

State of California
Natural Resources Agency
Department of Fish and Wildlife

**REPORT TO THE FISH AND GAME COMMISSION
STATUS REVIEW OF MILO BAKER'S LUPINE (*Lupinus milo-bakeri*)**

February 8, 2022



Milo Baker's Lupine, CDFW photo by Jeb McKay Bjerke

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LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

CalBG – California Botanic Garden
Caltrans – California Department of Transportation
CDFG – California Department of Fish and Game
CDFW – California Department of Fish and Wildlife
CDOC – California Department of Conservation
CEQA – California Environmental Quality Act
CESA – California Endangered Species Act
CMNHH – Carnegie Museum of Natural History Herbarium
CNDDDB – California Natural Diversity Database
Commission – California Fish and Game Commission
Department – California Department of Fish and Wildlife (formerly Fish and Game)
ESA – Environmentally Sensitive Area
et al. – “and others”
et seq. – “and what follows”
GIF – Geospatial Innovation Facility
MDOT – Mendocino Department of Transportation
MOU – Memorandum of Understanding
NPPA – Native Plant Protection Act
occurrence – CNDDDB Element Occurrence
RSABG – Rancho Santa Ana Botanic Garden
Status Review – Status Review of Milo Baker's lupine (<i>Lupinus milo-bakeri</i>)
UCIPM – University of California Integrated Pest Management

EXECUTIVE SUMMARY

This Status Review of Milo Baker's lupine (*Lupinus milo-bakeri* C.P. Smith) (Status Review) has been prepared by the California Department of Fish and Wildlife (Department) for the California Fish and Game Commission (Commission) pursuant to the California Endangered Species Act (CESA; Fish & G. Code, § 2050 et seq.).

Milo Baker's lupine was listed as a threatened species under CESA in February of 1987. On December 10, 2020, the Commission received a five-year species review on Milo Baker's lupine from the Department that recommended up-listing the species from threatened to endangered status. On February 10, 2021, the Commission considered the Department's five-year species review on Milo Baker's lupine and accepted the petition for consideration. This Status Review is based on the best scientific information currently available to the Department and has been independently peer reviewed.

Milo Baker's lupine is an annual herb in the legume family (Fabaceae) and grows to 1-2 m (3-6 ft) tall, commonly with blue flowers that yellow with age. This species exists only in California, and its range is restricted to Round Valley in eastern Mendocino County, but may extend into Bear Valley in western Colusa County. It occurs on privately owned or tribal land that is often in state- or county-maintained rights-of-way. Milo Baker's lupine was first listed as rare under the Native Plant Protection Act in 1978. At that time, it was known from only 14 small occurrences along roadsides or in grasslands on ancient river deposits. Today only one occurrence consisting of six very small subpopulations of Milo Baker's lupine is confirmed to still exist. This lone roadside occurrence is extremely vulnerable, and the species is at risk of extinction.

Road maintenance (e.g., mowing and construction) continues to pose the biggest threat to Milo Baker's lupine. Milo Baker's lupine is also susceptible to newly identified threats including competition from invasive plants, habitat destruction and modification, low genetic diversity, climate change, and the risks associated with small population sizes. The recovery of the species depends on sustained cooperation within and among state and county agencies, collaboration with private landowners, and consultation with local tribes to protect the known remaining subpopulations, quantify the genetic diversity of this natural population, and conduct surveys to determine if additional populations may exist. Additional information will also be needed to determine suitable habitat for possible reintroductions of Milo Baker's lupine within its known range.

The Department recommends that the Commission find that the petitioned action to list Milo Baker's lupine as an endangered species is warranted, and further recommends implementation of the management recommendations and recovery measures described in this Status Review.

INTRODUCTION

Listing and Petition History

This Status Review of Milo Baker's lupine (*Lupinus milo-bakeri* C.P. Smith) (Status Review) addresses a species that is currently listed as threatened under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 *et seq.*; Cal. Code Regs. tit. 14, § 670.2, subd. (b)(6)). The listing history of Milo Baker's lupine is as follows:

In 1978, the California Department of Fish and Wildlife (Department), formerly the California Department of Fish and Game, recommended that Milo Baker's lupine be listed as endangered under Fish and Game Code, section 1901, the Native Plant Protection Act (NPPA). On October 6, 1978, the Fish and Game Commission (Commission) voted to list Milo Baker's lupine as rare, rather than endangered. At the time of the initial listing, the main identified threats to the species included: present or threatened modification or destruction of its habitat (e.g., urban expansion and road widening) and other human-related activities, such as the application of herbicides (CDFG 1978).

In 1986, the Department recommended changing the listing status of Milo Baker's lupine from rare under the NPPA to threatened under CESA (CDFG 1986). The Commission up-listed Milo Baker's lupine and the change in status was effective on February 15, 1987. The provisions of CESA are summarized in the Regulatory and Listing Status section of this Status Review.

The Department conducted a five-year species review of Milo Baker's lupine that was received by the Commission on December 10, 2020. The Department recommended up-listing Milo Baker's lupine from threatened to endangered species status (CDFW 2020a). The five-year species review was considered equivalent to a petition with a Department recommendation to accept and consider the petition (Fish & G. Code §§ 2072.7 and 2077).

On January 8, 2021, as required by Fish and Game Code section 2073.3, the Commission published notice of receipt of the five-year species review on Milo Baker's lupine in the California Regulatory Notice Register (Cal. Reg. Notice Register 2021, No. 2-Z, p. 35).

On February 10, 2021, at its scheduled public meeting, the Commission considered the Department's five-year species review on Milo Baker's lupine, the Department's recommendation, and comments received. The Commission found that sufficient information existed to indicate the petitioned action may be warranted and accepted the

petition for consideration, which initiated the commencement of this Status Review by the Department.

Subsequently, on February 26, 2021, the Commission published its Notice of Findings in the California Regulatory Notice Register, designating Milo Baker's lupine as a candidate species for endangered status (Cal. Reg. Notice Register 2021, No. 9-Z, p. 226).

Status Review

Pursuant to Fish and Game Code section 2074.6 and section 670.1 of Title 14 of the California Code of Regulations, the Department has prepared this Status Review to inform the Commission's decision regarding whether the petitioned action to up-list Milo Baker's lupine from threatened to endangered status is warranted. An endangered species under CESA is one "which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish & G. Code, § 2062).

Using the best scientific information available to the Department, this Status Review includes information on each of the following components pursuant to section 2072.3 of the Fish and Game Code, and section 670.1 of Title 14 of the California Code of Regulations: population trend(s), range, distribution, abundance, life history, factors affecting the species' ability to survive and reproduce, the degree and immediacy of threats, the impact of existing management efforts, the availability and sources of information, habitat that may be essential for the continued existence of the species, and the Department's recommendations for future management activities and other recovery measures to conserve, protect, and enhance the species.

Specifically, this Status Review analyzes whether there is sufficient scientific information to indicate that the continued existence of Milo Baker's lupine throughout all or a significant portion of its range is in serious danger or is threatened by one or a combination of the following factors: present or threatened modification or destruction of its habitat, overexploitation, predation, competition, disease, or other natural occurrences or human-related activities (Cal. Code Regs., tit. 14, § 670.1, subd. (i)(1)(A)).

This Status Review was prepared by Dr. Raffica La Rosa in the Department's Habitat Conservation Planning Branch, Native Plant Program.

Notification, Information Received, and Peer Review

Following the Commission's action to designate Milo Baker's lupine as a candidate species for endangered status, the Department notified affected and interested parties and solicited data and comments on the petitioned action pursuant to Fish and Game Code section 2074.4 (see also Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)).

Comments on the petitioned action were invited via tribal notifications dated May 7, 2021, and general notifications dated June 3, 2021. These notifications were distributed to tribes and land managers within the range of Milo Baker's lupine, private landowners of property that overlaps with the species' known current and former distribution, scientists familiar with Milo Baker's lupine, and other affected or interested individuals and organizations. The Department received no comments in response to the tribal notifications and five responses with new information in response to the general notification. All comments received are included in Appendix A of this report.

Pursuant to Fish and Game Code section 2074.6, the review process included independent peer review of the draft status review by persons in the scientific/academic community acknowledged to be experts on Milo Baker's lupine or related topics and possessing the knowledge and expertise to critique the scientific validity of the status review contents. Appendix B contains the specific input provided by the individual peer reviewers to the Department, the Department's written response to the input, and any amendments made to the status review (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). Independent experts that reviewed the Status Review are listed in Table 1.

TABLE 1. Status Review peer reviewers

Name	Affiliation
Nancy Morin	Flora of North America
Billy Sale	California Botanic Garden
Teresa Sholars	Adjunct Professor, Curator Herbarium and Natural History Collection, Mendocino College
Jim Xerogeanes	Professor Emeritus, Agriculture and Natural Resources, Mendocino College

BIOLOGY

Taxonomy and Physical Description

A type specimen is the individual or individuals that were studied to describe and name a new species. The type specimen of Milo Baker's lupine was collected two miles east

of Covelo on Ranger Station Road in Mendocino County on August 12, 1940, by Milo S. Baker. It was described and named later that year by Charles Piper Smith (1940).

Milo Baker's lupine is an annual herb in the legume family (Fabaceae). When plants first germinate, the cotyledons form a disk (Sholars and Riggins 2020). Plants can grow to be 1-2 m (3.3-6.6 ft) tall, with stems that are smooth or have very few hairs and have a light waxy coating (Sholars and Riggins 2020). The leaves are palmately compound, consisting of 7-9 leaflets (Figure 1a), which are each 10-30 mm (0.4-1.2 in) long, 4-9 mm (0.2-0.4 in) wide, with hairy adaxial (upper) surfaces (Sholars and Riggins 2020). Milo Baker's lupine blooms between June and September and produces inflorescences at the ends of the branches (Figure 1b) that measure 5-22 cm (0.2-0.9 in) in length, with bisexual pea-like flowers clustered in one to several whorls (Sholars and Riggins 2020). Each flower is 10-16 mm (0.4-0.6 in) long, pale blue-purple, rarely yellow, but becomes yellowish with age, and is made up of a large upper petal called the banner, two side petals called wings, and two fused lower petals that form a keel that is densely hairy along the edges (Sholars and Riggins 2020). The peapod-like fruits (Figure 1c) are hairy, contain up to two dark brown seeds when ripe, and are 1 cm (0.4 in) long (Sholars and Riggins 2020). A large, healthy plant can produce hundreds of seeds.

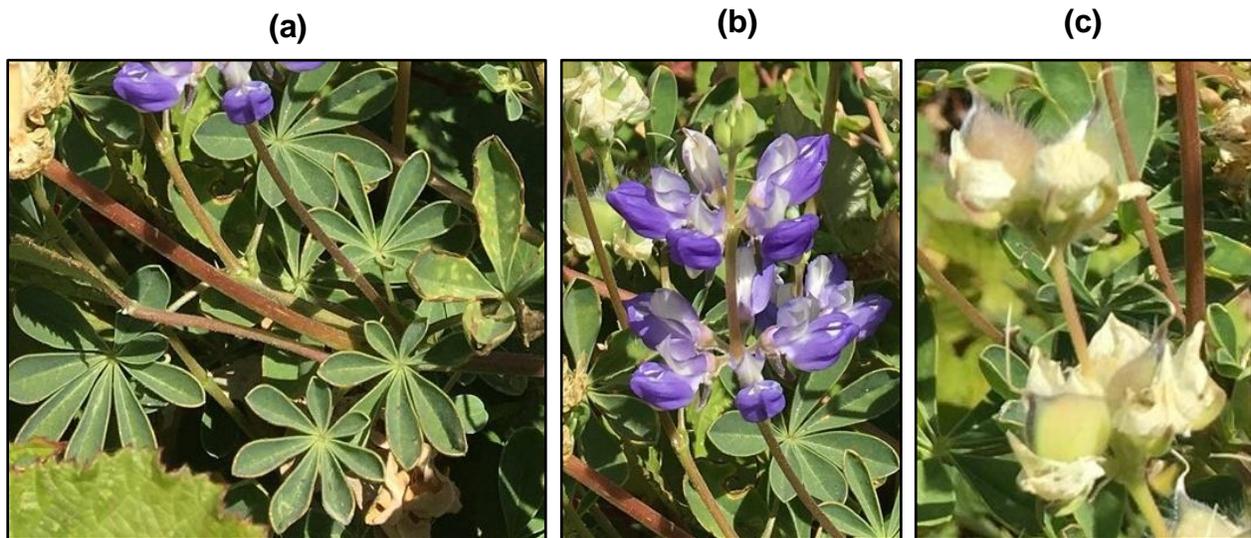


FIGURE 1. Photos of a Milo Baker's lupine plant. The three panels show the (a) leaves, (b) flowers, and (c) fruits. Department photos by R. La Rosa.

Range and Distribution

Range is the general geographical area in which an organism occurs. For purposes of CESA and this Status Review, the range is the species' California range (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal.App.4th 1535, 1551). Distribution

describes the actual sites where individuals and populations of the species occur within the species' range. Natural occurrences of Milo Baker's lupine have been documented from only two regions of California, as described in *The Jepson Manual* (Baldwin et al. 2012)—the Outer North Coast Range at about 410 m (1350 ft) elevation in Round Valley in eastern Mendocino County (Sholars 2012, CDFW 2019) and the Inner North Coast Range at about 402 m (1320 ft) elevation in Bear Valley in western Colusa County (CDFW 2019). Milo Baker's lupine was also documented near Longvale on Highway 101, southwest of Round Valley in Mendocino County (CDFW 2019), but Milo Baker's lupine is presumed to have been unintentionally introduced there by soil placed there from maintenance activities in Covelo, and its identity cannot be reconfirmed because there are no herbarium records from this site. The historical range of Milo Baker's lupine is unknown but may have extended beyond the two large valleys, Round Valley and Bear Valley. The Mendocino County populations of Milo Baker's lupine are near Mill Creek in the Eel River watershed that drains to the Pacific Ocean near Fortuna, California. The Colusa County population is near Bear Creek in the Cache Creek watershed, which drains to the Sacramento River and to the Pacific Ocean through the San Francisco Bay.

The distribution of Milo Baker's lupine is documented within the California Natural Diversity Database (CNDDDB). The CNDDDB documents "elements," which are plant or animal taxa, or natural communities that are of conservation concern within California. For plants, an "element occurrence" (occurrence) is a location record for a site which contains an individual, population, or a cluster of subpopulations of a special status element. Populations, individuals, or subpopulations that are located within 0.4 km (0.25 mi) of each other generally constitute a single occurrence (Bittman 2001). The CNDDDB occurrence records for Milo Baker's lupine were updated in January 2021 in conjunction with the completion of a five-year species review (CDFW 2020a) and again in October 2021. There are currently 11 occurrences of Milo Baker's lupine (Table 2) that are documented in the CNDDDB; however, 10 of them are possibly extirpated. Figure 2 shows a distribution map for Milo Baker's lupine.

There is one documented occurrence from Bear Valley Ranch (occurrence 18) in Colusa County, about halfway between Clearlake and Maxwell. Bear Creek and its associated tributaries run through the valley, and the description from the 1985 herbarium specimen (CMNHH 1985) describes Milo Baker's lupine as growing on mostly heavy black clay soil near the edges of gullies that are very wet in the springtime. When this occurrence was discovered in 1985, it was taxonomically intermediate between Milo Baker's lupine and butter lupine (*Lupinus luteolus* Kellogg), but taxonomists at the time identified it to be Milo Baker's lupine. Department staff revisited this occurrence on July 17, 2020 and found only butter lupine in the area where Milo Baker's lupine was allegedly found in 1985. Consequently, Milo Baker's

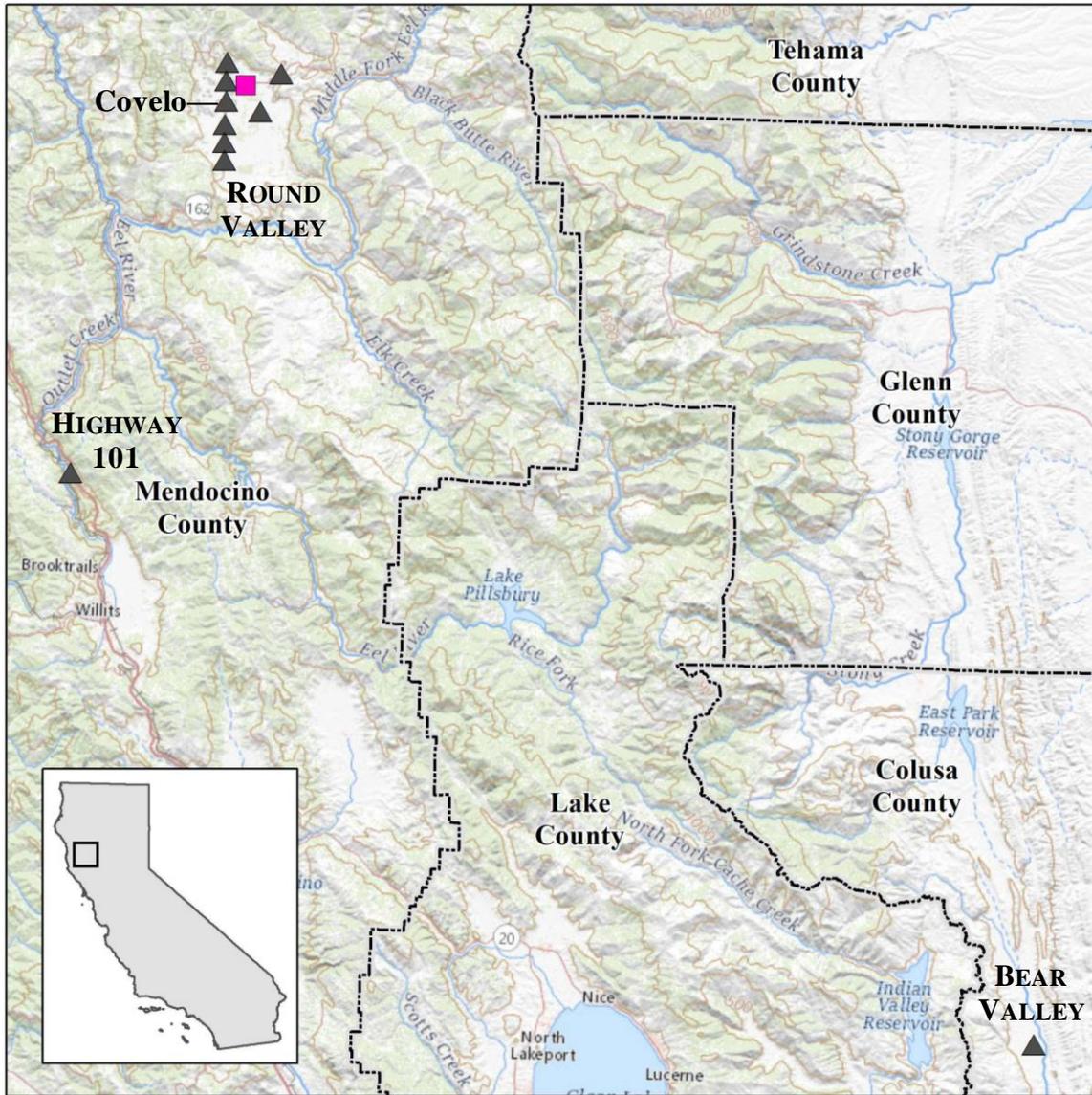
lupine has not been seen at this occurrence since 1985 (Table 2). Plant samples were collected in 2020 at this site, and as better genetic tools are developed for lupine species, it may become feasible to add genetic confirmation of the species identities of the 1985 and 2020 samples.

There is one occurrence near Longvale along Highway 101 (occurrence 13), about 5.6 km (3.5 mi) south of the junction with Highway 162 in Mendocino County. Over 100 plants may have been seen at this occurrence in 1985 and 1986. The Department is unaware of an herbarium record from this site, so the identity of the species cannot be confirmed. Jack Booth, a Department biologist in the 1980s, along with current Department staff suspected that seeds were unintentionally moved to this location as the result of the dumping of soil piles from road and ditch scraping by the California Department of Transportation (Caltrans) and Mendocino Department of Transportation (MDOT) maintenance crews in this area (CNDDDB 2021, Garrison pers. comm. 2021). The Department has received similar information from current Caltrans District 1 employees about ditches on the south side of Covelo having been removed by a practice called “pulling” (i.e., shaping roadside ditches using equipment) in the 1980s and excess soil having been deposited at that location on Highway 101 (Garrison pers. comm. 2021). Milo Baker's lupine has not been seen at this Longvale location in the intervening years between 1986 and 2021 (Table 2).

The other nine occurrences of Milo Baker's lupine are in Round Valley, in and around Covelo. At the time this Status Review was written, only one of the nine Round Valley occurrences, occurrence 2, was confirmed extant, and the others had the status of “possibly extirpated” (CNDDDB 2021) (Figure 2). This single occurrence consists of six subpopulations (A-F), which occur 3.2 km (1.9 mi) northeast of Covelo. Subpopulations A-D and F grow along Highway 162 (Mendocino Pass Road), which is maintained by Caltrans. Subpopulation E grows along a crossroad, which is maintained by MDOT. Since being named in 1940, Milo Baker's lupine has only been found growing in roadside ditches or in fields immediately adjacent to roads, but there is an account of the species growing throughout Round Valley at the turn of the twentieth century (Chesnut 1902). There may also be populations of Milo Baker's lupine not yet discovered on land that has undergone minimal or no modification.

TABLE 2. Element occurrences listed in the CNDDDB, with the origin, location, year last surveyed, and year that presence of Milo Baker's lupine was last confirmed at each occurrence. Some of the original occurrences were later merged due to their close proximity, which is why numbers in the first column are nonsequential. Source: (CNDDDB 2021)

Elem. Occur.	Origin	Location	Year Last Surveyed	Year Presence Last Confirmed	Notes
1	Natural	Round Valley; Covelo	2019	1986	
2	Natural	Round Valley; Covelo	2021	2021	Only confirmed extant occurrence
5	Natural	Round Valley; Covelo	2019	1986	
8	Natural	Round Valley; Unspecified	2017	1942	Known only from herbarium collection
10	Natural	Round Valley; Covelo	2017	1982	
13	Likely introduced	Longvale	2016	1986	May have been introduced from road scraping spoils piles
14	Natural	Round Valley; Covelo	2017	1979	
15	Natural	Round Valley; Covelo	2019	1986	
16	Introduced	Round Valley; Covelo	2020	1986	Intentional introduction by Caltrans in 1985
18	Natural	Bear Valley	2020	1985	May have been a variant of butter lupine rather than Milo Baker's lupine
19	Natural	Round Valley; Covelo	2016	1980	Specific location unknown



California Department of Fish and Wildlife. Habitat Conservation Planning Branch. D.Mastalir. 20210820



FIGURE 2. Distribution and range map of Milo Baker's lupine. This region of California contains all known populations of Milo Baker's lupine. The only confirmed extant population is marked with a pink square. Populations that are possibly extirpated are marked with black triangles (CNDDDB 2021).

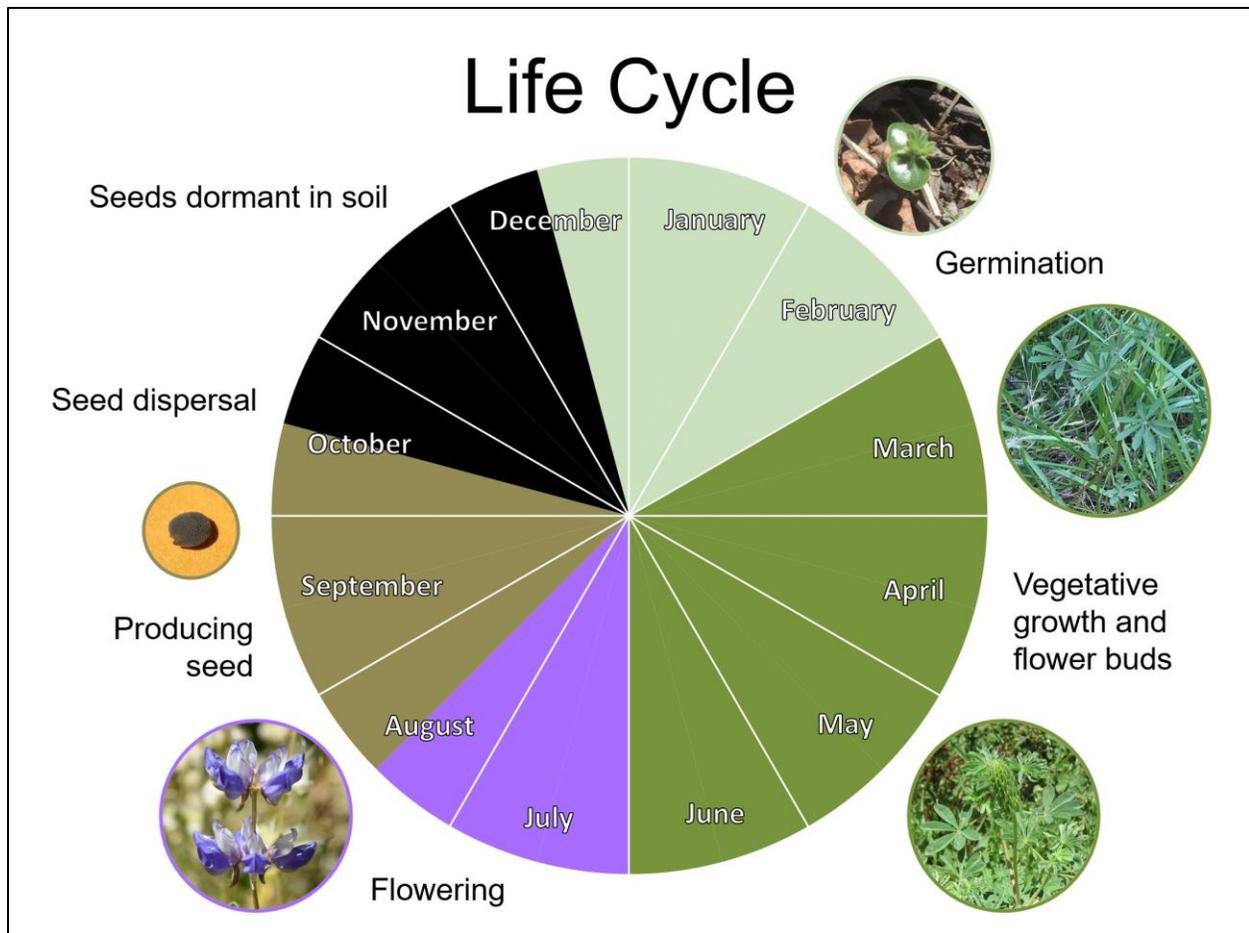


FIGURE 3. Annual life cycle of Milo Baker's lupine. Department photos by J. Bjerke, J. Garrison, and R. La Rosa. Flower bud photo by T. Sholars.

Life History

As an annual, Milo Baker's lupine relies on a seed bank to persist from one generation to the next, and populations can fluctuate across years depending on conditions. It is not known how long seeds remain viable in the soil, but if collected and stored properly, they can remain viable for many years (O'Brien pers. comm. 2021). Figure 3 shows the life cycle of Milo Baker's lupine. After the onset of winter rains as early as October, seeds generally sprout in December or January, grow a long taproot, and plants reach reproductive maturity June through September (Sale et al. 2019, Xerogeanes and Kyle 2019, Sholars and Riggins 2020, Frederickson et al. 2021). Milo Baker's lupine is insect pollinated and some of the insects that have been seen on Milo Baker's lupine include bumble bees (*Bombus* spp.) and honey bees (*Apis mellifera*), however it is not known if honey bees are able to effectively pollinate this species (Garrison pers. comm. 2019, Sholars pers. comm. 2022, Department observation). It is not known if plants are self-compatible and able to either self-pollinate within a flower without pollinator intervention

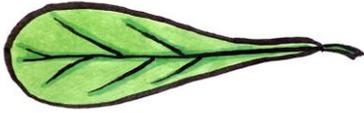
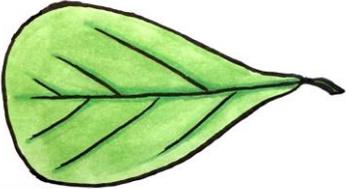
or if they are able to self-pollinate if a pollinator moves pollen between flowers on the same plant. It may be that pollen must be moved between plants (outcrossing) to produce viable seeds. Milo Baker's lupine fruits remain attached to the plants, split open when ripe, and the seeds fall to the ground. The seeds do not have an obvious dispersal mechanism and appear to fall near the maternal plant (Caltrans 2017). Given the seed size, they could potentially be dispersed short distances by flowing water, ants, or rodents.

Plants in the legume family often rely on a bacterial symbiosis to sequester nitrogen from the atmosphere. Lupine species may form mutualisms with bradyrhizobia (*Bradyrhizobium* spp.) bacteria (Robinson et al. 2000), which are bacteria that can be found in the soil and in small root nodules of plants that have been colonized. This mutualism allows the plants to live in disturbed and nutrient-deficient habitats because they can trade some of the carbohydrates that they produce through photosynthesis to the bradyrhizobia in exchange for a plant-friendly useable form of nitrogen (HN_3) that the bradyrhizobia have converted from atmospheric nitrogen (N_2).

Similar-looking Plants

Milo Baker's lupine has sometimes been taxonomically lumped with butter lupine, a species whose California range extends from the Klamath Ranges in the north to the Western Transverse Ranges near Los Angeles in the south, and west to the North Coast. Butter lupine can grow at elevations between 200 to 1900 m (650 to 6,235 ft). Milo Baker's lupine's range falls within the northern California range of butter lupine, and also grows within butter lupine's elevational range, but only at the lower end (around 410 m). Generally, butter lupine does not commonly grow in Round Valley, but rather at higher elevation (Sholars pers. comm. 2020). These two species are currently considered to be distinct species, based primarily on morphology (Sholars and Riggins 2020). They differ by a number of physical characteristics that were documented by Knight (1965) and are summarized in Table 3. Milo Baker's lupine grows much taller than butter lupine and it flowers later in the season. The flowers of butter lupine are yellow, but flowers of Milo Baker's lupine are typically blue until they age, when they become yellowed. It has been noted that dried herbarium specimens of butter lupine can sometimes have blueish flowers, but they are typically bright yellow when fresh (Sholars pers. comm. 2022). The leaflets of butter lupine are broader than those of Milo Baker's lupine, and the stems of Milo Baker's lupine are pithy, until becoming hollow during seed production, while the stems of butter lupine are generally hollow throughout its life.

TABLE 3. Traits to distinguish between Milo Baker’s lupine and butter lupine, taken from Knight (1965). Leaflet shape images by R. La Rosa.

Trait	Milo Baker’s lupine (<i>Lupinus milo-bakeri</i>)	butter lupine (<i>Lupinus luteolus</i>)
Status in late June	Young inflorescences that are not yet flowering	Mostly in fruit with only a few flowers remaining
Height	Greater than 75 cm (29 in)	Less than 75 cm (29 in)
Leaflet keel angle	Keeled (folded along the midrib) to approximately 45 degrees	Keeled (folded along the midrib) to approximately 90 degrees
Leaflet shape	 Oblanceolate	 Obovate to suboblong
Flower color	Most flowers are blue, becoming pale yellow in age	Yellow
Stem	Pithy until seed stage, becoming hollow with age	Generally hollow throughout its life

HABITAT THAT MAY BE ESSENTIAL TO THE CONTINUED EXISTENCE OF THE SPECIES

Since the time of listing, and many decades prior, Milo Baker's lupine has almost exclusively been found along roadsides and adjacent ditches and fields (Figure 4). According to Chesnut (1902), Milo Baker's lupine “covering wide areas of bottom land [of Round Valley] with...uniform and profuse growth...” However, the extensive conversion of Round Valley to agriculture and grazing was likely a driving force relegating Milo Baker's lupine to disturbed roadside habitats. Very little is definitively known about the historical habitat of Milo Baker's lupine, but based on what we know of their current distribution, the species may have naturally occurred along streams and in areas of high groundwater. More broadly, Milo Baker's lupine occurs in areas of cismontane woodland and valley and foothill grasslands (CNDDDB 2021). The Department’s preliminary identification of the habitat that may be essential to the continued existence of Milo Baker’s lupine includes habitats that fit the general habitat descriptions provided below in this section or contain any of the current or former Milo Baker’s lupine populations. The identification of essential habitats could be expanded to include the habitats of any Milo Baker’s lupine populations discovered in the future.

Vegetation Communities

The current roadside habitat for Milo Baker's lupine consists primarily of weedy species due to the high frequency of human disturbance. In the rights-of-way that have low ditches and lack biodiversity, the vegetative community is dominated by poison oak (*Toxicodendron diversilobum*) and non-native Himalayan blackberry (*Rubus armaniacus*), often with a valley oak (*Quercus lobata*) overstory. Other major species that have been documented include non-native yellow star thistle (*Centaurea solstitialis*), non-native teasel (*Dipsacus* sp.), horsetail (*Equisetum* sp.), canary grass (*Phalaris* sp.), and non-native puncture vine (*Tribulus terrestris*) (CDFG 1986, Department observation). In 1984, the largest subpopulation of Milo Baker's lupine was in an opening in valley oak woodland (Figure 4) (CNDDDB 2021). Milo Baker's lupine may be an early successional or ruderal species, growing best in areas with recently disturbed, nutrient-poor soil and little competition from other plant species.



FIGURE 4. Photo of a patch of Milo Baker's lupine. This patch of Milo Baker's lupine was growing in a large sunny opening in valley oak woodland. This was formerly occurrence 4, which is now grouped into occurrence 2; however, this patch no longer exists. Department photo taken in 1986 by J. Booth on July 23, 1986.

Geology and Soils

Round Valley is a very large, 6200-ha (15,300-ac), valley in the north coast ranges at the northern end of the Bartlett Springs Fault Zone. The very large valley is likely a “pull-apart structure,” created when the tectonic plates shifted at a bend in the fault line, then filled with Holocene and Pleistocene sediment (McLaughlin et al. 2018). The Northern Bartlett Springs Fault Zone is an active, moving fault zone that is part of the San Andreas fault system of the Northern California region. The fault zone begins in Round Valley and extends southeast, ending near the southern tip of Bear Valley, near Wilbur Hot Springs (McLaughlin et al. 2018). Milo Baker's lupine is only known from these two locations, both consisting of patches of sandstone and shale marine deposits (McLaughlin et al. 2018).

TABLE 4. Soil composition of naturally occurring Milo Baker’s lupine at Occurrence 2. Subpopulations are A-F, all with a less than 2% slope (Soil Survey Staff 2019).

Series	Subpop.	Water table depth (in)	Texture	Source	Drainage
Clear Lake clay, high precipitation	B, C, D	18-36	undefined	Clayey alluvium	Poorly drained
Cole	A	> 80	loam, drained	Alluvium	Somewhat poorly drained
Cole	B	12-48	silty clay loam	Alluvium	Somewhat poorly drained
Russian	E	> 80	loam	Alluvium	Well drained
Talmage	A	> 80	gravelly sandy loam	Alluvium	Somewhat excessively drained
Pinole	F	> 80	gravelly loam	Alluvium	Well drained

The Geologic Map of California (CDOC 2010) shows that the area around Covelo and across Round Valley is made of Quaternary deposits, which consist of “alluvium, lake, playa, and terrace deposits.” The soil survey (Soil Survey Staff 2019) from the Covelo area along Highway 162 confirms that the soil is derived from alluvium (i.e., ancient river deposits) from sedimentary rock, and sometimes metamorphic rock. On a fine scale, the soil types are not identical between the subpopulations, but are similar to each other at a coarser scale (Table 4). All soils in which Milo Baker's lupine is found appear to be alluvial loam deposits from ancient waterbodies, but drainage differs between sites, ranging from well drained to poorly drained (Soil Survey Staff 2019). The soil mapping likely does not account for the human-induced alterations that can have direct effects on the soils immediately adjacent to the road, including ditch maintenance, soil compaction

along the road shoulder, and runoff from the impermeable road surfaces. The 1985 Milo Baker's lupine collection from the open and grazed grassland habitat of Bear Valley describes the plants as growing near dark soil rich in clay by gullies that were very wet in the springtime (CMNHH 1985), but the identity of plant(s) collected here remains in question.

Climate, Hydrology, and Other Factors

Round Valley, the region with nearly all of the historic and current Milo Baker's lupine occurrences, experiences a Mediterranean climate, which is characterized by hot, dry summers and cold, wet winters. The hottest month is July, with average daily high/low temperatures of 34.1°C/10.8°C (93°F/51°F), and the coldest month is December with average daily high/low temperatures of 11.1°C/-0.4°C (52°F/31°F) (UCIPM 2021). Precipitation falls in the form of rain.

Historically, Milo Baker's lupine may have been common in along streams in riparian habitat and in areas of high groundwater (CDFG 1986). Round Valley received about 102.3 cm (40.3 in) of precipitation annually between 1951 and 2010 (UCIPM 2021), but the average annual precipitation has decreased to 82.2 cm (32.4 in) in the span between 1998 and 2021 (Nixon 2021). Precipitation is heaviest November through March (UCIPM 2021) when Milo Baker's lupine is germinating. Precipitation drops to near zero in July through September (UCIPM 2021), a time of year when Milo Baker's lupine is flowering and seeds are developing. Seedlings have been found in standing water at the bottom of roadside ditches along Highway 162 (Mendocino Pass Road) in Round Valley, but do not appear to survive extended inundation very well. Most plants that reach reproductive maturity are rooted along the slopes of the ditch and may grow in the bottom of the ditch in drier years (Department observation). The roadside ditches that support populations of Milo Baker's lupine accumulate and retain late-season moisture, so Milo Baker's lupine may be restricted to areas with late-season water sources.

It is presumed, based on the current location of Milo Baker's lupine in wet, roadside ditches, that this species used to be most common near streams and in areas of high groundwater in the Covelo area (CDFG 1986). The occurrence in Bear Valley that was last seen in 1985 was growing along Bear Creek and associated tributaries, as well as along Bear Valley Road. The climate and hydrology of Bear Valley is very similar to Covelo in Round Valley, based on climate data from Clearlake, California (Your Weather Service 2021), which is 40 km (25 mi) to the southwest; however, Bear Valley may have less annual precipitation. Bear Creek runs through the center of Bear Valley, which may supply the needed soil moisture during the spring months when Milo Baker's lupine would be growing.

POPULATION TRENDS AND ABUNDANCE

Just before the turn of the twentieth century, Milo Baker's lupine was widespread across Round Valley (Chesnut 1902). Its commonness and density in the valley may have been considered a nuisance by the people living in the area and a threat to their livestock. Some species of lupine contain compounds that are poisonous to livestock and can cause birth defects (Davis 1982), so there could have been broad removal by ranchers to avoid potential consumption by cattle. The leaves and perhaps the seeds of Milo Baker's lupine may have occasionally been utilized as a food source by Native Americans after processing to remove any toxic alkaloids (Chesnut 1902). Chesnut (1902) provides the only documented account of Milo Baker's lupine known to the Department prior to the first herbarium collection in 1940. The 1940-1942 herbarium collections label notes do not provide any insight into the population size in those years, just that the species was present north of Covelo in Round Valley.

Based on Chesnut's (1902) descriptions of Milo Baker's lupine before the turn of the twentieth century and documentation of the species since 1978, it is presumed that the abundance of Milo Baker's lupine declined drastically after 1900 as Round Valley became highly fragmented with ranching and conversion to agricultural uses. This reduction of suitable habitat relegated Milo Baker's lupine to property edges and into roadside ditches where it exists today in small patches. The Department does not have any information on Milo Baker's lupine abundance before 1978, just that it was present in the years when herbarium specimens were collected. Appendix C shows population sizes and presence/absence for the 11 occurrences known to the CNDDDB. In 1978, Milo Baker's lupine was listed as rare under the NPPA, but the species description did not include information on population size. In 1979, occurrences 10 and 14 had fewer than ten plants each, and Milo Baker's lupine was only known to be present at occurrences 1, 2, and 5. No information was available for the other occurrences in that year.

In 1984, all but one subpopulation in Round Valley was negatively impacted by the application of herbicide intended to target unwanted vegetation on the sides of roads and increase visibility for motorists. This activity reduced the global population of Milo Baker's lupine by an estimated 60 percent in 1984 (Booth 1984, Hunter 1984). As a result, spraying pre-emergent herbicide was halted at Milo Baker's lupine occurrences 1, 2, and 5 through a Memorandum of Understanding (MOU) between the Department and Caltrans (CDFG 1985), and later banned through a countywide no-spray policy enacted by the Mendocino County Board of Supervisors that restricted herbicide application by Caltrans (Xerogeanes pers. comm. 2022). This policy was in place until 2017 (Caltrans 2017). Half of the affected subpopulations of Milo Baker's lupine may have been extirpated in 1984 or were already extirpated, because in 1985, plants were only found at three occurrences in Round Valley, and population sizes were very small

(Appendix C). The 1985 MOU (CDFG 1985) instructed Caltrans to collect seed from occurrence 2 and redistribute in or adjacent to occurrences 1, 2, and 5, and surveys of these areas in 1986 showed large, but temporarily increase population sizes (Appendix C).

Just a handful of surveys were conducted between 1989 and 2014, and only for a few subpopulations of occurrence 2 (Table 5). During that span of time, all other occurrences may have been extirpated (CNDDDB 2021) and now occurrence 2 is the only remaining population that currently supports plants. The information collected for the five-year species review (CDFW 2020a) showed that surveys by the Department, conducted within the past five years, have turned up zero Milo Baker's lupine plants at any of the other ten occurrences across its range (Appendix C) (CNDDDB 2021). The abundance of Milo Baker's lupine is now extremely low, and although population trends for annual plants can be flashy and difficult to discern, censuses showing no plants at ten of the 11 occurrences demonstrates a very significant decline in abundance since 1987 when Milo Baker's lupine was listed as threatened under CESA. Due to the extremely low abundance of the species, these population declines also represent the potential loss of a significant portion of Milo Baker's lupine's total range.

The single confirmed extant occurrence of Milo Baker's lupine (occurrence 2) now consists of six small subpopulations; five previously known subpopulations (A-E) and one new subpopulation (F) discovered in June 2020 and reported to the Department in early 2021 (Garrison pers. comm. 2021). Table 5 shows the documented population history of this occurrence. In 1982 and 1984, this occurrence collectively had over 1000 plants, but then declined to near zero a number of times since (CNDDDB 2021). Spraying of herbicide and poorly timed mowing events (i.e., mowing of Milo Baker's lupine during the summer before they could produce seeds) were the major events that likely contributed to this decline (Table 5). In May 2016, subpopulations A and B collectively had 60-100 mature individuals, but then in June 2016, a Caltrans crew inadvertently mowed these two subpopulations of Milo Baker's lupine two months before plants would have set seed (CDFW 2016, Caltrans 2017, Frederickson et al. 2021). After the destruction of the mature plants in 2016, the subpopulation's continued existence relied entirely on seeds subpopulations (Frederickson et al. 2021). Further, in late June 2017, MDOT maintenance crews inadvertently mowed subpopulation E, killing all but one plant that later died (Caltrans 2017).

In 2018, there were just 38 total plants in subpopulation A, and only 21 plants were reproductive (annual plants that do not reproduce only deplete the seed bank by not producing seeds to perpetuate the species). Recovery activities at occurrence 2 in 2018 and 2019, namely late-fall mowing to reduce the non-native Himalayan blackberry thickets (described in more detail in the Management Efforts section), led to an increase

in several of the subpopulations. In 2019, the sum of the five subpopulations was 208 plants (164 were reproductive) and in 2020 the sum of the five subpopulations was 510 (455 were reproductive). Figure 5 shows the expansion of subpopulation B in 2019 and again in 2020. The increase between 2019 and 2020 would have likely been even greater across the population if a private resident had not mowed the western portion of subpopulation A in June 2020 while plants were still developing (Figure 6). In the following year, 2021, Department staff found no surviving plants in the section that had been mowed. Also, during 2019 and 2020, no plants grew at subpopulations C and E, but the reason for this is unknown. Occurrence 2 was not mowed in late fall 2020. In 2021, Milo Baker's lupine was found at subpopulations A, B, D, E, and F. In total, there were 162 plants, but only 36 were reproductive (Department observation). The decrease in population size is most likely due to renewed competition from Himalayan blackberry and other non-native species in the absence of late-fall mowing and may also be due to drier conditions between July 2020 and June 2021 when rainfall was only 36% of the 60-year (1951-2010) average (Figure 7) (Nixon 2021).

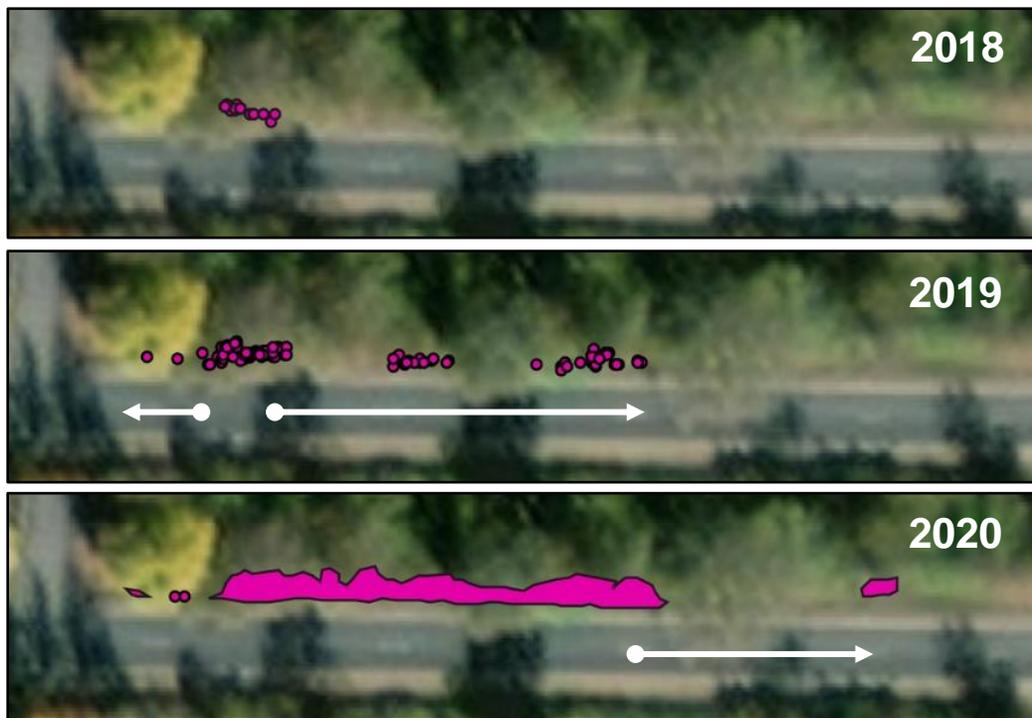


FIGURE 5. Expansion of the Milo Baker's lupine subpopulation B from 2018 to 2020. Individual plants are marked by pink dots and clusters of plants are marked by pink polygons. White arrows indicate how the distribution expanded from the prior year (CDFW 2020b).

TABLE 5. Mid- to late-summer census totals (population size) of mature Milo Baker’s lupine individuals at occurrence 2 in Round Valley from 1982 to present, with two large data gaps of more than ten years each (CDFG 1986, Caltrans 2017, CDFW 2020b, CNDDDB 2021, Frederickson et al. 2021).

Year	Population Size	Events
1982	1000+	
1983		No survey
1984	1000+	Herbicide broadly applied to roadsides
1985	100+	Herbicide spraying banned at occurrences 1, 2, and 5
1986	10,000+	Supplemental seeding by Caltrans in fall 1985
1987	present	
1988	1000+	Subpopulation E only
1989		No survey
1990		No survey
1991	75	Subpopulation E only
1992	500-700	Subpopulation E only
1993	33	Subpopulation E only
1994	250-350	Subpopulation E only
1995-2001		No surveys for 7 years
2002	present	Gravel shoulder backing installed by Caltrans
2003	200-300	
2004-2008		No surveys for 5 years
2009	present	
2010-2014		No surveys for 5 years
2015	77	
2016	86	Mowed mid-growing season (Caltrans), post-survey
2017	42	Mowed mid-growing season (MDOT), pre-survey
2018	38	Late-fall mowing in late-2018 after senescence
2019	208	Late-fall mowing in late-2019 after senescence
2020	510	Mowed in June (by private landowner) prior to late-summer census; no fall mowing in late-2020
2021	162	Subpopulation F discovered in January 2021



FIGURE 6. Subpopulation A showing a reduction in plant survival and distribution from 2019 to 2020. Points mark individual plants and polygons mark clusters of plants. Mowing in 2020 likely destroyed plants on the western end of subpopulation A and the quickly, expanding unpermitted driveway prevents the population’s expansion to the east. The three photos at the bottom were taken in October 2020 and show (from left to right) the section mowed that summer, the largest cluster of plants (large pink polygon; mowed the previous fall), and the driveway adjacent to the subpopulation’s current eastern boundary.

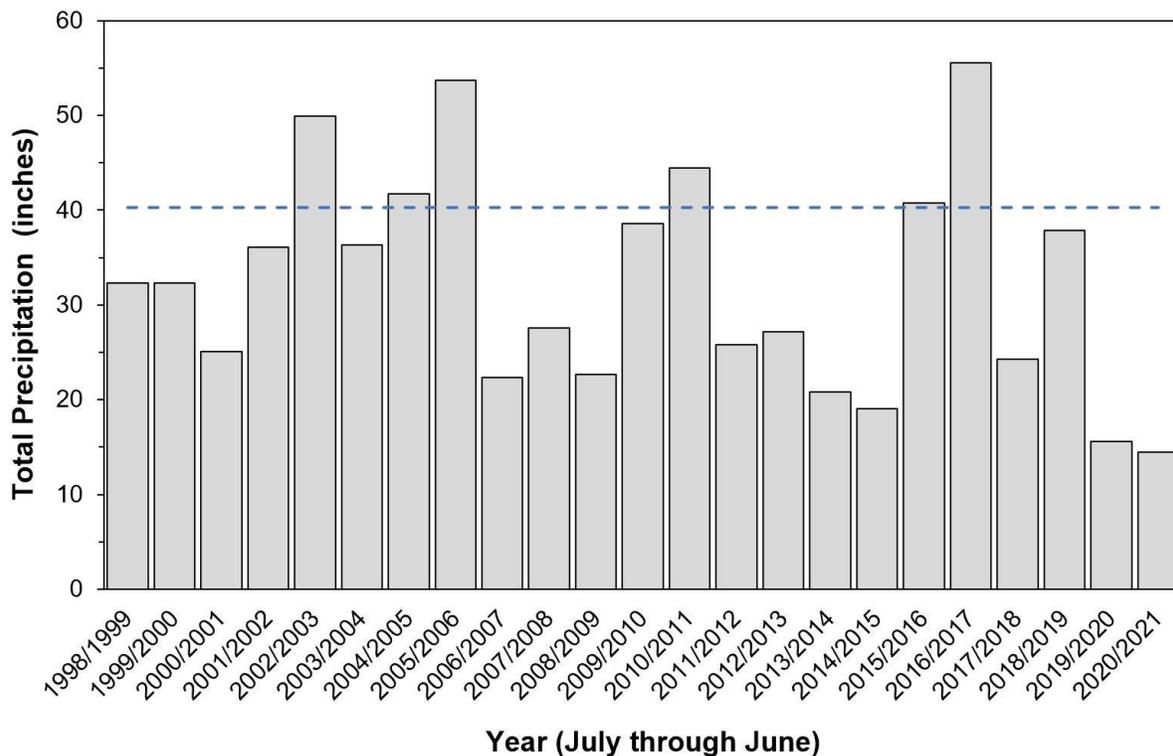


FIGURE 7. Total annual precipitation (July through June) from 1998 to 2021. Daily precipitation data was collected from a private weather station in Round Valley, southeast of Covelo. The blue dashed line is the average annual historic precipitation, based on precipitation records from 1951 to 2010. (Nixon 2021, UCIPM 2021)

FACTORS AFFECTING THE ABILITY TO SURVIVE AND REPRODUCE

The greatest threat to Milo Baker's lupine is human-related activities. Over the past 50 years, these activities have primarily been in the form of road maintenance, such as roadside mowing and herbicide sprayed to control invasive grasses and other vegetation including Himalayan blackberry to increase visibility and for fire safety. Additional human-related activities that threaten Milo Baker's lupine include trail construction, bridge repairs, and targeted destruction of plants. Competition from invasive species, low genetic variation, and random events are also significant threats to the species (CDFW 2020a). Explanations of how these factors threaten the survival of Milo Baker's lupine are described below.

Road Maintenance

Road maintenance including mowing, construction activities, and herbicide application poses the greatest threat to Milo Baker's lupine. As annuals, if a plant population is

impacted before the plants have produced seed, the population can lose an entire generation and prevents contribution to the soil seed bank. If there are no seeds remaining in the seed bank, the population would be at risk of extirpation due to a single catastrophic event.

Annual roadside summer mowing is a human-related activity that has contributed to declines in Milo Baker's lupine populations as recently as 2020 (Department observation) (Table 5) and may have also occurred regularly between 1988 and 2014 when there were few surveys or observations made along Highway 162 (Table 5, Appendix C). Roadside summer mowing continues to be an imminent threat. Nearly every recorded Round Valley occurrence of Milo Baker's lupine has been immediately adjacent to a road. State and County maintenance crews annually mow the sides of roads in the late spring and early summer to improve visibility for motorists and for fire safety, and while Environmentally Sensitive Areas (ESA) are marked by Caltrans with tall, white paddles, accidental mowing sometimes occurs, as it did in 2016 and 2017 (CDFW 2016, Caltrans 2017). The timing of roadside maintenance activities can result in no seed being produced that season if the plants are mowed prior to setting seed. While Caltrans maintains the right-of-way along Highway 162, it does not own the rights-of-way where roadside subpopulations of Milo Baker's lupine occur on tribal land. Caltrans does, however, maintain roadsides with landowner permission, and any mowing in these areas is performed by Caltrans. Milo Baker's lupine also grows on roadsides that are maintained by MDOT. Sometimes private landowners have mowed stretches of the roadside containing Milo Baker's lupine, despite ESA signs marking its presence along Highway 162. This happened most recently in June 2020 (Garrison pers. comm. 2020) and had an effect on the reproductive output and expanse of the second largest subpopulation (Figure 6) (CDFW 2020b). If Milo Baker's lupine were to occur on property adjacent to roadside ditches, plants could similarly be at risk of mowing by the landowner.

In addition to weed management and maintenance, road construction activities including bridge repairs, ditch shaping (i.e., pulling), road widening, road resurfacing, and pedestrian trail building have the potential to be very damaging to Milo Baker's lupine. As an example, a current safety project is in the planning and permitting phase to construct a multi-purpose trail along the west side of 162, running north-south through Covelo to accommodate local residents that need to travel along that route by foot (Garrison pers. comm. 2019). This project would potentially impact five subpopulations of Milo Baker's lupine that are possibly extirpated but could still be lying dormant in the seed bank. To offset these potential impacts to the seed bank, the project has proposed to remove and replace the topsoil within these occurrences (Garrison pers. comm. 2019)

In 1984, nearly all the Milo Baker's lupine occurrences had been sprayed with herbicide targeted at weedy vegetation to increase visibility for motorists (Hunter 1984). Caltrans has since modified their use of herbicides around the Milo Baker's lupine populations and abided a no-spray policy along state highways in Mendocino County, but this policy was lifted in 2017 (Caltrans 2017). While Caltrans intends to continue the ban on spraying along Highway 162 where Milo Baker's lupine occurs (Caltrans 2017), without a formal policy prohibiting the use of herbicides in Mendocino County, herbicide application for road maintenance remains a threat to Milo Baker's lupine.

Human Destruction/Poaching

On a site visit by Department staff in 2019, there was evidence that the few reproductive plants at subpopulation E, adjacent to Barnes Lane had been deliberately uprooted by humans; these plants were alongside a footpath to a cannabis growing operation. The destruction of flowering individuals can deplete the seed bank, prevent the population from expanding into new locations, or lead to extirpation.

Loss of Genetic Diversity and Random Events

Milo Baker's lupine populations likely experienced several human-induced genetic bottlenecks in the history of the species. Since Milo Baker's lupine was first formally identified in 1940, it has only been known from small occurrences near roadsides. Isolated events, such as mowing and herbicide application have also extirpated or drastically reduced already small populations and subpopulations. Each time such an event has happened, it may have caused a bottleneck event (i.e., significant reduction in population size), which is typically marked by loss of genetic diversity. Because the current distribution of Milo Baker's lupine is restricted to such a small area, and the population sizes have declined so much since the 1980s, the entire species may have low genetic diversity. This threatens the existence of the species by making it less able to adapt to environmental changes (Ellstrand and Elam 1993) and susceptible to inbreeding depression from harmful mutations. For example, Xerogeanes and Kyle (2019) sprouted seeds from Milo Baker's lupine and observed seedlings with early growth occurring below the cotyledons, which is highly abnormal. Self-pollination can further reduce genetic diversity through inbreeding depression, but it is unknown what proportion of seed produced by Milo Baker's lupine, if any, is the result of self-pollination. Additionally, small populations and species with small distributions are further at risk of extirpation and extinction by random events. With such small population sizes that are confined to very small areas, Milo Baker's lupine is highly vulnerable to extinction from random catastrophic events.

Present or Threatened Modification or Destruction of its Habitat

Nearly all Milo Baker's lupine habitat has been significantly modified or destroyed by human activities, and destruction and modification of the remaining habitat is a continuing threat. Newly documented threats to Milo Baker's lupine through the destruction of habitat identified by the Department include unpermitted driveways that impact wide sections of roadside (Figure 6) and changes to soil moisture from water diversions for agriculture. Illegal cannabis growing operations present a threat to Milo Baker's lupine through both mechanisms—driveway creation and diversion of water. Currently, subpopulation A is impacted by an unpermitted driveway that aerial imagery shows leads to a large cannabis growing operation (Department observation). The driveway now spans 43.5 m (143 ft) (Figure 6) and its placement, immediately adjacent to subpopulation A, creates a barrier that will halt any unassisted expansion of that subpopulation to the east. The likelihood of seeds naturally dispersing to the far side of this driveway is extremely low. Dispersal is one mechanism a species has to defend against local extinction, dispersing to new areas of suitable habitat or expanding to increase population size, but the dispersal distance for Milo Baker's lupine seeds is likely very short. Additionally, unpermitted driveways may alter or disrupt hydrology of the roadside ditches in their immediate vicinity, impacting current and future Milo Baker's lupine subpopulations. Illegal cannabis growing operations frequently divert water from surface water sources (e.g., streams and rivers), but even usage of well water can affect sub-surface moisture (Dillis et al. 2019). Unpermitted use of these water sources could have negative effects on soil moisture, possibly harming any not-yet-discovered Milo Baker's lupine populations. Diverted water may reduce available water in the roadside ditches that current populations of Milo Baker's lupine rely upon, and nutrient runoff from cannabis growing operations and other agriculture into water sources for Milo Baker's lupine also poses a risk to the species and reduces the area of available suitable habitat.

The land surrounding the occurrences of Milo Baker's lupine continues to become highly fragmented from ranching, conversion to agricultural uses, and urbanization. Modification of ditches along Highway 162 south of Covelo, but within Round Valley, may have contributed to the decline of the occurrences in that area. Ditches along this north-south stretch of the highway appear to be wider and shallower than those along the east-west section of Highway 162, and they are also devoid of shade trees, likely making the area where Milo Baker's lupine once grew, hotter and drier (Department observation). Additional modification or destruction of habitat could arise from landscaping and fence installation and repair by landowners that could impact Milo Baker's lupine populations growing at property edges.

Competition

Milo Baker's lupine faces competition from weedy and invasive species, particularly poison oak and non-native Himalayan blackberry and grasses that grow alongside and over Milo Baker's lupine in roadside ditches (Figure 8). Invasive Himalayan blackberry can occupy the same habitat that Milo Baker's lupine requires and is thus in direct competition with Milo Baker's lupine for light, water, and other nutrients. It can spread asexually by rhizome, forming a dense thicket with high water needs, and blocking light to nearby species (DiTomaso 2010). Invasive species sometimes alter habitats, increasing their own survival to the detriment of native species (Vitousek et al. 1996). Poison oak, a native but sometimes weedy species, readily grows along roadsides and in disturbed habitats as a shrub or vine and can also shade out other species (Oneto and DiTomaso 2021). The positive effects of reducing competition by these species, particularly the Himalayan blackberry, were evident in 2019 when late-fall mowing in 2018, after Milo Baker's lupine had dropped its seeds, reduced the volume of blackberry the following season. Milo Baker's lupine experienced a large increase in population size and distribution (Figure 5), presumably from the release from competition with blackberry for resources. The occurrences north of Covelo in Round Valley all occur either in blackberry thickets or occur in areas with large patches of roadside blackberry thickets. All five subpopulations of occurrence 2 compete with blackberry, so the survival of the species depends on controlling this invasive species.

Climate Change

The Department performed a climate change vulnerability assessment and found Milo Baker's lupine to be extremely vulnerable to the threat of climate change, which is likely to result in a significant decrease in its abundance or extinction within the next 30 years (CDFW 2021). The primary factors making Milo Baker's lupine extremely vulnerable were identified as: limited dispersal ability and limited suitable habitat, reliance on particular hydrological conditions, and sensitivity to competition from invasive species.

Conservative climate scenarios, where emissions peak around the year 2040 then decrease, predict that the average maximum and minimum temperatures from across the entire year are expected to increase about 2 and 3°C (3.6 and 5.4°F), respectively, by 2099, leading to a hotter growing season (GIF 2020). Under this same climate scenario, the amount of precipitation in Round Valley is predicted to increase up to an additional 7.3 cm (2.9 in) per year or an increase of about seven percent (GIF 2020, UCIPM 2021). This modest increase in precipitation may not mitigate for the stress the higher temperatures will place on Milo Baker's lupine. Presently, Round Valley may be in a multi-year drought. Over the 60-year span from 1951 to 2010, the average annual rainfall at the Round Valley Airport 4.2 km (2.6 mi) southwest of occurrence 2 was 102.3 cm (40.3 in) (UCIPM 2021). Now, the average annual precipitation over the past 23-

year span from 1998 to 2021 from a private weather station 7.9 km (4.5 mi) south of occurrence 2 is only 82.2 cm (32.4 in) (Nixon 2021). In addition to average seasonal temperatures and rainfall amounts, the timing of rain events may strongly influence how large populations are from year to year (Xerogeanes pers. comm. 2022). There is currently not enough data to determine the effect precipitation has on annual population size in Milo Baker's lupine. With hotter temperatures and drier conditions, wildfire and small roadside fires are likely to occur more frequently. Milo Baker's lupine is still flowering and starting to set seed when fire season begins in August/September. Seeds that are retained on the plants may not survive a fire, and it is unknown how resilient seeds in the seed bank are to fire and heat.

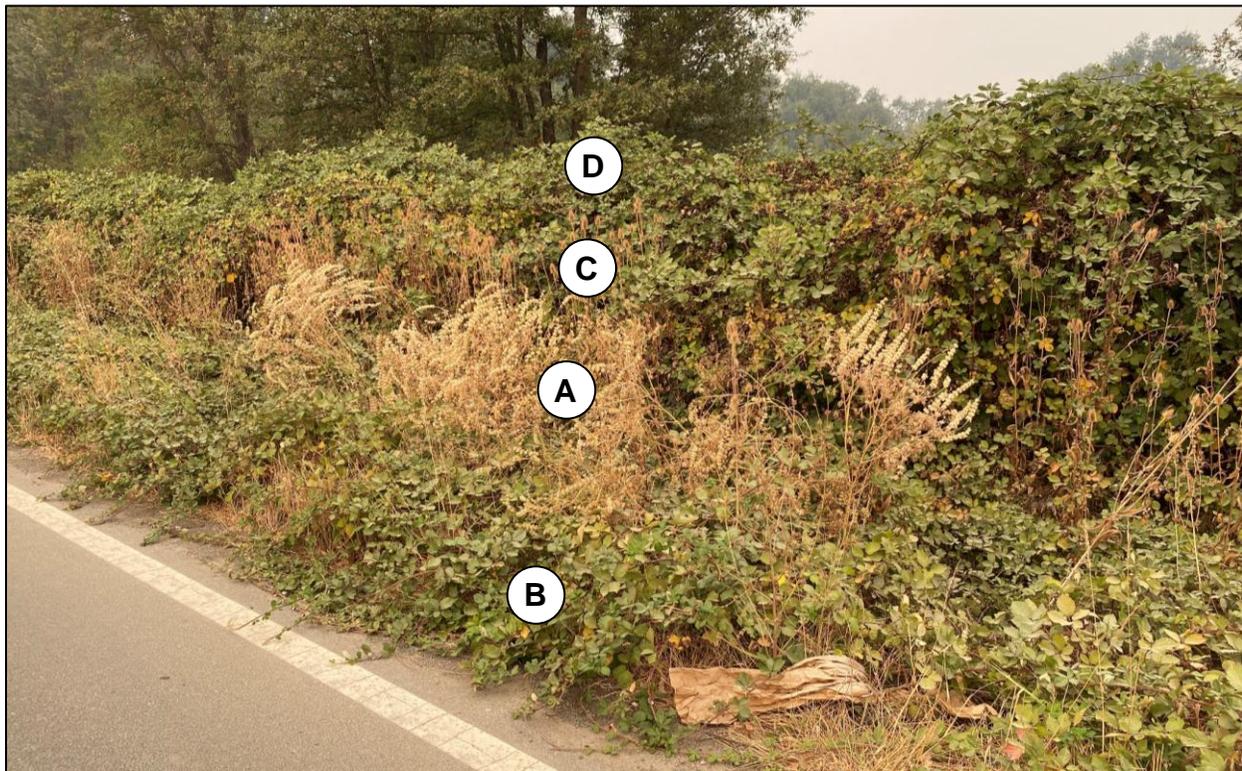


FIGURE 8. Species competing with Milo Baker's lupine. In the center of this photo from subpopulation A is Milo Baker's lupine (A), with a layer of Himalayan blackberry and poison oak beneath it (B), teasel intermixed with it (C), and a thicket of unmowed Himalayan blackberry along the fence side of the ditch (D). Department photo by R. La Rosa, taken on October 1, 2020.

Predation and Herbivory

There is evidence of small rabbit browsing of nursery-grown Milo Baker's lupine plants (Sale et al. 2017), young leaves eaten by birds (Xerogeanes pers. comm. 2022), some cattle browsing of naturally occurring plants, herbivory by pocket gophers (York and

Frederickson 2017), and seed predation by insects (Department observation). Given the current distribution of the populations along roadsides, herbivory may not be a major threat to the existing distribution but may prevent the expansion of Milo Baker's lupine in adjacent pastures and throughout its range. By one account, Milo Baker's lupine may have historically covered much of Round Valley (Chesnut 1902), and the drastic reduction in its distribution would likely have been attributable to increased livestock grazing in conjunction with direct destruction by humans. Additionally, as a member of the pea plant family, the seeds of Milo Baker's lupine are relatively large and may be a food source for insects and/or small rodents, and populations likely incur some seed loss each year due to seed predation, but the significance of this type of predation is unknown.

MANAGEMENT EFFORTS

Initial management efforts were put in place on March 27, 1986, through an MOU between Caltrans and the Department. This MOU was in response to broad application of herbicide to reduce vegetation encroachment along the roadsides in Round Valley in 1984. The MOU was instituted on July 1, 1985 (Cochrane 1985). The agreement stated that Caltrans would: (1) not spray pre-emergent herbicide in three areas where Milo Baker's lupine was known to occur, (2) only use contact herbicide on blackberries before the lupine had germinated and after it had set seed, (3) not mow until after Milo Baker's lupine was in fruit, and (4) apply seed of Milo Baker's lupine within a particular stretch of Highway 162 (CDFG 1985). The combination of seeding and restricted herbicide use resulted in an immediate, but possibly short-lived benefit to the populations. The results of the seeding project in 1985 were not detailed enough to quantitatively assess the effect on the populations over time (Vierra 1987). The mowing restrictions prevented direct destruction of plants, but often resulted in sensitive areas rarely getting mowed, shifting threats from human-caused destruction to competition from invasive plant species. When road or bridge maintenance has been necessary, the Department has sometimes collected Milo Baker's lupine seed prior to the activities that would be detrimental to the population or subpopulation so the area could be re-seeded afterwards. An example of this occurred in 1980 when the Department requested time to collect seed before the Mendocino County Public Works Department mowed the roadside (Hunter 1980). Agreements such as these rely heavily on clear, sustained communication between agencies over many years; miscommunications can result in the mowing, spraying, or leveling of a population, potentially resulting in extirpation.

Recent Management Efforts Resulting from Cooperative Agreements

Recent management efforts since 2016 have been undertaken in Covelo through another Cooperative Agreement (#01-0390) between Caltrans and the Department

(CDFW 2018). This agreement was developed in response to a Notice of Violation issued by the Department to Caltrans for mowing activities that occurred on June 9, 2016, resulting in the destruction of half the remaining extant subpopulations of Milo Baker's lupine in occurrence 2. Caltrans was fined; the fine and MOU resulted in the following management efforts including a revision of maintenance prescriptions with the Department's approval.

Update Environmentally Sensitive Area Database—The ESA database was updated to include presence of Milo Baker's lupine and all known state-listed plants within the Caltrans District 1 rights-of-way and their associated ESA maintenance prescriptions. This information was provided to the Department's Northern Region (Region 1) staff. Caltrans will maintain roadside ESA paddles that demarcate the extent of each subpopulation.

Selectively-timed Mowing to Remove Competitive Species—Milo Baker's lupine faces competition from invasive and weedy plant species that co-occur along roadsides. Caltrans typically mows roadsides in the spring and summer to improve motorist visibility and fire safety. Caltrans applied for and received a 2081(a) permit in 2018 to manage Milo Baker's lupine by reducing competition from other vegetation. Under this permit, Caltrans proposed to only mow near Milo Baker's lupine between October 1 – November 30 to avoid damage or death (i.e., take) of Milo Baker's lupine. No additional mowing would be performed within 15.25 m (50 ft) of any Milo Baker's lupine plants until its seeds were mature and dispersed, so as not to disrupt Milo Baker's lupine from completing its life cycle. These activities appear to benefit Milo Baker's lupine, as demonstrated by the increase in Milo Baker's lupine population size and extent after late-fall mowing and the subsequent decrease in population size when late-fall mowing did not occur. This permit expired on December 31, 2020, and Caltrans has not applied for another permit to continue this activity.

Soil Ripping at Sites of Historic Occurrences—In 2017, the Department recommended a seed bank viability experiment where the treatment was ripping the soil to a depth of about 30 cm (12 in) along the road shoulder and ditch. The goal was to remove sediment or “road slash” that had been deposited over time to expose the native soil underneath to see if Milo Baker's lupine would sprout from the buried seed bank once it was exposed. In October 2018, the treatment was applied south of Covelo in 60-m (200-ft) stretches on the eastern side of Highway 162 within occurrence 5 and on both sides of the road within occurrence 16. No lupines grew from this treatment at occurrence 5. Many lupines grew after treatment at occurrence 16, but were all identified as butter lupine; no Milo Baker's lupine was present. While treatments did not recover Milo Baker's lupine at these historical occurrences, this treatment could be attempted in the future at other occurrences that are possibly extirpated.

Monitoring and Conservation Seed Banking—Since 2015, Caltrans has censused Milo Baker's lupine subpopulations of occurrence 2 annually at multiple life stages throughout the growing season. Each year since 2018, the Department has collected spatial data on each plant to indicate location and if it reproduced. The Department has also collected a sample of seeds for preservation at the California Botanic Garden (CalBG; formerly Rancho Santa Ana Botanic Garden). The Department is not aware of any other ongoing Milo Baker's lupine monitoring.

Propagation and Seed Bulking—Caltrans contracted with CalBG and faculty in the Agriculture Department at Mendocino College, to grow Milo Baker's lupine for seed bulking by hand pollination to reach a total of about 3000 seeds for long-term conservation storage and 3000 seeds for future reintroduction efforts. There was varied success for propagating Milo Baker's lupine. CalBG was successful in growing plants that bloomed and produced seed. Aspects of the life history of Milo Baker's lupine can make it challenging to propagate. One challenge is that plants quickly produce a long taproot, making them difficult to transplant into larger pots or into the ground without damaging the root (Sale et al. 2019). Xerogeanes and Kyle (2019) were able to germinate seeds and outplant young plants into an outdoor space, but plants never grew larger than 20 cm (8 in) and did not flower. CalBG lost their outplanted plants to small mammal herbivory; however, they had success with the plants that remained in the greenhouse. They were also able to clone Milo Baker's lupine from cuttings of branches that were broken off of mature plants during an unexpected hailstorm, which ultimately increased the total number of flowering plants for seed production, and CalBG fertilized flowers to enable fruit and seed production through hand pollination using a paintbrush to transfer pollen (Sale et al. 2019). By 2019, there were 1127 seeds in permanent storage and 4070 seeds in temporary short-term storage that could be used for reintroductions. In accordance with the MOU between the Department and Caltrans, the Department agreed to be responsible for any future contracts for propagation and seed bulking efforts (CDFW 2016).

Other Previous and Current Management Efforts

Reintroductions—The most consequential management effort to increase the survival of Milo Baker's lupine will be reintroducing the species to areas within its range that are not immediately adjacent to Highway 162. The areas most likely to be successful will have suitable habitat for Milo Baker's lupine. In 1985, Caltrans planted seeds south of Covelo in what is now occurrence 16 (CNDDDB 2021). This population produced plants in 1986, but no surveys since then have found plants at that location (Appendix C). In cooperation with the Round Valley Indian Tribes, the Department and Caltrans also planted 151 seeds along the bank of Mill Creek, north-northwest of Covelo in December, 2016 (Caltrans 2017). In May 2017, a survey was conducted but no Milo

Baker's lupine plants were found. Reintroducing plants is difficult and success rates tend to be very low (Fiedler 1991). Annual plants may rely more heavily on environmental cues for ideal conditions before germinating since they have just one chance to reproduce, so if conditions are not ideal, they may not germinate, further making reintroductions challenging.

Building Relationships with Landowners and Land Managers—Without landowner permission to search for undiscovered populations of Milo Baker's lupine, searches are restricted to what one can observe from the road. Building relationships with landowners and land managers is important for exploring areas of potentially suitable habitat in Round Valley to look for populations of Milo Baker's lupine or suitable locations for outplanting. Thus far, two landowners are interested in partnering with the Department to help with recovery efforts by granting access for surveys and potential outplanting if there is suitable habitat on their properties to support Milo Baker's lupine (Garrison pers. comm. 2020; 2021).

REGULATORY AND LISTING STATUS

Some activities that threaten Milo Baker's lupine are subject to state environmental laws, which provide some level of protection to the species and its habitat. In addition, non-regulatory rare plant rankings may provide some protection through public awareness and impact disclosure and avoidance during project planning. The following is not an exhaustive list.

California Endangered Species Act

Milo Baker's lupine was designated a threatened species under CESA in 1987. CESA prohibits the import, export, take, possession, purchase, or sale of Milo Baker's lupine, or any part or product of Milo Baker's lupine, except as otherwise provided by the NPPA, California Desert Native Plants Act, or Fish and Game Code, such as through a permit or agreement issued by the Department under the authority of the Fish and Game Code (Fish & G. Code, § 2080 *et seq.*). For example, the Department may issue permits that authorize the incidental take of listed and candidate species if the take is incidental to an otherwise lawful activity, impacts of the authorized take are minimized and fully mitigated, the activity will not jeopardize the continued existence of the species, and other conditions are met (Fish & G. Code, § 2081, subd. (b).). The Department may also authorize the take and possession of Milo Baker's lupine for scientific, educational, or management purposes (Fish & G. Code, § 2081, subd. (a).).

California Environmental Quality Act

State and local agencies must conduct environmental review under the California Environmental Quality Act (CEQA) for discretionary projects proposed to be carried out or approved by the public agency unless the agency properly determines the project is exempt from CEQA (Pub. Resources Code, § 21080). If a project has the potential to substantially reduce the habitat, decrease the number, or restrict the range of any rare, threatened, or endangered species, the lead agency must make a finding that the project will have a significant effect on the environment and prepare an environmental impact report or mitigated negative declaration as appropriate before proceeding with or approving the project (Cal. Code Regs., tit. 14, §§ 15065(a)(1), 15070, and 15380.). An agency cannot approve or carry out any project for which the environmental impact report identifies one or more significant effects on the environment unless it makes one or more of the following findings: (1) changes have been required in or incorporated into the project that avoid the significant environmental effects or mitigate them to a less than significant level; (2) those changes are in the responsibility and jurisdiction of another agency and have been, or can and should be, adopted by that other agency; or (3) specific economic, legal, social, technological, or other considerations make infeasible the mitigation measures or alternatives identified in the environmental impact report (Pub. Resources Code, § 21081; Cal. Code Regs., tit. 14, §§ 15091 and 15093.). For (3), the agency must make a statement of overriding considerations finding that the overriding benefits of the project outweigh the significant effects on the environment. CEQA establishes a duty for public agencies to avoid or minimize such significant effects where feasible (Cal. Code Regs., tit. 14, § 15021.). Impacts to Milo Baker's lupine, as a CESA-threatened species, must be identified, evaluated, disclosed, and avoided or mitigated under the Biological Resources section of an environmental document prepared pursuant to CEQA.

Natural Heritage Program Ranking

All natural heritage programs, such as the CNDDDB, use the same ranking methodology originally developed by The Nature Conservancy and now maintained by (Faber-Langendoen et al. 2012). This ranking methodology consists of a global rank describing the rank for a given taxon over its entire distribution, and a state rank describing the rank for the taxon over its state distribution. Both global and state ranks reflect a combination of rarity, threat, and trend factors. Milo Baker's lupine has been assigned a global rank of G1 and a state rank of S1, indicating that the species is critically imperiled both within California and globally, with a very high risk of extinction due to extreme rarity, very steep declines, or other factors. Natural heritage ranking does not provide any regulatory protections but is often considered during the CEQA process.

California Rare Plant Rank

The California Native Plant Society works in collaboration with the Department and botanical experts throughout the state to assign rare and endangered plants a California Rare Plant Rank reflective of their status. Milo Baker's lupine has been assigned a California Rare Plant Rank of 1B.1. Plants with a California Rare Plant Rank of 1B are rare throughout their range and most of them are endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century. The threat code extension of ".1" indicates that the species is seriously threatened in California, with over 80 percent of occurrences threatened or a high degree and immediacy of threat. California Rare Plant Ranking does not provide any regulatory protections but is often considered during the CEQA process.

SCIENTIFIC DETERMINATIONS REGARDING THE STATUS OF MILO BAKER'S LUPINE IN CALIFORNIA

The definitions of endangered and threatened species in the Fish and Game Code provide key guidance to the Department's scientific analysis. An endangered species under CESA is one "which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish & G. Code, § 2062). A threatened species under CESA is one "that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts required by [CESA]" (Fish & G. Code, § 2067).

The preceding sections of this Status Review describe the best scientific information available to the Department. The section below considers the significance of any threat to the continued existence of Milo Baker's lupine, with respect to the key factors identified in the California Code of Regulations (Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

Present or Threatened Modification or Destruction of Habitat

Milo Baker's lupine is threatened by the reduction of suitable habitat. Not much is known about the former natural habitat of Milo Baker's lupine, but much of the surrounding area within its range has been fragmented and converted from grassland and oak woodlands to grow agricultural crops or graze livestock or horses. Milo Baker's lupine's current habitat has been reduced to roadside ditches, which are threatened by road construction and other projects that include trail building, bridge repairs, and road resurfacing. In the immediate vicinity of the remaining extant population, the creation of unpermitted driveways has destroyed a large section of potential habitat into which the

population could have expanded. Additionally, cannabis growing operations are increasing in quantity and size in the region, and water diversions for these operations may greatly impact the hydrology of the areas where Milo Baker's lupine grows or could grow. The Department considers modification and destruction of habitat to be a significant threat to the continued existence of Milo Baker's lupine.

Overexploitation

Milo Baker's lupine is not presently threatened by overexploitation. The species has been sold at botanic garden plant sales from seed stock originating from the 1960s, but the Department is not aware of any other special use of the species by humans presently. As a threatened plant species, possession of Milo Baker's lupine is unlawful except as provided by CESA (Fish & G. Code, § 2082). The Department does not currently consider overexploitation to be a significant threat to the continued existence of Milo Baker's lupine.

Predation

The degree and immediacy of threats to Milo Baker's lupine from herbivory and seed predation are not well known. The seeds of Milo Baker's lupine are relatively large and may be a food source for insects and/or small rodents, and populations likely incur some seed loss each year due to predation, but the significance of this possible predation is unknown. Some herbivory from pocket gophers has also been documented from the extant population (Caltrans 2017), but the level of impact from this herbivory has not been quantified. The degree of impact from seed predation and herbivory would depend on the amount of seed predation and/or herbivory in relation to the size of the affected Milo Baker's lupine population. The Department does not know the degree to which herbivory and predation are factors affecting the ability of Milo Baker's lupine populations to survive and reproduce.

Competition

Invasive plants are present at most of the Milo Baker's lupine subpopulations, and by competing with Milo Baker's lupine for resources, they pose an immediate and ongoing threat to the species. Milo Baker's lupine faces significant competition from poison oak and invasive species including grasses, teasel, and Himalayan blackberry that grow alongside and over Milo Baker's lupine in roadside ditches. The Department considers competition with other plant species to be a significant threat to the continued existence of Milo Baker's lupine.

Disease

The Department does not have any information on diseases or parasites affecting Milo Baker's lupine. The Department does not currently consider disease or parasites to be a significant threat to the continued existence of Milo Baker's lupine.

Other Natural Occurrences or Human-related Activities

The greatest threat to Milo Baker's lupine, since the time it was listed as a threatened species under CESA in 1987, has been direct human activities. The most damaging has been summer roadside mowing by Caltrans, MDOT, and private landowners when the plants are still growing and have not yet produced seeds. In 2019, there was evidence of targeted removal of plants at a subpopulation that only contained a few individuals; plants were uprooted and left lying on the ground near a footpath. Prior to CESA-listing, herbicide application was a major threat and could become a threat again in the future, if management practices and policies change. The presence of livestock in pastures adjacent to roadside ditches presents the threat of the trampling of any subpopulations able to expand into these nearby pastures. As annuals, Milo Baker's lupine plants have one chance to reproduce, so any damage that results in the inability of plants to reproduce during a given season can be devastating to a population.

The inherent vulnerability of small populations to random events and reduced genetic variation is a significant and immediate threat to Milo Baker's lupine. The loss of a significant portion of the remaining Milo Baker's lupine population would represent the loss of a significant portion of Milo Baker's lupine's total current range. Additionally, the genetic repercussions of a population being small (e.g., low genetic variation and inbreeding depression), can make a population highly vulnerable to extirpation.

Changes in climate may also threaten the continued existence of Milo Baker's lupine. A climate change vulnerability assessment found Milo Baker's lupine to be extremely vulnerable (CDFW 2021). Conservative climate scenarios for the areas where Milo Baker's lupine has occurred are predicted to increase 2-3°C (3.6-5.4°F) by 2099, leading to a hotter growing season (GIF 2020). Daily precipitation in Round Valley is predicted to increase by seven percent (GIF 2020, UCIPM 2021), yet it has declined in recent decades. It is unknown if this increase in precipitation would mitigate for the stress the higher temperatures could place on Milo Baker's lupine, so the severity of the effects of climate change is unknown.

The Department considers other natural occurrences or human-related activities described above to be a significant threat to the continued existence of Milo Baker's lupine.

SUMMARY OF KEY FINDINGS

Milo Baker's lupine is a very rare annual species that was only known from three localized areas at the time of listing in 1987 and has since been reduced to only one extant population made up of several very small subpopulations. The species is found along roadsides near wooded and agricultural areas in Round Valley, north of Covelo. Preventing the extinction of Milo Baker's lupine will likely require ongoing monitoring, scientific investigation, and active management.

Milo Baker's lupine continues to be most at risk from human-related activities, competition, and the modification or destruction of habitat. Milo Baker's lupine is presently in danger of extinction; without continued protection of the remaining population, and management through appropriately timed seasonal mowing and recovery projects, Milo Baker's lupine could become extinct at any time. Accidental or intentional summer mowing by transportation agencies and private landowners, competition from surrounding invasive shrubs and vines, modifications of habitat from unpermitted cannabis growing operations and driveways, loss of genetic diversity, and random stochastic (chance) events are all current and serious threats to the continued existence of Milo Baker's lupine.

RECOMMENDATION FOR THE COMMISSION/FOR PETITIONED ACTION

CESA stipulates that the Department prepares this report regarding the status of Milo Baker's lupine in California based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA also requires the Department to indicate in this Status Review whether the petitioned action is warranted (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). Based on the criteria described above, the best scientific information available to the Department indicates that Milo Baker's lupine is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes including present or threatened modification and destruction of habitat, competition, and other natural occurrences and human-related activities.

The Department recommends that the Commission find the petitioned action to list Milo Baker's lupine as an endangered species to be warranted.

MANAGEMENT RECOMMENDATIONS AND RECOVERY MEASURES

CESA directs the Department to include in its Status Review recommended management activities and other recommendations for recovery of Milo Baker's lupine (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). Department staff generated the following list of recommended management actions and recovery

measures based on considerations from researchers, non-profit organizations, and other interested parties. The following list is not a detailed conservation strategy for Milo Baker's lupine; however, it outlines major components of a plan to prevent the extinction of the species. The Department recommends that the following actions be conducted in coordination with the Round Valley Indian Tribes, private landowners, Caltrans, MDOT, researchers, and other partners, consistent with California's goals of preventing the extinction of rare, threatened, and endangered species (Fish & G. Code, § 2055).

The Department's recommendations for management and recovery of Milo Baker's lupine begin with the continued preservation of current, natural subpopulations in and around Covelo through monitoring activities, promotion of plant recruitment to expand the population, and surveys for new populations. In Covelo, the known occurrences of Milo Baker's lupine are located near the Round Valley Reservation. The Department has reached out to the Round Valley Indian Tribes' environmental liaison to increase attention to the plight of Milo Baker's lupine and to facilitate the Tribe's involvement with recovery activities (Garrison pers. comm. 2019). Recovery of Milo Baker's lupine is dependent on the cooperation of all stakeholders in the area, and on reintroductions within the historical range of the species to increase the number of individuals and occurrences. Recommendations include:

- Complete a recovery plan that the Department can implement in collaboration with local landowners, the Round Valley Indian Tribes, the Mendocino Council of Governments, Caltrans, MDOT, and local K-12 schools and colleges.
- Continue removal and reduction of competing invasive species. This may include late-fall or early-winter mowing of the extant population to reduce competition from invasive species, however, DiTomaso (2010) states that mowing of blackberry can result in denser thickets. The density of the blackberry thicket may have less overall importance than its height when considering competition with Milo Baker's lupine for light throughout the growing season. Consider hand-removal of blackberry canes where feasible to potentially provide more permanent blackberry control.
- Conduct a habitat assessment: model habitat criteria to identify possible suitable habitat in Round Valley. Survey areas within the region that the model identifies as having suitable habitat to attempt to detect new occurrences. Use the model results to identify locations for future outplantings or reintroductions. Include the following habitat criteria in the model:
 - hydrological regime; duration, timing, and/or total precipitation; soil inundation; and flooding or surface flow for germination and tap root development (Garrison 2020);
 - soil profiles and composition;

- associations with other plants, such as those commonly found within oak woodland natural communities, which were once common across Round Valley;
 - the type and degree of disturbance (e.g., fire, roadside scraping or ripping) that is beneficial; and
 - climate projections to identify sites that will still be viable under future climate conditions.
- Conduct studies to determine if Milo Baker's lupine forms symbiotic associations with mycorrhizal fungi to identify soil treatments that could increase the success of recovery actions, such as outplantings.
 - Conduct seed bank studies in soils adjacent to current subpopulations to identify the extent of a soil seed bank and the boundaries of suitable microhabitat to understand possible restrictions to population expansion. Where possible, extend ESA boundaries to encompass areas supporting Milo Baker's lupine seed bank.
 - Continue collecting a subset of seeds annually following protocols that consider genetic diversity and rarity, such as the protocols provided by CalBG (RSABG 2009), and place them in long-term conservation storage at Department-approved facilities.
 - Perform additional seed bulking of annual seed collections to produce first-generational seed stock from multiple years using protocols developed by CalBG. This activity would help preserve any remaining interannual genetic diversity and provide a stock of seeds for outplanting into new sites or augmenting or expanding the only natural extant population until new populations can be established in protected areas away from roads.
 - Continue outreach efforts with landowners in the historical range of Milo Baker's lupine and seek permission to survey possible suitable habitat. If Milo Baker's lupine is found, employ tools such as Safe Harbor Agreements (Fish and G. Code, § 2089.2 et seq.) and conservation easements to incentivize recovery and conservation of the species. If suitable habitat is found, use these same tools to reintroduce Milo Baker's lupine on private land.
 - Engage in consultation and continued coordination with the Round Valley Indian Tribes to develop and implement recovery and management actions.
 - Avoid removing or burying soils that may contain seeds of Milo Baker's lupine while conducting roadside projects. Projects, such as the pedestrian trail planned for the west side of Highway 162 through Covelo, should be designed and routed to avoid damage to areas with documented occurrences of Milo Baker's lupine.

- Create educational and informational opportunities to build public support for conservation of Milo Baker's lupine.
- Develop genetic markers or conduct genomic studies to assess the genetic and phenotypic relationship between Milo Baker's lupine and its close relative, butter lupine (*L. luteolus*). Grow the two in a common garden to help assess genetic differences and confirm the physical differences that support their unique taxonomic identities.
- Conduct a genetic analysis to quantify current genetic diversity within and among (sub)populations, providing the most scientifically-grounded information for making decisions about management actions. It is critical to preserve genetic diversity of the species to increase its chances of adapting to any long-term environmental changes, such as climate change.
- Though Milo Baker's lupine was not found in Bear Valley in 2020, continue to monitor this area to see if Milo Baker's lupine may grow there in other years with more ideal conditions than in 2020.
- Enforce legal water use by cannabis growers and proper permitting for property modifications, where possible.

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Personal Communications

- GARRISON PERS. COMM. 2019. In person correspondence with J. Garrison, Senior Environmental Scientist, California Department of Fish and Wildlife. On site in Covelo, CA. September 13, 2019.
- GARRISON PERS. COMM. 2020. Phone call with J. Garrison, Senior Environmental Scientist, California Department of Fish and Wildlife. June 17, 2020.

GARRISON PERS. COMM. 2021. In person correspondence with J. Garrison, Senior Environmental Scientist, California Department of Fish and Wildlife. On site in Covelo, CA. October 1, 2020.

O'BRIEN PERS. COMM. 2021. Phone call with B. O'Brien, Botanic Garden Manager, Regional Parks Botanic Garden. August 18, 2021.

SHOLARS PERS. COMM. 2020. Phone call with T. Sholars, Adjunct Professor, Curator Herbarium and Natural History Collection, Mendocino College. May 6, 2020.

SHOLARS PERS. COMM. 2022. Peer review by T. Sholars of the Status Review of Milo Baker's lupine (*Lupinus milo-bakeri*), Adjunct Professor, Curator Herbarium and Natural History Collection, Mendocino College. January 21, 2022.

XEROGEANES PERS. COMM. 2022. Peer review by J. Xerogeanes of the Status Review of Milo Baker's lupine (*Lupinus milo-bakeri*), Professor Emeritus, Agriculture and Natural Resources, Mendocino College. January 22, 2022.

APPENDIX A: Comments from Affected and Interested Parties on the Petitioned Action



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



Date: 5/7/2021

Dear Honorable Tribal Representative:

SUBJECT: NOTIFICATION OF STATUS REVIEW FOR MILO BAKER'S LUPINE

The California Department of Fish and Wildlife (Department) has initiated a status review of the rare plant Milo Baker's lupine (*Lupinus milo-bakeri*) pursuant to Fish and Game Code section 2074.6, and is providing this notice pursuant to Fish and Game Code section 2074.4, and the Department's Tribal Communication and Consultation Policy to solicit data and comments on the petitioned action from interested and affected parties. The Department is committed to open communication with your Tribe under its Tribal Communication and Consultation Policy, which is available through the Department's Tribal Affairs web page at <https://www.wildlife.ca.gov/General-Counsel/Tribal-Affairs>. Milo Baker's lupine is currently listed as a threatened species under the California Endangered Species Act (CESA) (Cal. Code Regs. tit. 14 § 670.2, subd. (b)(6)(C)).

The Department has initiated the Milo Baker's lupine status review following related action by the Fish and Game Commission (Commission), having provided notice on February 26, 2021, designating Milo Baker's lupine as a candidate for endangered species status under CESA (Cal. Reg. Notice Register 2021, No. 9-Z, p. 226; Fish & G. Code, § 2074.2). The Department's five-year species review of Milo Baker's lupine is available at: <https://fgc.ca.gov/CESA#MBL>. The Department has 12 months to evaluate the available information and report to the Commission on whether the petitioned action is warranted (Fish & G. Code, § 2074.6). The Department's recommendation must be based on the best scientific information available to the Department.

The provisions of CESA continue to apply to Milo Baker's lupine as both a threatened species and as a candidate for endangered status (Fish & G. Code, § 2080; Fish & G. Code, § 2085). Under CESA, it is illegal to import, export, "take", possess, purchase, sell, or attempt to do any of those actions to species that are designated as threatened, endangered, or candidates for listing, unless authorized by permit by the Department. "Take" is defined in the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

We are providing a distribution map showing the known locations of the Milo Baker's lupine populations, which may occur in Colusa and Mendocino counties. The populations are located in the following USGS 7.5-minute quadrangles: COVELO EAST, LONGVALE, and WILBUR SPRINGS.

Anyone with data or comments on Milo Baker's lupine's population trend, range, distribution, abundance, life history, threats to its reproduction or survival, the adequacy of existing management, management recommendations, or other factors related to the

Milo Baker's Lupine Status Review Notice

Date: 5/7/2021

Page 2

status of Milo Baker's lupine is hereby requested to provide such data or comments to the Department. Submission of comments or data related to the petitioned action via email is preferred. Please direct email to the Department's contact, Raffica La Rosa, at raffica.larosa@wildlife.ca.gov and include "Milo Baker's lupine" in the subject line. Comments may also be submitted by mail, addressed to:

California Department of Fish and Wildlife
Habitat Conservation Planning Branch
Attn: Raffica La Rosa
P.O. Box 944209
Sacramento, CA 94244-2090

To ensure that the Department has adequate time to evaluate data and comments and incorporate them, as appropriate, into its final report to the Commission, the Department is requesting that all comments be submitted by **June 15, 2021**. The Department will evaluate data and comments received after that date to the extent possible. The Department's written report will indicate, based on the best scientific information available, whether the Department concludes that the action to list Milo Baker's lupine as endangered is warranted or not warranted. Receipt of the status review report will be placed on the agenda for the next available Commission meeting after delivery. The report will be made available to the public at that time. Following receipt of the Department's report, the Commission will allow a 30-day public comment period prior to taking any action on the Department's recommendation.

If you have any questions, please contact Raffica La Rosa via e-mail or phone at (916) 206-4502. If you would like to initiate consultation with the Department concerning the status review for Milo Baker's lupine, please designate and provide contact information for the appropriate Tribal lead person to the Department's Tribal Liaison, Nathan Voegeli, via email at tribal.liaison@wildlife.ca.gov or by mail addressed to:

California Department of Fish and Wildlife
Attn: Nathan Voegeli, Tribal Liaison
P.O. Box 944209
Sacramento, CA 94244-2090

We look forward to your response and input on the Milo Baker's lupine status review.

Sincerely,

DocuSigned by:

37E732799B3C452...
Jeff Drongesen, Chief
Habitat Conservation Planning Branch
jeff.drongesen@wildlife.ca.gov

Milo Baker's Lupine Status Review Notice

Date:

Page 3

Enclosure

Distribution Map for Milo Baker's lupine

cc: California Department of Fish and Wildlife

Nathan Voegeli, Tribal Liaison

tribal.liaison@wildlife.ca.gov

Isabel Baer, Native Plant Program Manager

Habitat Conservation Planning Branch

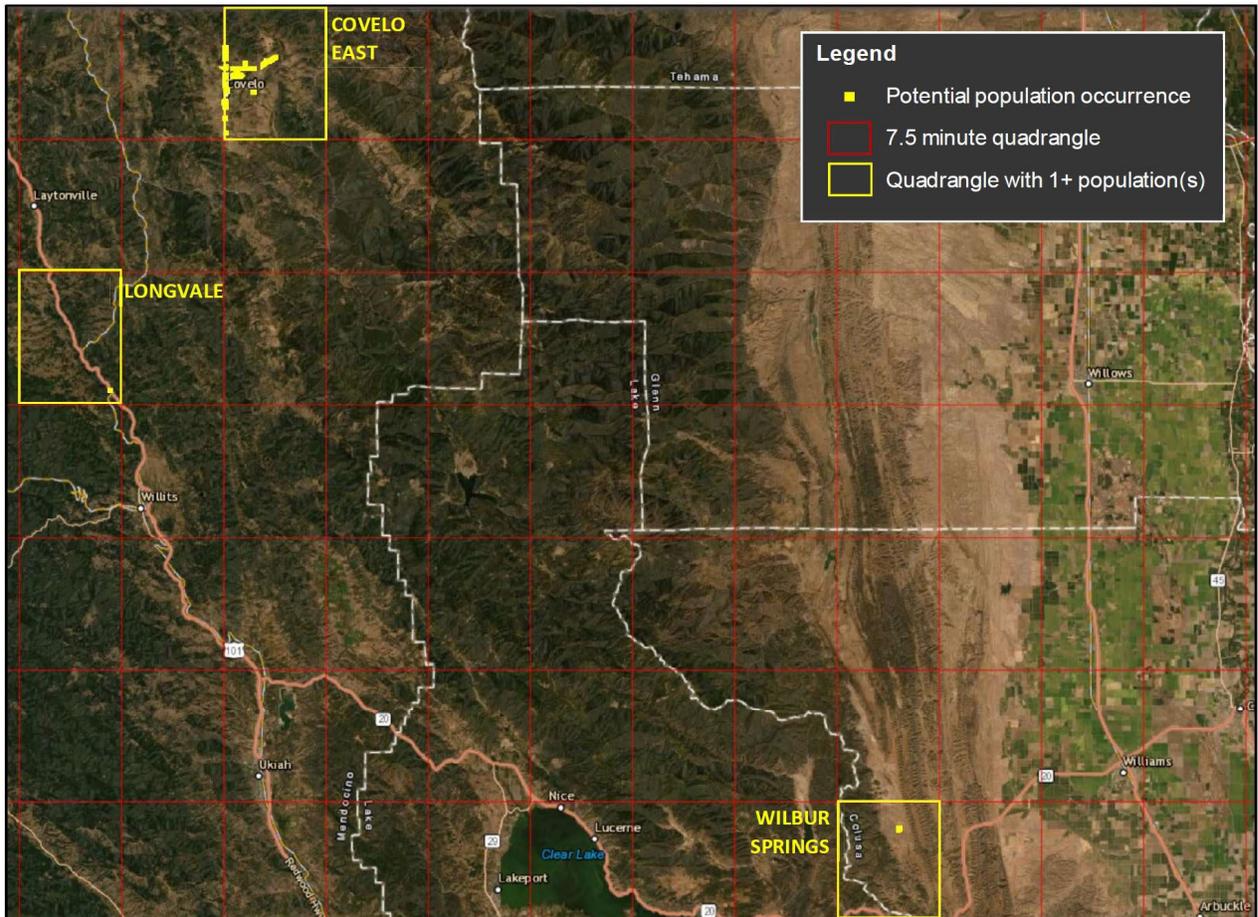
isabel.baer@wildlife.ca.gov

Raffica La Rosa, Environmental Scientist

Habitat Conservation Planning Branch

raffica.larosa@wildlife.ca.gov

Distribution Map for Milo Baker's Lupine





State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



Date: 6/3/2021

SUBJECT: NOTIFICATION OF STATUS REVIEW FOR MILO BAKER'S LUPINE

To whom it may concern:

The California Department of Fish and Wildlife (Department) has initiated a status review of the threatened plant Milo Baker's lupine (*Lupinus milo-bakeri*) pursuant to Fish and Game Code section 2074.6, and is providing this notice pursuant to Fish and Game Code section 2074.4 to solicit data and comments on the petitioned action from interested and affected parties. Milo Baker's lupine is currently listed as a threatened species under the California Endangered Species Act (CESA) (Cal. Code Regs. tit. 14 § 670.2, subd. (b)(6)(C)).

The Department has initiated the Milo Baker's lupine status review following related action by the Fish and Game Commission (Commission), having provided notice on February 26, 2021, designating Milo Baker's lupine as a candidate for endangered species status under CESA (Cal. Reg. Notice Register 2021, No. 9-Z, p. 226; Fish & G. Code, § 2074.2). The Department's five-year species review of Milo Baker's lupine is available at: <https://fgc.ca.gov/CESA#MBL>. The Department has 12 months to evaluate the available information and report to the Commission on whether the petitioned action is warranted (Fish & G. Code, § 2074.6). The Department's recommendation must be based on the best scientific information available to the Department.

The provisions of CESA continue to apply to Milo Baker's lupine as both a threatened species and as a candidate for endangered status (Fish & G. Code § 2080; Fish & G. Code, § 2085). Under CESA, it is illegal to import, export, "take", possess, purchase, sell, or attempt to do any of those actions to species that are designated as threatened, endangered, or candidates for listing, unless authorized by permit by the Department. "Take" is defined in the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

Anyone with data or comments on Milo Baker's lupine's population trend, range, distribution, abundance, life history, threats to its reproduction or survival, the adequacy of existing management, management recommendations, or other factors related to the status of Milo Baker's lupine is hereby requested to provide such data or comments to the Department. Submission of written comments or data related to the petitioned action via email is preferred. Email may be directed to the Department's contact, Raffica La Rosa, at raffica.larosa@wildlife.ca.gov, and should include "Milo Baker's lupine" in the subject line. Comments may also be submitted by mail, addressed to:

Milo Baker's Lupine Status Review Notice

Date: 6/3/2021

Page 2

California Department of Fish and Wildlife
Habitat Conservation Planning Branch
Attn: Raffica La Rosa
P.O. Box 944209
Sacramento, CA 94244-2090

To ensure that the Department has adequate time to evaluate data and comments and incorporate them, as appropriate, into its final report to the Commission, the Department is requesting that all comments be received by **July 15, 2021**. The Department will evaluate data and comments received after that date to the extent possible. The Department's written report will indicate, based on the best scientific information available, whether the Department concludes that the action to list Milo Baker's lupine as endangered is warranted or not warranted. Receipt of the status review report will be placed on the agenda for the next available Commission meeting after delivery. The report will be made available to the public at that time. Following receipt of the Department's report, the Commission will allow a 30-day public comment period prior to taking any action on the Department's recommendation.

If you have any questions regarding this notice, please contact Raffica La Rosa via email at raffica.larosa@wildlife.ca.gov.

Sincerely,

DocuSigned by:



37E732799B3C452...

Jeff Drongesen, Chief
Habitat Conservation Planning Branch
jeff.drongesen@wildlife.ca.gov

From:
Sent:
To:
Subject:
Attachments:

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

Good morning Raffica,

re: County of Mendocino Cannabis cultivation site 24550 Biggar Lane Covelo, CA
APN: 032-390-29

Thank you for reaching out to the County of Mendocino Cannabis Program.
I have been working on a cannabis cultivation site review which may or may not have the presence of Milo Baker's Lupine. According to CNDDDB it is located at the site. A biological survey has been requested of the applicant. Are there other steps you would like us to take in this particular case? I have attached maps and the site location information. Let me know if there is anything else I can do to help you in this matter.

Thank you,

Gabriella Eaton
Planner I

Cannabis Program: (707)234-6680



Get the latest County of Mendocino Cannabis Program NEWS sent to your email.

Click [HERE](#)

>>> "La Rosa, Raffica@Wildlife" <Raffica.LaRosa@Wildlife.ca.gov> 6/3/2021 5:11 PM >>>

Attached you will find our Notification of Status Review for Milo Baker's Lupine (*Lupinus milo-bakeri*). Milo Baker's lupine is known from Mendocino and Colusa counties. It is listed as threatened under the California Endangered Species Act, but is a candidate for endangered species status. The California Department of Fish and Wildlife is requesting any

information you may have on this species for consideration during the review period. Please share any information or comments you may have.

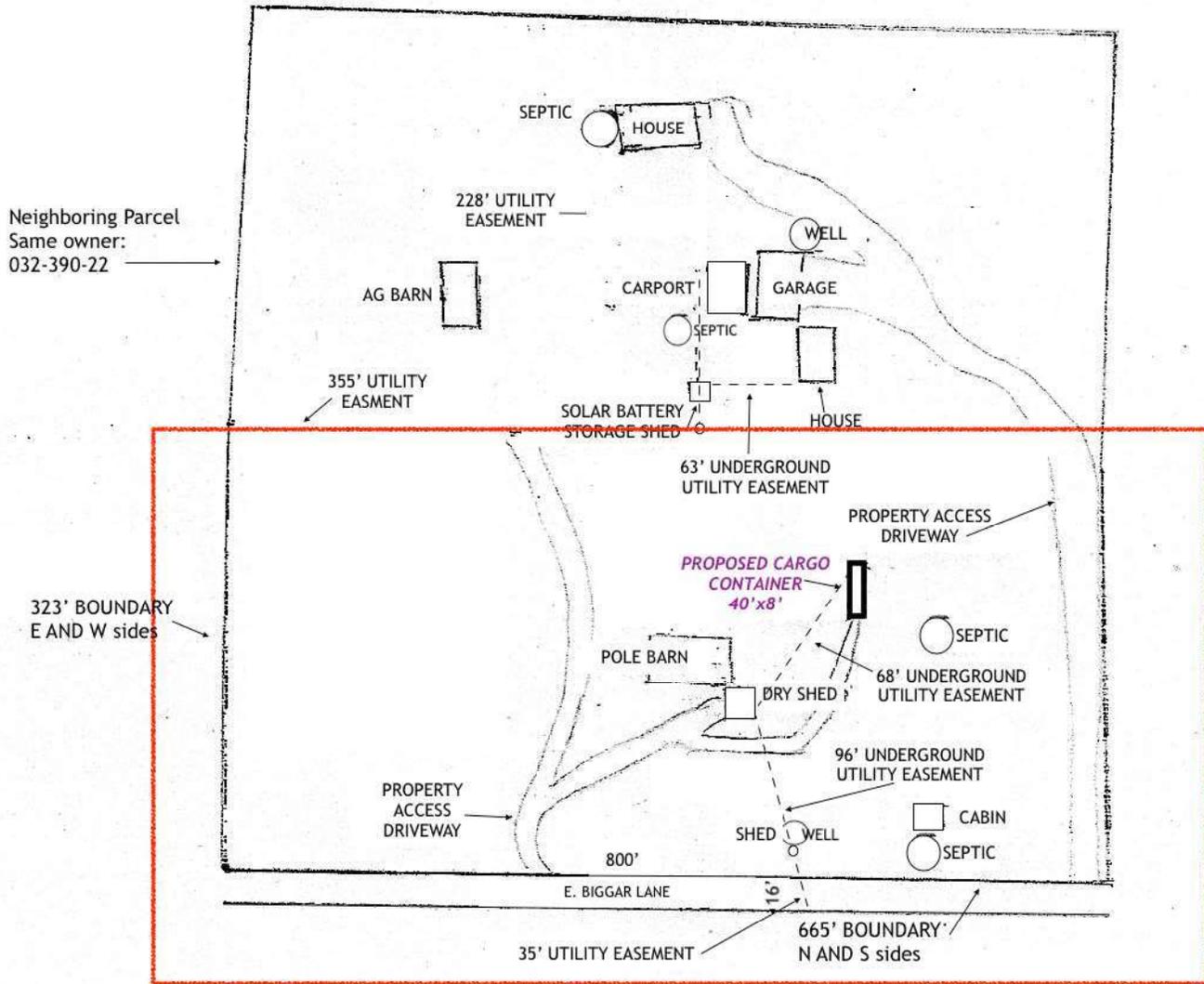
Thank you for your time.

Sincerely,
Raffica

--

Raffica La Rosa, PhD
Environmental Scientist
Native Plant Program
Habitat Conservation Planning Branch
California Department of Fish & Wildlife
<https://www.wildlife.ca.gov/Conservation/Plants>

SITE PLAN



PARCEL NUMBER 032-390-29 (outlined in red)
(BOUNDARY LINE ADJUSTMENT IN PROGRESS)

PROPERTY OWNED BY: FORREST J. GAUDER
ADDRESS: 24550 BIGGAR LANE, COVELO CA 95428

MAP PREPARED BY: PATRICIA VARGAS
ADDRESS: 24550 BIGGAR LANE, COVELO CA 95428
PHONE #: 1 (707) 272-4852
MAP PREPARED ON 3/29/2021

Note: Forrest Gauder also owns neighboring parcel, with AG Permit No.: AG_2017-0774 which is in process of being combined with this one through Boundary Line Adjustment Application: B_2021-0005.

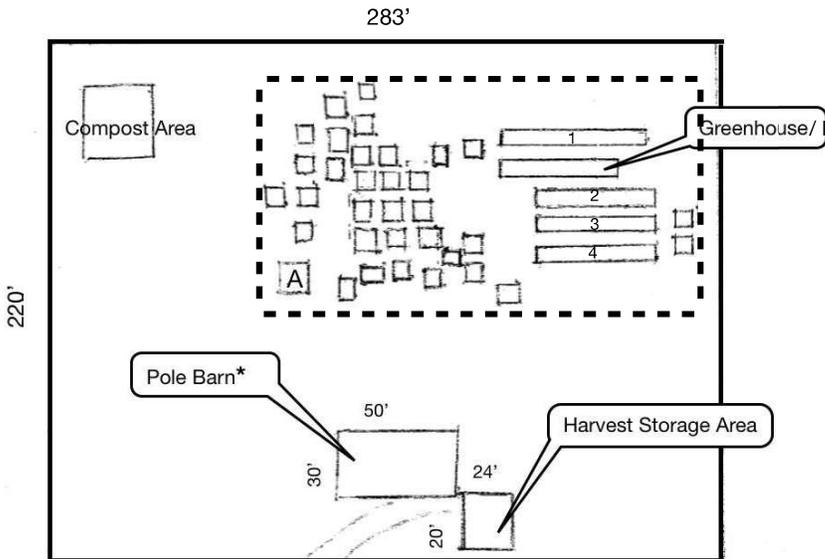
0 62.5 125 FEET



24550 East Biggar Lane
Covelo, CA 95428

PREMISES DIAGRAM
APN 032-390-29

Cultivation Application:
LCA18-0000729



Aggregate Sq. Footage
of Growing Area =
14,450 sq. ft. (170' x 85')

50' Scale



Canopy Square Footage = 4,963 sq. ft.

Each box drawing indicates one plant canopy of 9' x 9'. There are 33 of these boxes which equal a total of **2,673 sq. ft.**

Larger box indicated on diagram with the letter **A** is 14' x 14' equaling a total of **196 sq. ft.**

Greenhouse/Immature Plant Area

Rectangle indicated with the number **1** is a long row that is 8' x 68' for a total of **544 sq. ft.**

Rectangles indicated with the numbers **2, 3, and 4** are each rows of 7' x 50' equaling a total for the three rectangle rows (2, 3, and 4) of **1,050 sq. ft.**

Greenhouse serves as immature plant area until we remove the cover to plant in a 10' x 50' row equaling a total of **500 sq. ft.**

Totals in bold indicate true canopy square footage of 4,963 sq. ft. Each plant canopy area is clearly bordered and measurable on our property by 4 corner posts and string lines. Please note the importance of garden air flow and spaces in between plants that act as pest and disease control, spaces for other agriculture that increase plant and pollinator biodiversity and a healthy ecosystem.

Pesticide and Agricultural Storage Area is located on the adjacent property owned by same property owner and license applicant Forrest Gauder - cultivation license # LCA18-0000654.

* Pole Barn NOT used for cannabis activity.

The beginning laws, now changed, of our local county required we apply for two separate licenses because our property is split in different parcels - it is now allowed that adjacent parcels with the same owner be combined. However, we are forced to keep what we have already applied for with the state of CA until our applications get approved and upon

Tracy Toloy - Application Paperwork Add in Info

#0773

From: Sun Roots <sunrootsfarm@gmail.com>
To: <toloyt@mendocinocounty.org>
Date: 3/6/2018 11:06 AM
Subject: Application Paperwork Add in Info
Attachments: 2017 1108 Gauder Well Covelo.zip; 20180306_101610.jpg

Hello,

We have a Cannabis cultivation application for **File No. : AG_2017-0773** located at. 24550 Biggar Ln. Covelo, CA 95428

The following information and attachments are remaining paperwork due for this application:

Lease Agreement attached*

Well Reports attached*

Fish and Wildlife verification received on 2/8/18 by epims.support@wildlife.com to sunrootsfarm@gmail.com:

"The following Cannabis Cultivation Self-Certification was received:
 Notification Number: 00197
 Name: Sun Roots Farm Fish and Wildlife
 Program Area: Region 1

The California Department of Fish and Wildlife (CDFW) reviewed your Cannabis Cultivation Self-Certification (Self-Certification) that indicates the following:

1. Your project does not or will not result in **diversion or obstruction of water** from any river, stream, or lake; or use water from a source other than a municipal/public water supply.
2. Your project does not or will not result in **disturbance to land or vegetation** in or adjacent to any river, stream, or lake, including those that are periodically dry.
3. Your project does not or will not result in **deposition of any material** in or adjacent to any river, stream, or lake, including those that are periodically dry.

Based upon your Self-Certification survey response, your project is not subject to the notification requirement in Fish and Game Code section 1602.

This letter serves as **written verification that a Lake or Streambed Alteration Agreement is not required** for the activities described in your Self-Certification.

A copy of this email, your Self-Certification form, and all information and attachments submitted to CDFW must be available at all times at the project site."



Applicant: Forrest Gauder			Date: 5/23/2021
Application No.: AG-2017-0773	APN: 032-390-29	DFW CEQA No.: N/A	Case No.: N/A
<input type="checkbox"/> New <input type="checkbox"/> Existing	Proposed: <input checked="" type="checkbox"/> Outdoor (SF): 14,450		
<i>Additional Project details</i>	<i>Artificial light: no</i>	<i>Power source: grid</i>	<i>Water source: well</i>

Thank you for referring this application to the California Department of Fish and Wildlife (CDFW) for review and comment.

CDFW offers the following recommendations and comments on the Project in our role as a Trustee and Responsible Agency pursuant to the California Environmental Quality Act (CEQA; California Public Resource Code Section 21000 *et seq.*). These comments are intended to assist the Lead Agency in making informed decisions during project review.

The performance standards detailed below are required to avoid significant impacts to sensitive species and/or natural communities. Upon the **County’s verification of performance standard completion**, the Project, incorporating all standards, requirements, and limitations pursuant to the County ordinance, and in compliance with other applicable laws and regulations, demonstrates that there will be a less than significant impact to sensitive species or natural communities.

Please note the following performance standards required to avoid or reduce impacts to sensitive species and their habitats to a less than significant level:

On 12/11/2019, CDFW submitted a review to Mendocino County stating the California Natural Diversity database (CNDDDB) documents an occurrence of Milo Baker’s lupine (*Lupinus milo-bakeri*) adjacent to the project parcel. Comments on the project included if the project was modified or expanded, then surveys for rare and sensitive species need to occur (see images below). Milo Baker’s lupine is listed as threatened under the California Endangered Species Act. Currently, CNDDDB maps Milo Baker’s lupine as present on the parcel. Additionally, it appears there has been project expansion since the 2018 NAIP imagery was reviewed. This is supported by imagery and by the 2019 review stating there was 5,000 sq. ft. of cultivation but the current site map indicating there is 14,450 sq. ft of cultivation. Both the lupine being on the parcel and expansion are reasons for conducting botanical surveys.

To determine the extent of the Milo Baker’s lupine occurrence, the Applicant must have a qualified botanist conduct an appropriately timed survey to identify the extent of the occurrence and its potential habitat. Any other rare or sensitive plant species or their habitat found on the parcel must also be identified to prevent impacts to them or to natural communities. The appropriate surveys shall be conducted in all areas that have the potential to be directly and indirectly impacted by the project. This includes but is not limited to ground disturbing activities (e.g., relocation of facilities, etc.). A qualified botanist should conduct all botanical surveys. A report of findings should be provided to the County and CDFW for review. After review of the report, CDFW will be able to provide sites specific recommendations to avoid, minimize, or mitigate project impacts.

Please note the following information:

1. A Self-Certification (EPIMS-00197-R1) has been issued to the applicant through CDFW’s online Lake or Streambed Alteration Notification process. Two wells are on the parcel, neither is covered by an agreement.

2. The County should confirm that the disclosed wells are producing at a sufficient rate of water and in sufficient quantity of water for cultivation purposes. The County should confirm if the wells are not producing at a sufficient rate or in sufficient quantity to meet agricultural demand what other water source will be employed to meet irrigation demand. To determine well productivity, a 24-hour pump down test is recommended to be conducted by the applicant. If the wells are not productive enough, then a water management plan should be provided by the applicant. Alternative, the County could determine if other sources of waters will be used.

Thank you for the opportunity to comment. Please feel free to contact me with questions at Jane.Arnold@wildlife.ca.gov.

- Jane

Jane Arnold
Senior Environmental Scientist – Specialist, Retired Annuitant
California Department of Fish and Wildlife

Image 1 is redacted because it does not meet the terms of the CNDDDB License Agreement.

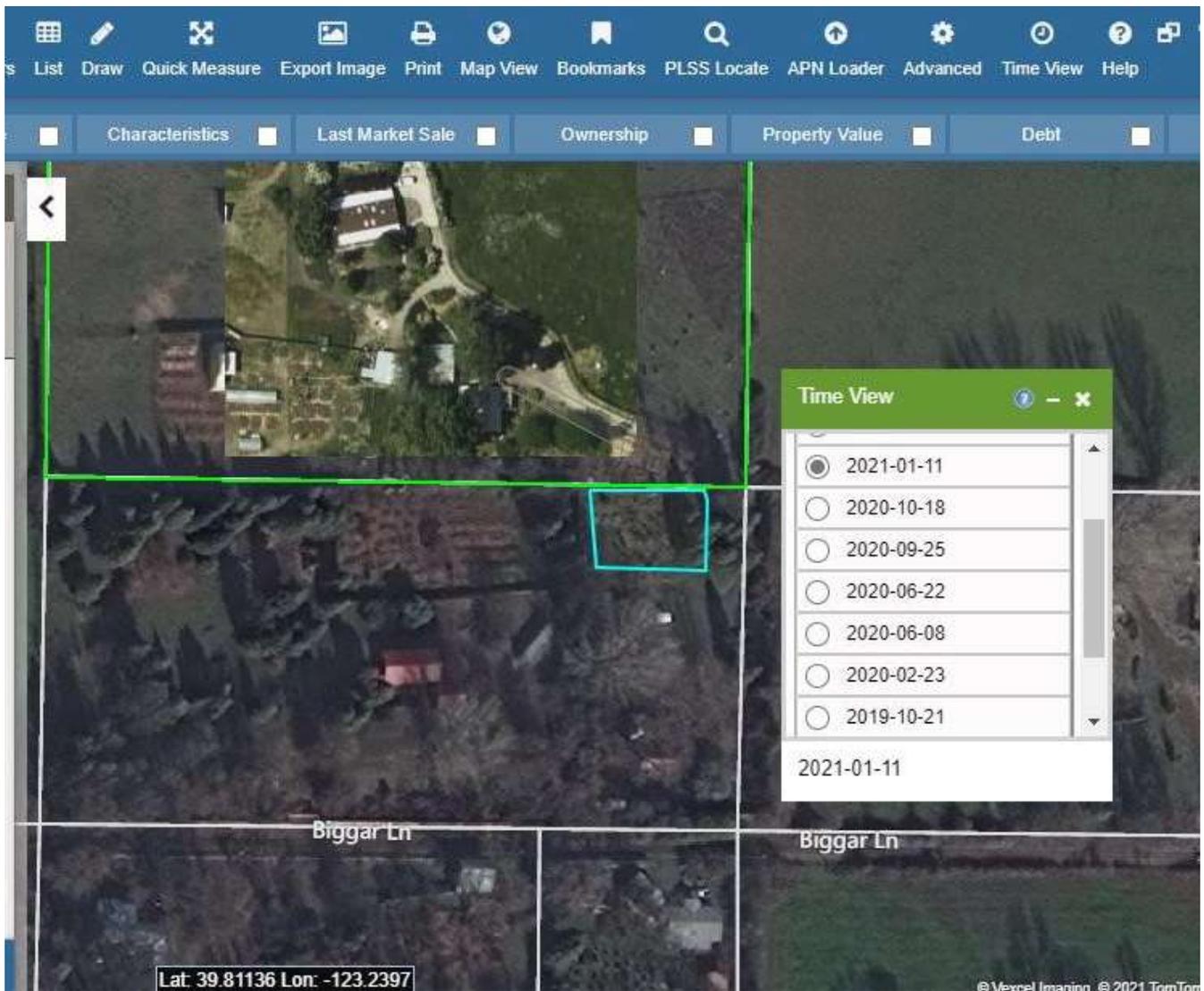


Image 2. Landvision imagery from January 11, 2021, which appears to show an expanded area of cultivation (inside rectangle) in 2020 and according to site map will stay under cultivation.

Image 3 is redacted because it does not meet the terms of the CNDDDB License Agreement.

La Rosa, Raffica@Wildlife

From: Moreno, Polo@CDPR <Polo.Moreno@cdpr.ca.gov>
Sent: Thursday, July 8, 2021 12:01 PM
To: La Rosa, Raffica@Wildlife
Cc: Talpasanu, Leslie@CDPR; Bilheimer, Catherine@CDPR
Subject: Milo Baker's lupine
Attachments: Milo Bakers Lupine Bio.pdf

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

God morning,

I was forwarded your request for information pertinent to Milo Baker's lupine (*Lupinus milo-bakeri*). The Endangered Species Program of the Department of Pesticide Regulation has developed a series of field identification cards, one of which corresponds to Milo Baker's lupine (see attached). The information and photograph included were provided by Roxanne Bittman of the California Native Plant Society. Thus, I believe you probably have access to this information.

Should you require a copy of these documents, please contact me at your earliest convenience.

Cordially,

Leopoldo A. Mo
Senior Environmental Scientist
Endangered Species Program
Dept. of Pesticide Regulation

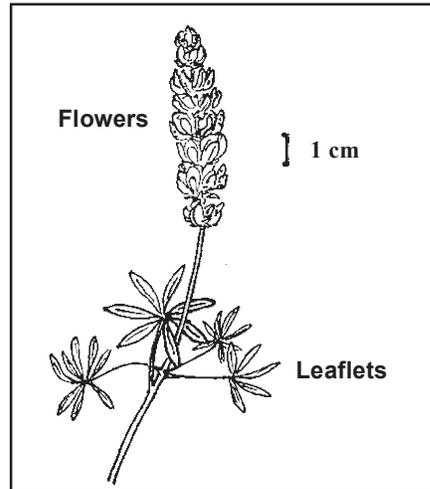
CONFIDENTIALITY NOTICE: This e-mail message, including any attachments, is for the sole use of the intended recipient(s) and may contain confidential and privileged information. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please contact the sender by reply e-mail and destroy all copies of the original message.

Milo Baker's Lupine (*Lupinus milo-bakeri*)
Status -- Federal: Category 2 ; California: Candidate



Photo: Jack Booth, CDFG

Milo Baker's lupine is an herbaceous annual plant of the Pea family (Fabacea) found along some roadsides of Mendocino and Colusa Counties (see details on back). It measures approximately 3-5 ft. in height. Its flowers go from blue to pale yellow with age. Flowering occurs from June through August. Milo Baker's lupine is commonly associated with weedy species such as Blackberry (*Rubus sp.*), Canary grass (*Phalaris sp.*), Puncture vine (*Tribulus terrestris*), and Yellow Star thistle (*Centaurea solstitialis*)



Distribution

This plant has been found primarily along roadsides in wet ditches and streams in Round Valley in the town of Covelo, Mendocino County. A new occurrence was discovered along Hwy 101 Southwest of Covelo and one other was found in Bear Valley in Colusa County. The occurrences of Milo Baker's lupine along roads may not represent the original habitat for this species, however, its natural habitat is not well known.

Description

As stated before, Milo Baker's lupine is an herbaceous annual plant. Its leaflets and stems are covered with fine "hair". The leaves are palmate, and composed of 6 to 9 leaflets radiating from a central point. Flowers mature from the bottom of the plant to the top, forming hairy pods containing several round seeds.

Management

Since the remaining occurrences of this species are found along roadsides where the California Department of Transportation (Caltrans) performs roadside maintenance, the most critical questions that need answers are those regarding this plant's response to herbicides. More study is needed to see if and when the plant can be sprayed and/or mowed.

Caltrans and the Department of Fish and Game are developing strategies that allow certain types of road maintenance and guarantee viable, healthy occurrences of Milo Baker's lupine

California Department of Pesticide Regulation
Endangered Species Program
www.cdpr.ca.gov/docs/endspec/index.htm **dpr**

La Rosa, Raffica@Wildlife

From: Jim Xerogeanes <jxerogea@mendocino.edu>
Sent: Friday, June 4, 2021 9:41 AM
To: La Rosa, Raffica@Wildlife
Subject: RE: [EXTERNAL]Notification of status review for Milo Baker's lupine

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

Hi Raffica,

I might have a couple of useful observations that might help.

In the meantime please note that my email address has changes as I just retired. 😊

Hi there,

I need to change my email address so I can continue receiving your notifications.
Please change my email address in your system from jxerogea@mendocino.edu to jimxflora@gmail.com.

I will continue to use my cell phone number 707-972-3139.

Thank you very much,

Jim Xerogeanes
Instructor/Director
Agriculture & Natural Resources
Mendocino College
(707) 468-3218

From: La Rosa, Raffica@Wildlife <Raffica.LaRosa@Wildlife.ca.gov>
Sent: Thursday, June 3, 2021 5:11 PM
To: La Rosa, Raffica@Wildlife <Raffica.LaRosa@Wildlife.ca.gov>
Subject: [EXTERNAL]Notification of status review for Milo Baker's lupine

Attached you will find our Notification of Status Review for Milo Baker's Lupine (*Lupinus milo-bakeri*). Milo Baker's lupine is known from Mendocino and Colusa counties. It is listed as threatened under the California Endangered Species Act, but is a candidate for endangered species status. The California Department of Fish and Wildlife is requesting any information you may have on this species for consideration during the review period. Please share any information or comments you may have.

Thank you for your time.

Sincerely,
Raffica

--

Raffica La Rosa, PhD

Environmental Scientist
Native Plant Program
Habitat Conservation Planning Branch
California Department of Fish & Wildlife
<https://www.wildlife.ca.gov/Conservation/Plants>

La Rosa, Raffica@Wildlife

From: Frederickson, Stephanie@DOT <Stephanie.Frederickson@dot.ca.gov>
Sent: Thursday, June 17, 2021 10:14 AM
To: York, Dana A@DOT; Aaron E. Sims; La Rosa, Raffica@Wildlife
Cc: Nick Jensen; Garrison, Jennifer@Wildlife
Subject: RE: Notification of status review for Milo Baker's lupine
Attachments: MBL Census Data.xlsx; 4_2019_CNDDDB_1 of 3.pdf; 4_2019_CNDDDB_3 of 3.pdf; 4_2019_CNDDDB_2 of 3.pdf; 4_2020_CNDDDB_2 of 2.pdf; 4_2020_CNDDDB_1 of 2.pdf; MBL Premowing Survey_April_2020_map 2 of 4.pdf; MBL Premowing Survey_April_2020_map 3 of 4.pdf; MBL Premowing Survey_April_2020_map 4 of 4.pdf; MBL Premowing Survey_April_2020_map 1 of 4.pdf; MBL_8_2019_map 1 of 3.pdf; MBL_8_2019_map 2 of 3.pdf; MBL_8_2019_map 3 of 3.pdf; MBL_4_2019_map 2 of 4.pdf; MBL_4_2019_map 3 of 4.pdf; MBL_4_2019_map 4 of 4.pdf; MBL_4_2019_map 1 of 4.pdf; MBL_4_2019_map 2 of 4.pdf; MBL_4_2019_map 3 of 4.pdf; MBL_4_2019_map 4 of 4.pdf; MBL_4_2019_map 1 of 4.pdf; MBL_8_2019_map 1 of 3.pdf; MBL_8_2019_map 2 of 3.pdf; MBL_8_2019_map 3 of 3.pdf; ESA Encroachment_4_25_2019.pdf

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

Hi all,

Attached is our census data (and notes) for the extant MBL populations on MEN 162 in Covelo. I have yet to submit CNDDDB forms for 2021 but will attempt to get that done before the end of the day – I also need to do some mapping for the current year. I've attached past forms from 2019 and 2020, along with the mapping and our mowing ESA boundaries. Note: Caltrans did not mow these areas in the fall after seeds dispersed (in an effort to control weeds) due to Covid. As a possible consequence, we had lower numbers in April compared to recent years where we did fall vegetation management (i.e. mowing). Also attached is our MOU for a seed bank viability experiment we conducted in historic EOs. We did not find any lupine in these areas post soil disturbance.

If you have any questions, please call. I will send the 2021 forms and mapping once they are complete.

Stephanie

Stephanie Frederickson
Senior Resource Specialist
California Department of Transportation
North Region Environmental
Cell: 707-496-6244

(currently answering emails from home, response time may be delayed)

From: York, Dana A@DOT <dana.york@dot.ca.gov>
Sent: Friday, June 4, 2021 11:50 AM
To: Aaron E. Sims <asims@cnps.org>; La Rosa, Raffica@Wildlife <Raffica.LaRosa@Wildlife.ca.gov>
Cc: Nick Jensen <njensen@cnps.org>; Frederickson, Stephanie@DOT <Stephanie.Frederickson@dot.ca.gov>
Subject: RE: Notification of status review for Milo Baker's lupine

Dear Aaron & Raffica:

Here's a copy of the Milo Baker's Lupine Conservation Strategy Completed in 2017. At that time, it was truly endangered of being wiped out. Stephanie Frederickson has continued monitoring over the years and will be sharing current numbers/trends with you.

Let me know if you need anything else.

Dana

Dana York
Senior Environmental Planner
CALTRANS North Region Environmental
Cell: (707) 572-09's48

From: Aaron E. Sims <asims@cnps.org>
Sent: Friday, June 4, 2021 9:12 AM
To: York, Dana A@DOT <dana.york@dot.ca.gov>
Cc: Nick Jensen <njensen@cnps.org>
Subject: Fwd: Notification of status review for Milo Baker's lupine

EXTERNAL EMAIL. Links/attachments may not be safe.

I'm sure you got this but sending your way in case.

I'd like to setup a time to talk with you about this if you are available. I spoke with you about the mowing saga briefly in the past but would like your current take on the situation of this plant and it's proposed status change.

Thanks,
Aaron

----- Forwarded message -----

From: La Rosa, Raffica@Wildlife <Raffica.LaRosa@wildlife.ca.gov>
Date: Thu, Jun 3, 2021 at 5:11 PM
Subject: Notification of status review for Milo Baker's lupine
To: La Rosa, Raffica@Wildlife <Raffica.LaRosa@wildlife.ca.gov>

Attached you will find our Notification of Status Review for Milo Baker's Lupine (*Lupinus milo-bakeri*). Milo Baker's lupine is known from Mendocino and Colusa counties. It is listed as threatened under the California Endangered Species Act, but is a candidate for endangered species status. The California Department of Fish and Wildlife is requesting any information you may have on this species for consideration during the review period. Please share any information or comments you may have.

Thank you for your time.

Sincerely,

Raffica

--

Raffica La Rosa, PhD

Environmental Scientist

Native Plant Program

Habitat Conservation Planning Branch

California Department of Fish & Wildlife

<https://www.wildlife.ca.gov/Conservation/Plants>

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Aaron E. Sims, [CCB-0008](#) | Rare Plant Program Director | California Native Plant Society
2707 K Street, Suite 1, Sacramento, CA 95816 | (916) 738-7610, asims@cnps.org

"Differ as we may as to what constitutes a species, the object of us all is to know plants and to help others to know them." -- Aven Nelson

La Rosa, Raffica@Wildlife

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Sent: Friday, June 4, 2021 11:50 AM
To: Aaron E. Sims; La Rosa, Raffica@Wildlife
Cc: Nick Jensen; Frederickson, Stephanie@DOT
Subject: RE: Notification of status review for Milo Baker's lupine
Attachments: Milo-Bakers_Lupine_Cons_Strat_11_30_17_final.pdf

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

Dear Aaron & Raffica:

Here's a copy of the Milo Baker's Lupine Conservation Strategy Completed in 2017. At that time, it was truly endangered of being wiped out. Stephanie Frederickson has continued monitoring over the years and will be sharing current numbers/trends with you.

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Thank you for your time.

Sincerely,

Raffica

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Raffica La Rosa, PhD

Environmental Scientist

Native Plant Program

Habitat Conservation Planning Branch

California Department of Fish & Wildlife

<https://www.wildlife.ca.gov/Conservation/Plants>

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APPENDIX B: Comments from Peer Reviewers on the Draft Milo Baker's lupine Status Review

The Report to the Fish and Game Commission Status Review of Milo Baker's Lupine (*Lupinus milo-bakeri*) is thorough and well-done. It incorporates all available scientific knowledge based on herbarium records, field studies, and garden observations.

Lines 243—260: The description appears to be accurate.

Lines 261—343: Range and Distribution appears to be accurate.

Lines 293—305: It seems important to continue to check for Milo Baker's lupine in the Bear Valley Ranch, Colusa County, location. It is possible that it occurs very sporadically in the same location—but possibly in different years—as *Lupinus luteolus*.

Lines 344—375: Good overview of the biology of these plants.

Lines 376—397: Evidence supports the separation of *Lupinus milo-bakeri* from *L. luteolus*. However, it is important to keep in mind there is not consensus among taxonomists about whether or how to recognize these taxa. The Covelo subpopulations are different morphologically in size, leaf shape, and flower color from *L. luteolus*. When an entity consists of so few individuals in so few populations, it is critically important that it be protected. Although genetic analysis might not fully resolve this issue, it might give an indication of how similar or dissimilar *L. milo-bakeri* is to populations of *L. luteolus*.

Lines 400—495: Habitat considerations appear to be thorough and well-documented.

Lines 496—614: The historical account is very interesting. At some point a study of the seed bank within the subpopulations and in adjacent habitat would be useful to help determine whether *Lupinus milo-bakeri* is restricted to specific microhabitats. The pattern of seed dispersal would also be important to determine. Every effort should be made to protect the current locations of the subpopulations and adjacent areas.

Lines 615--:798 Factors affecting.... Repeat: every effort should be made to protect the current locations of the subpopulations and adjacent areas.

Lines 799--914: Management efforts: Collaboration with private landowners and tribes is obviously very important. Lack of communication among agencies that results in management mistakes is not acceptable. The agreement with CalTrans should have helped. Seed banking and seed bulking efforts should be continued.

Lines 915: 981: I agree with the recommendations.

Lines 982--1071: Scientific determinations: I agree with these conclusions and recommendations.

Lines 1072--1101: Summary of key findings and Recommendation for the Commission: I agree.

Lines 1102--:1186 Management recommendations and recovery measures. I agree with all of these recommendations. I would especially encourage that a habitat assessment be conducted to determine whether there are other places that *Lupinus milo-bakeri* might be expected to occur, or even if there is suitable habitat to encourage new populations to be established.

Reviewer	Line	end	Comment/Question	Response
Morin	243	260	The description appears to be accurate.	Noted
Morin	261	343	Range and Distribution appears to be accurate.	Noted
Morin	293	305	It seems important to continue to check for Milo Baker's lupine in the Bear Valley Ranch, Colusa County, location. It is possible that it occurs very sporadically in the same location—but possibly in different years—as <i>Lupinus luteolus</i> .	Agreed. Added a bullet to the recommendations section.
Morin	344	375	Good overview of the biology of these plants.	Noted
Morin	376	397	Evidence supports the separation of <i>Lupinus milo-bakeri</i> from <i>L. luteolus</i> . However, it is important to keep in mind there is not consensus among taxonomists about whether or how to recognize these taxa. The Covelo subpopulations are different morphologically in size, leaf shape, and flower color from <i>L. luteolus</i> . When an entity consists of so few individuals in so few populations, it is critically important that it be protected. Although genetic analysis might not fully resolve this issue, it might give an indication of how similar or dissimilar <i>L. milo-bakeri</i> is to populations of <i>L. luteolus</i> .	Noted. Added "based primarily on morphology" to indicate that the species identity is not backed by any genetic analysis. I agree that genetic analysis may elucidate how these species are related, and the recommendation of genetic analysis is in a later section.
Morin	400	495	Habitat considerations appear to be thorough and well-documented.	Noted
Morin	496	614	The historical account is very interesting. At some point a study of the seed bank within the subpopulations and in adjacent habitat would be useful to help determine whether <i>Lupinus milo-bakeri</i> is restricted to specific microhabitats. The pattern of seed dispersal would also be important to determine. Every effort should be made to protect the current locations of the subpopulations and adjacent areas.	Added a recommendation bullet that says: Conduct seed bank studies in soils adjacent to current subpopulations to identify the extent of suitable microhabitat to understand possible restrictions to population expansion. Where possible, extend protections to areas supporting Milo Baker's lupine seed bank.
Morin	615	798	Factors affecting.... Repeat-- every effort should be made to protect the current locations of the subpopulations and adjacent areas.	Noted

Reviewer	Line	end	Comment/Question	Response
Morin	799	914	Management efforts-- Collaboration with private landowners and tribes is obviously very important. Lack of communication among agencies that results in management mistakes is not acceptable. The agreement with CalTrans should have helped. Seed banking and seed bulking efforts should be continued.	Noted.
Morin	915	981	I agree with the recommendations.	Noted.
Morin	982	1071	Scientific determinations-- I agree with these conclusions and recommendations.	Noted.
Morin	1072	1101	Summary of key findings and Recommendation for the Commision-- I agree.	Noted.
Morin	1102	1186	Management recommendations and recovery measures. I agree with all of these recommendations. I would especially encourage that a habitat assessment be conducted to determine whether there are other places that <i>Lupinus milobakeri</i> might be expected to occur, or even if there is suitable habitat to encourage new populations to be established.	Noted.

From:
Sent:
To:
Subject:

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening

Hi Raffica,

As I stated previously, I am not familiar with the location of the current or previous populations and I have never had the pleasure to see these plants in the wild. With that being said, I read through the whole document, but left my comments to the propagation section and recommendations.

I wouldn't say that propagating these plants is too difficult. I know Medecino had some issues, but I am not familiar with their procedures.

We got 89% germination, which is pretty good. We did end up with some weird growth on some of our seedlings, which resulted in less transplants, but I've seen that happen with other lupines as well. Once we did get them up to larger pot sizes, we had pretty good survival. We were just unlucky with the predation issues of the out-planted plants for the first round and then a freak hail and wind storm that hit us for the second round. The problem with doing these rare seed bulking trials is that we have so few seeds to work with that any random event becomes a major problem and since we had never grown these plants, there is some trial and error that needs to take place to figure out how to best treat the species. I feel confident that if we did it again, we could better handle the predation issues (with better caging) and stake down and better secure the top heavy container plants to prevent environmental damage. The reason we did the vegetative cuttings was because of the wind storm and damage that occurred to the plants (stems snapping). We don't normally do cuttings for annuals, but in this instance it worked and could be helpful if there are certain genetic individuals you want moved to a new location to make different types of genetically different subpopulations. With all that being said, I would recommend doing more years of seed bulking from multiple seed harvesting years. This could really increase the amount of seed available to do trial restoration projects. Seed bulking can impact genetics, so I agree with sticking only with the first generation of seeds for restoration. That's as far as we ever go for rare plants at CalBG. As you stated, lupines do need certain environmental cues to germinate, so it could be worthwhile to administer seed pretreatments prior to seed based restoration efforts. These seeds do like disturbance in order to germinate (that's why we disturb them artificially in the nursery by clipping a small section of the seed coat to allow water to penetrate in and the seeds to imbibe in water). I would recommend doing some restoration trials that also include plugs. I think with a well managed site, it would be possible to make new sites through restoration. From what I have seen in the nursery, these plants like a lot of water, so continued site maintenance would most likely be necessary for the plants to reach maturity and seeding. Unless the rain that year is really good. In SoCal, we cannot do restoration without supplemental water, but I don't know this area at all. I saw in Figure 7 that rain the past couple of years has been on the lower end

Let me know if you need anything else or if there was a section you thought I should have made comments on and didn't.

Billy

Reviewer	Line	Comment/Question	Response
Sale	Comment	<p>I wouldn't say that propagating these plants is too difficult. I know Medecino had some issues, but I am not familiar with their procedures. We got 89% germination, which is pretty good. We did end up with some weird growth on some of our seedlings, which resulted in less transplants, but I've seen that happen with other lupines as well. Once we did get them up to larger pot sizes, we had pretty good survival. We were just unlucky with the predation issues of the out-planted plants for the first round and then a freak hail and wind storm that hit us for the second round. The problem with doing these rare seed bulking trials is that we have so few seeds to work with that any random event becomes a major problem and since we had never grown these plants, there is some trial and error that needs to take place to figure out how to best treat the species. I feel confident that if we did it again, we could better handle the predation issues (with better caging) and stake down and better secure the top heavy container plants to prevent environmental damage. The reason we did the vegetative cuttings was because of the wind storm and damage that occurred to the plants (stems snapping). We don't normally do cuttings for annuals, but in this instance it worked and could be helpful if there are certain genetic individuals you want moved to a new location to make different types of genetically different subpopulations. With all that being said, I would recommend doing more years of seed bulking from multiple seed harvesting years. This could really increase the amount of seed available to do trial restoration projects. Seed bulking can impact genetics, so I agree with sticking only with the first generation of seeds for restoration. That's as far as we ever go for rare plants at CalBG. As you stated, lupines do need certain environmental cues to germinate, so it could be worthwhile to administer seed pretreatments prior to seed based restoration efforts. These seeds do like disturbance in order to germinate (that's why we disturb them artificially in the nursery by clipping a small section of the seed coat to allow water to penetrate in and the seeds to imbibe in water). I would recommend doing some restoration trials that also include plugs. I think with a well managed site, it would be possible to make new sites through restoration. From what I have seen in the nursery, these plants like a lot of water, so continued site maintenance would most likely be necessary for the plants to reach maturity and seeding. Unless the rain that year is really good. In SoCal, we cannot do restoration without supplemental water, but I don't know this area at all. I saw in Figure 7 that rain the past couple of years has been on the lower end.</p>	<p>Noted. I edited the section on Propagation and Seed Bulking subsection and also added a recommendation and modified another recommendation from the Management Recommendations towards the end of the document.</p>

Review of *Lupinus milobakeri* status Review 1 19 2022 Teresa Sholars

Line 126. The population in Colusa County is probably based on a misidentification.
Line 136 add county agencies as Mendocino County road maintenance has mown populations
Line 149 delete the hyphen in the binomial according to nomenclatural experts from Harvard & FNA
Line The population in Longvale cannot be confirmed as being accurate
Line 303 4 At this point I don't think we have any genetic makers to differentiate *L. luteolus* from *Lupinus milobakeri*. We don't have genetic markers to differentiate any species of Lupine so far (at least any that correspond to any morphology)
Line 337 I would also doubt that the Longvale population (EO 13) was accurate, but that point may be moot.
Line 354 Bumblebees have been shown to pollinate *Lupinus*. It is not yet known for sure if honeybees pollinate or just steal lupine pollen due to the difficulty of squeezing the flower so the pistil pops up.
Line 388 *L. luteolus* can have bluish flowers (uncommon, bright yellow is more common) and we do know that *L. milobakeri* can have yellowish flowers.
Line 396 flowering time of *L. luteolus* can be later but only at higher elevation. I cannot corroborate your stem, leaflet, keel angle shape information. I would love to see that data so I can use it too in my treatments. How many specimens did you all measure?
Line 646 Mendocino County does mow county roads and has mowed areas within the EOs. I think Barnes lane but I can get you the exact location if you need
Line 1354 see my signature and vitae

FNA has determined that the hyphen should be deleted, I have put in a request to make sure that that is correct. See below

Hi Teresa,

Yes, under the current Code of Nomenclature, there should be no hyphen. Hyphens would be used if his names had been Latinized, as in *Lupinus johannis-howellii* C.P.Sm., but not if they are used in their original form.

Cheers,
Geoff

From: tsholars@mcn.org <tsholars@mcn.org>

Sent: January 19, 2022 3:14 PM

To: Levin, Geoffrey A <levin1@illinois.edu>

Subject: hyphenation of CP Smith names

Hi Geoff:

Just checking that you also think that *Lupinus milobakeri* CP Sm. is not hyphenated (it is treated in synonymy in FNA, but I treat it as a species in the Jepson treatments.) The Galleys you sent did delete the hyphen in the synonymy under *L. luteolus*.

I am reviewing a status review on this taxon for Cal Fish and Wildlife and want to spell correctly.
best

Teresa Sholars

Professor Emeritus of Biology & Sustainable Agriculture, College of the Redwoods
Adjunct Professor, Curator Herbarium and Natural History Collection Mendocino Coast Campus,
Mendocino College

Retired Botanical and Ecological Consultant

PO Box 2340

Mendocino, Ca 95460

707 9374130

tsholars@mcn.org

tsholars@mendocino.edu

cell 707 4726370(reception limited, text only)

Reviewer	Line	end	Comment/Question	Response
Sholars	126	126	The population in Colusa County is probably based on a misidentification.	Added the text "may extend into" to suggest that the Bear Valley identity is uncertain.
Sholars	136	136	add county agencies as Mendocino County road maintenance has mown populations	Added county agencies "... depends on sustained cooperation between state and county agencies..."
Sholars	149	149	delete the hyphen in the binomial according to nomenclatural experts from Harvard & FNA	Noted, but hyphen was not added to remain consistent with the species name in Title 14, section 670.2.
Sholars	150	302	The population in Longvale cannot be confirmed as being accurate	Added the text ", and its identity cannot be confirmed as accurate today because there are no herbarium records from this site." Also, updated text around other mentions of Longvale to convey similar uncertainty about species identity.
Sholars	303	304	At this point I don[t think we have any genetic makers to differentiate <i>L. luteolus</i> from <i>Lupinus milobakeri</i> . We don't have genetic markers to differentiate any species of Lupine so far (at least any that correspond to any morphology)	Edited this sentence to indicate that genetic tools still need to be developed, and edited one of the recommendations to also take this into consideration.
Sholars	337	337	I would also doubt that the Longvale population (EO 13) was accurate, but that point may be moot.	No changes made. Whether or not this was truly Milo Baker's lupine, it was accidentally introduced and the lupines only survived briefly in that location.
Sholars	354	354	Bumblebees have been shown to pollinate <i>Lupinus</i> . It is not yet known for sure if honeybees pollinate or just steal lupine pollen due to the difficulty of squeezing the flower so the pistil pops up.	Added text, "however it is not known if honey bees are able to effectively pollinate this species."
Sholars	388	388	<i>L. luteolus</i> can have bluish flowers (uncommon, bright yellow is more common) and we do know that <i>L. milobakeri</i> can have yellowish flowers.	Spoke with Teresa to clarify. The bluish flowers of <i>L. luteolus</i> is from dried herbarium specimens and the yellowish flowers of <i>L. milo-bakeri</i> comes from observations of the older, drying flowers. Text edited to mention blue in butter lupine.

Reviewer	Line	end	Comment/Question	Response
Sholars	396	396	flowering time of <i>L. luteolus</i> can be later but only at higher elevation. I cannot corroborate your stem, leaflet, keel angle shape information. I would love to see that data so I can use it too in my treatments. How many specimens did you all measure?	Added to the table title ", taken from Knight (1965)" to clarify that those data from from that article. Knight does not provide a sample size, other than to say that five field visits were made for each species. They filed four herbarium samples, but I do not know if all four are Milo Baker's lupine, or if they are split between the two species.
Sholars	646	646	Mendocino County does mow county roads and has mowed areas within the EOs. I think Barnes lane but I can get you the exact location if you need	Updated paragraph to include text that says the County is responsible for maintaining the rights-of-way for smaller county roads.
Sholars	1354	1354	see my signature and vitae	Updated title in table and pers. comm. list.
Sholars	Comment	-	FNA has determined that the hyphen should be deleted, I have put in a request to make sure that that is correct. See below: Hi Geoff: Just checking that you also think that <i>Lupinus milobakeri</i> CP Sm. is not hyphenated (it is treated in synonymy in FNA, but I treat it as a species in the Jepson treatments.) The Galleys you sent did delete the hyphen in the synonymy under <i>L. luteolus</i> . I am reviewing a status review on this taxon for Cal Fish and Wildlife and want to spell correctly. Hi Teresa, Yes, under the current Code of Nomenclature, there should be no hyphen. Hyphens would be used if his names had been Latinized, as in <i>Lupinus johannis-howellii</i> C.P.Sm., but not if they are used in their original form. Cheers, Geoff	Noted. For the sake of consistency with the code, it will continue to be referred to with the hyphen until there is a code revision to update nomenclature across the plant species.

Peer review comments for Milo Baker Lupine, *Lupinus milo-bakeri*

By Jim Xerogeanes per request by Raffica La Rossa

Comments noted by line number

- 236 Table 1 - I do not have a Ph.D. **If a title is needed for this report,** then Retired, Mendocino College or Professor Emeritus Agriculture and Natural Resources, Mendocino College.
- 235 I do not believe Teresa has a Ph.D. either, but I may be wrong. She may desire to be listed as Professor Emeritus Biology, College of the Redwoods. You are correct that she is currently teaching part-time for Mendocino College.
- 309 John Booth is listed later as Jack. We have always known him as **Jack** Booth.
- 360's We tried inoculating some of our seedlings during the 2017/2018 grow-out with a commercially available mix of nitrogen-fixing bacteria a number of times while they were in containers. No positive results were seen. **I can get you the product name and exact labeled bacteria mixture if desired.** It was a shot in the dark as no specific info could be found on N-fixing bacteria on lupines outside of possibly a bradyrhizobia.
- 394 The diagram in the chart that is stated as **Oblanceolate is Lanceolate!** This should be changed to Oblanceolate to reflect the photos and Teresa's description.
- 440 Wilbur Springs noted on maps as Wilbur **Hot** Springs
- 482-485 Excellent notation here that may be very important in the future in designating alternative sites or to continue detection of any unknown populations. I believe that this good drainage with available moisture wicking up is why they do well there and in the photo by Jack Booth 1986 and why one reason why they failed when planted out into the field in the Ukiah native clay soils.
- 527 During the mid-1980's there was a large outcry by the public against Caltrans roadside herbicide spraying program and county roadside spraying program in Mendocino County. As a result of these protests Caltrans told the counties that if they wanted to opt-out of the roadside spraying

program they could with a vote by the respective Board of Supervisors. Roadside spraying was stopped in Mendocino County following a vote by the BOS to end roadside spraying. Spraying was possibly stopped in Humboldt County and then in later Trinity County. I say possibly because I cannot remember exactly, and neither could a person I checked about this issue. There is no recollection by the person I checked with or myself of an end date stated at that time by Caltrans. However, this was not a written agreement between Caltrans and the respective counties and Caltrans may have come up with the 2017 end date later.

644-645 Private lands adjacent to hwy 162 and Barnes Ln area also have/could have MBL plants on their properties.

664-670 Refer to the comments under line 527.

677-694 Loss of genetic diversity– It was observed and photographed that some of the MBL seedlings had their first set of true leaves and thus their apical shoot emerge from the stem below the disk shaped (discoïd) cotyledons. This contrasts with the normally observed emergence of this shoot/cotyledons from the center of the top side of the cotyledons.

(See photo attached)

724 “south of Covelo” Change to ... **south of Covelo, Round Valley** Just to clarify that it is not the long portion of hwy 162 south of Covelo but outside of the valley.

771 Climate-- In addition to the importance of rainfall amounts and temperature is the timing of when the precipitation may fall. Good fall rains may promote early germination and more robust seedlings. Dry fall weather may mean seedlings germinate late and possibly remain smaller plants with fewer flowers and thus decrease seed production. Increase precipitation in the spring or late spring may encourage more plant growth later in the season as the soil moisture levels would conceivably remain higher as hot temperatures approach.

778 Seedlings in containers were observed to have foliage fed on by birds at Mendocino College. This was limited to the first few sets of true leaves.

998 **Present or Threatened modification or Destruction of Habitat** - Should the following be included??? (spraying/mowing/trampling by livestock in properties adjacent to the ditch)

Figure 2

The occurrence (occurrence #13) near Longvale was thought to be different by myself and a past botanist/biologist with the USDA biological Control unit out of Berkeley, Ca. In 1991-1993 this botanist from USDA and I were to collect living MBL samples under permit for a trial to ensure that a potential new European insect bio-control for gorse, *Ulex europeas*, did not feed on MBL. The site that we were directed to is located about 2.5 miles east of Longvale on Hwy 162, where a gravel quarry operated for many years. There was no mention of a location south of Longvale along hwy 101. We found no MBL growing in the location east of Longvale at that time. Sites in Round Valley were known and talked about during this period, but I never visited them.

To try to get some clarity on this location I called Jack Booth, who not resides outside of Portland, Oregon. Jack could not remember details about the location.

Reviewer	Line	end	Comment/Question	Response
Xerogeanes	235	235	I do not believe Teresa has a Ph.D. either, but I may be wrong. She may desire to be listed as Professor Emeritus Biology, College of the Redwoods. You are correct that she is currently teaching part-time for Mendocino College.	Updated in Table 1 and Personal Communication section
Xerogeanes	236	236	Table 1 - I do not have a Ph.D. <u>If a title is needed for this report,</u> then Retired, Mendocino College or Professor Emeritus Agriculture and Natural Resources, Mendocino College.	Updated in Table 1
Xerogeanes	309	309	John Booth is listed later as Jack. We have always known him as <u>Jack</u> Booth.	Fixed, thank you.
Xerogeanes	360	369?	We tried inoculating some of our seedlings during the 2017/2018 grow-out with a commercially available mix of nitrogen-fixing bacteria a number of times while they were in containers. No positive results were seen. I can get you the product name and exact labeled bacteria mixture if desired. It was a shot in the dark as no specific info could be found on N-fixing bacteria on lupines outside of possibly a bradyrhizobia.	Noted. Asked if the mix contained any Bradyrhizobia, but they were unable to locate the exact product.
Xerogeanes	394	394	The diagram in the chart that is stated as <u>Oblanceolate is Lanceolate!</u> This should be changed to Oblanceolate to reflect the photos and Teresa's description.	Replaced both images with hand drawings.
Xerogeanes	440	440	Wilbur Springs noted on maps as Wilbur <u>Hot</u> Springs	Added the word Hot.
Xerogeanes	482	485	Excellent notation here that may be very important in the future in designating alternative sites or to continue detection of any unknown populations. I believe that this good drainage with available moisture wicking up is why they do well there and in the photo by Jack Booth 1986 and why one reason why they failed when planted out into the field in the Ukiah native clay soils.	Noted. Thank you.

Reviewer	Line	end	Comment/Question	Response
Xerogeanes	527	527	During the mid-1980's there was a large outcry by the public against Caltrans roadside herbicide spraying program and county roadside spraying program in Mendocino County. As a result of these protests Caltrans told the counties that if they wanted to opt-out of the roadside spraying program they could with a vote by the respective Board of Supervisors. Roadside spraying was stopped in Mendocino County following a vote by the BOS to end roadside spraying. Spraying was possibly stopped in Humboldt County and then in later Trinity County. I say possibly because I cannot remember exactly, and neither could a person I checked about this issue. There is no recollection by the person I checked with or myself of an end date stated at that time by Caltrans. However, this was not a written agreement between Caltrans and the respective counties and Caltrans may have come up with the 2017 end date later.	Edited the text to clarify that the ban was enacted by the Menocino Co Board of Supervisors and later cancelled by Caltrans. https://www.sfgate.com/news/article/Caltrans-Stops-Mendocino-County-Spraying-2851699.php
Xerogeanes	644	645	Private lands adjacent to hwy 162 and Barnes Ln area also have/could have MBL plants on their properties.	Added this sentence to the end of the paragraph: If Milo Baker's lupine were to occur on property adjacent to roadside ditches, plants could similarly be at risk of mowing by the landowner.
Xerogeanes	664	670	Refer to the comments under line 527.	Edited the wording slightly to indicate that Caltrans was following a policy of the County.
Xerogeanes	677	694	Loss of genetic diversity – It was observed and photographed that some of the MBL seedlings had their first set of true leaves and thus their apical shoot emerge from the stem below the disk shaped (discoid) cotyledons. This contrasts with the normally observed emergence of this shoot/cotyledons from the center of the top side of the cotyledons. (See photo attached)	Added a sentence describing this growth as an example of harmful genetic mutations that could result from inbreeding depression. Cited Xerogeanes and Kyle (2019).
Xerogeanes	724	724	“south of Covelo” Change to ... south of Covelo, Round Valley Just to clarify that it is not the long portion of hwy 162 south of Covelo but outside of the valley.	Clarified to indicate that I do actually mean the 5-6 km immediately adjacent to Covelo, south of town.

Reviewer	Line	end	Comment/Question	Response
Xerogeanes	771	771	Climate-- In addition to the importance of rainfall amounts and temperature is the timing of when the precipitation may fall. Good fall rains may promote early germination and more robust seedlings. Dry fall weather may mean seedlings germinate late and possibly remain smaller plants with fewer flowers and thus decrease seed production. Increase precipitation in the spring or late spring may encourage more plant growth later in the season as the soil moisture levels would conceivably remain higher as hot temperatures approach.	Added this sentence: In addition to average seasonal temperatures and rainfall amounts, the timing of rain events may strongly influence population sizes from year to year (Xerogeanes pers. comm. 2022).
Xerogeanes	778	778	Seedlings in containers were observed to have foliage fed on by birds at Mendocino College. This was limited to the first few sets of true leaves.	Added "young leaves eaten by birds (Xerogeanes pers. comm. 2022)" to the list of documented herbivory.
Xerogeanes	998	998	Present or Threatened modification or Destruction of Habitat - Should the following be included??? (spraying/mowing/trampling by livestock in properties adjacent to the ditch)	Agreed. Added two sentences to the <i>Other Natural Occurrences of Human-related Activities</i> section.
Xerogeanes	Figure 2	-	The occurrence (occurrence #13) near Longvale was thought to be different by myself and a past botanist/biologist with the USDA biological Control unit out of Berkeley, Ca. In 1991-1993 this botanist from USDA and I were to collect living MBL samples under permit for a trial to ensure that a potential new European insect bio-control for gorse, <i>Ulex europeas</i> , did not feed on MBL. The site that we were directed to is located about 2.5 miles east of Longvale on Hwy 162, where a gravel quarry operated for many years. There was no mention of a location south of Longvale along hwy 101. We found no MBL growing in the location east of Longvale at that time. Sites in Round Valley were known and talked about during this period, but I never visited them.	Spoke with Jim to clarify the location of occurrence 13, and he confirmed that the information they received in the 1990s must have been erroneous and that they were looking in a location where Milo Baker's lupine has never been documented.

APPENDIX C. Table of Milo Baker's lupine Population Information; occurrence population size, maintained by, quantity of subpopulations, and population trends of Milo Baker's lupine by element occurrence. Presence is denoted as greater than zero (> 0) (CDFG 1986, Caltrans 2017, CDFW 2020b, CNDDDB 2021, Frederickson et al. 2021). Subpopulations are the number of polygons mapped by the CNDDDB. *Planted by Caltrans (CNDDDB 2021), **Supplemental seed addition in October 1985 (Vierra 1987, Fiedler 1991).

Color Code:

0	1-10	11-100	101-1000	> 1000
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Elem. Occur.	1	2	5	8	10	13*	14	15	16*	18	19
Maintained by	Caltrans	Caltrans/ Private	Caltrans	Unknown	Caltrans	Caltrans	Unknown	Caltrans	Caltrans	Private	Caltrans
Subpops.	3	6	2	1	2	1	1	1	1	1	1
Year/Trend	Possibly Extirpated	Presumed Extant/ Decreasing	Possibly Extirpated								
1940		> 0									
1941		> 0									
1942		> 0		> 0							
1943-1978											
1979	> 0	> 0	> 0		1-10		2				
1980	> 100										> 0
1981											
1982	500	> 1000	175	0	1-10						
1983	0										
1984	1-10	> 1000	<100	0	0						
1985	1-10	> 100	0	0	0	> 100			planted	> 500	
1986	> 350**	> 10,000**	100			> 100		20	40		
1987		> 0									
1988		> 1000									
1989-1990											
1991		75									

Elem. Occur.	1	2	5	8	10	13*	14	15	16*	18	19
Maintained by	Caltrans	Caltrans/ Private	Caltrans	Unknown	Caltrans	Caltrans	Unknown	Caltrans	Caltrans	Private	Caltrans
Subpops.	3	6	2	1	2	1	1	1	1	1	1
Year/Trend	Possibly Extirpated	Presumed Extant/ Decreasing	Possibly Extirpated								
1992		500-700									
1993		33									
1994		250-350									
1995-2001											
2002		> 0									
2003		> 200									
2004-2008											
2009		> 0									
2010-2013											
2014	0		0	0	0		0	0	0		
2015	0	77	0	0	0		0	0			
2016	0	86	0		0						
2017	0	42	0	0	0		0	0		0	
2018		38									
2019	0	208	0	0	0		0	0	0		
2020		510								0	
2021		162									