fire and Fuel Reduction**

No wildfires have been documented on the property containing Bear Lake buckwheat but that may change as the climate changes (CAL FIRE 2023a). It is unknown if Bear Lake buckwheat can survive fire or if fire would offer any benefits to the species. Other *Eriogonum* species with a subshrub growth form have been studied and shown to be negatively affected by fire with low rates of resprouting and a decrease in seed viability and germination (Keeley 2006, Shank 2019).

The California Department of Forestry and Fire Protection (CAL FIRE) uses fire hazard severity zones to identify which areas of the state have a moderate, high, or very high fire hazard severity. These fire hazard severity zones reflect areas that have similar burn probabilities and fire behavior characteristics (CAL FIRE 2023b). The property with Bear Lake buckwheat is outside of the fire hazard severity zone area designated by the state and is considered an area of local responsibility. In 2008, CAL FIRE recommended that local government designate most of the City of Big Bear Lake as a zone of very high fire hazard severity (CAL FIRE 2008). The property with Bear Lake buckwheat is outside of the very high fire hazard severity zone area recommended by CAL FIRE; however, properties adjacent to the Bear Lake buckwheat population are within the very high fire hazard severity zone. This could increase the likelihood that fuel reduction activities will be prioritized on the property with Bear Lake buckwheat, given that it is adjacent to an area that is very susceptible to wildfire.

Big Bear Lake City Ordinance 2008-379 (Native Brush and Shrub Ordinance) requires private property owners to reduce fire fuel dangers posed by native brush and vegetation by minimizing fuel materials. While the ordinance provides exceptions to activities that would result in the taking of rare, threatened, or endangered plant species, Bear Lake buckwheat does not currently receive any state or federal protections. Bear Lake buckwheat could therefore be impacted by brush clearing for fuel reduction if vegetation on the property is deemed a fire hazard.

Fire and fuel reduction are significant and immediate threats to Bear Lake buckwheat since the surrounding area is considered a very high fire hazard severity zone. In addition, fuel reduction activities could be a high priority to protect the restaurants and

homes on the property. Fire and fuel reduction could significantly reduce the population of Bear Lake buckwheat or cause the extinction of the species.

### **Climate Change**

California is already experiencing the effects of climate change and those effects are anticipated to increase over the coming decades (Bedsworth et al. 2018). Predictions for California include rising temperatures, greater year to year variability in total precipitation, and reduced snowpack (Berg and Hall 2015, Polade et al. 2017, Bedsworth et al. 2018, Pierce et al. 2018). While some species may be able to adjust to a changing climate by migrating to more favorable conditions, it is unlikely that Bear Lake buckwheat will be able to do this. It is a perennial species with a longer generation time, meaning it likely takes longer to reach reproductive age, making it slower to migrate and adapt to changing climate conditions (Jump and Peñuelas 2005, Bisbing et al. 2021). In addition, since Bear Lake buckwheat appears to be a habitat specialist, migrating to more suitable conditions in the face of climate change is not likely if similar habitat and soil types are not available nearby. Further studies are needed to determine how strict of a habitat specialist Bear Lake buckwheat is, but all evidence points to it being restricted to a specialized soil type that is not found anywhere else in the Big Bear Lake area.

While climate change is not considered an immediate threat to Bear Lake buckwheat, it is a long-term threat that should be taken into consideration when developing management guidelines for the site and species.

### **Non-native Plants**

Non-native plants are not currently considered a significant or immediate threat to Bear Lake buckwheat. There are some non-native plants on the same site as Bear Lake buckwheat, including intermediate wheatgrass (*Elymus hispidus*) and common soapwort (*Saponaria officinalis*), but these non-native plants are not currently impacting the species (Bell pers. comm. 2024). Intermediate wheatgrass could become an issue in the future if it spreads on the site since it is a rhizomatous grass that can create a monoculture under the right conditions (Bell pers. comm. 2024). The occurrence of common soapwort on site is likely the result of a garden escape from the adjacent mobile home park and could easily be removed from the site before it becomes an issue (Bell pers. comm. 2024). It is possible the lack of a large number of non-native plant species on the site is due to the unique soils Bear Lake buckwheat grows on.

Habitats with harsh or unusual soils have been shown to be less invaded by non-native plants than more hospitable habitats and soils (Zefferman et al. 2015).

### **Overexploitation**

Bear Lake buckwheat is not currently known to be in the horticultural trade; however, buckwheat species are popular plants for rock gardens. Bear Lake buckwheat was mentioned in a 2003 article titled "*Eriogonum* as a Rock Garden Plant" as an "attractive plant to the garden," but the article noted that it might not be as sought after as other buckwheat species (Reveal 2003). The Department is not aware of any Bear Lake buckwheat plants in the horticultural trade and overexploitation is not currently a significant or immediate threat to Bear Lake buckwheat, but this could change in the future.

### **Existing Management Efforts**

This section discusses the impact of existing management efforts on the species (Fish & G. Code, § 2072.3).

No existing regulatory mechanisms are currently in place at the federal, state, or local level that adequately protect Bear Lake buckwheat. As of October 2023, the City of Big Bear Lake is in the conceptual planning stages for developing the property that contains the only known occurrence of Bear Lake buckwheat (Sullivan pers. comm. 2023). The Department met with the City of Big Bear Lake in January of 2024 to discuss possible conservation measures for the species.

Bear Lake buckwheat co-occurs with one federally threatened species, ash-gray paintbrush (*Castilleja cinerea*). If Federal Endangered Species Act (ESA) protections are afforded to ash-gray paintbrush on the property due to its status as a federally threatened species, Bear Lake buckwheat may gain some protection due to its proximity to ash-gray paintbrush. However, ash-gray paintbrush only co-occurs with Bear Lake buckwheat in a small portion of the Bear Lake buckwheat population, so protections for ash-gray paintbrush may not benefit the entire Bear Lake buckwheat population (Roberts 2008). In addition, the full protections afforded to plants listed under the ESA are not always provided to plants on private land (ESA §9(a)(2)(B), 16 U.S.C. §1538(a)(2)(B)).

Seed collection is an important component to managing rare species, as collected seeds can be used for future research and restoration activities. Seed collections also provide insurance in case something happens to the natural population causing the species to go extinct in the wild. In September of 2003, 4,258 seeds were collected from 65 Bear Lake buckwheat individuals (Birker pers. comm. 2024). In 2023, a 20-year follow-

up germination test was run on the seeds and there was a 50% germination rate (Birker pers. comm. 2024). In October of 2023, 1,083 seeds were collected from 43 Bear Lake buckwheat individuals and germination tests are underway (Birker pers. comm. 2024).

### **SUFFICIENCY OF SCIENTIFIC INFORMATION TO INDICATE THE PETITIONED ACTION MAY BE WARRANTED**

Bear Lake buckwheat is a subshrub in the buckwheat family with only a single known occurrence on the south shore of Big Bear Lake in San Bernardino County, California. Bear Lake buckwheat grows on a unique substrate of gray, silty, clay soil in a Jeffrey pine and juniper woodland. Bear Lake buckwheat occupies an area of less than 1.5 acres with 150 plants estimated in 2023. While Bear Lake buckwheat has been visited periodically over the years, no formal monitoring or research studies have been conducted on the species.

Bear Lake buckwheat is primarily threatened by habitat modification or destruction from the potential development of the private property where the species occurs. The property is owned by the Bear Valley Mutual Water Company and is being leased to the City of Big Bear Lake, who is exploring opportunities to further develop the property. Other significant threats to Bear Lake buckwheat include human disturbances (from off-road vehicle use, footpaths/trampling, and trash dumping), effects of small population size, and fire and fuel reduction activities. In addition, Bear Lake buckwheat is threatened by climate change, non-native plants, and overexploitation which could become increasingly significant in the future if the species is not monitored or adequately managed.

Pursuant to Fish and Game Code section 2073.5, the Department evaluated in this report the available information for each of the petition components and has determined that the petition includes sufficient scientific information to indicate that the petitioned action to list Bear Lake buckwheat as endangered may be warranted.

### **RECOMMENDATION TO THE COMMISSION**

The Department recommends the Commission accept the petition for further consideration under CESA. If the Commission accepts the petition for further



consideration under CESA, the Department will commence a review of the status of the species at that time (Fish & G. Code, § 2074.6).

## **FUTURE MANAGEMENT**

No management activities are currently being implemented for Bear Lake buckwheat. Below are some recommended future management actions to benefit Bear Lake buckwheat.

- Preserve existing occurrence and habitat. Bear Lake buckwheat is restricted to a single occurrence on private property. Every effort should be made to preserve all Bear Lake buckwheat plants and to protect Bear Lake buckwheat habitat from any disturbances that may occur on the property.
- Survey the west side of Alden Road to determine if any Bear Lake buckwheat plants or habitat remain. Plants are thought to have been extirpated from the west side of Alden Road but if habitat remains, this area could be used for potential outplanting efforts to expand the population.
- Establish baseline quantitative data. Very little is known about Bear Lake buckwheat's life history, genetics, soil preferences, or population size and trends. Collecting baseline data and implementing a demographic monitoring program are essential in order to assess the health of the population, understand the current status of the species, and inform best management strategies and conservation measures to ensure its continued existence.
- Research the feasibility of enhancing the existing population and establishing additional populations. Studies are needed to determine if it is appropriate and feasible to enhance the current population of Bear Lake buckwheat through outplanting efforts. Research is also needed to determine if Bear Lake buckwheat is a strict endemic to the unique substrate it grows on or whether it could grow on other substrates. This information can be used to inform the likelihood of success of transplanting activities.
- Collect additional seeds for long-term conservation storage and for potential use in future projects to increase Bear Lake buckwheat populations.
- Educate the public about the need to protect Bear Lake buckwheat.

## LITERATURE CITED

A petition shall include information regarding the availability and sources of information (Fish & G. Code, § 2072.3). Below are all of the sources of information used in this report. These sources will be provided to the Fish and Game Commission.

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