Plant Species Evaluation Form

Lupinus lapidicola Heller

HELLER'S MOUNT EDDY LUPINE

Family: Fabaceae (CNPS 2018)

PLANTS Symbol: LULA (USDA 2018)

Calif. Endemic: Yes (CNPS 2018)

Synonyms/Other Names: Heller described *Lupinus lapidicola* in 1924. No additional names or synonyms have been used to refer to this taxon (Tropicos 2018).

Identification Issues: Considerable identification issues are unknown. *Lupinus lapidicola* is distinguished by its short and nearly prostrate habit, silver-silky vestiture, short stem with cauline leaves clustered at base, hairy banner back, and ciliate upper keel margins (Sholars and Riggins 2018).

Taxonomy:

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Species In Genus: +- 220 species: especially western North America, western South America to eastern United States, also tropical South America, Mediterranean to western Asia, eastern tropical Africa; some cultivated for fodder, green manure, edible seed, ornamental. Etymology: (Latin: wolf, from mistaken idea that plants rob soil of nutrients) Toxicity: Some (e.g. *Lupinus arboreus, Lupinus latifolius, Lupinus leucophyllus*) have alkaloids (especially in seeds, fruits, young herbage). TOXIC to livestock (especially sheep). Note: Inflorescence length excludes peduncle; some California species naturalized in eastern North America, South America, Australia, southern Africa

Genus Description – Habit: Annual to shrub; cotyledons generally petioled, withering early. Stem: generally erect. Leaf: palmately compound [or not], generally cauline; stipules fused to petiole; leaflets 3--17, generally oblanceolate, entire. Inflorescence: raceme, flowers spiraled or whorled, occasionally also in lower leaf axils; bracts generally deciduous. Flower: calyx 2-lipped, lobes entire or toothed, generally appendaged between; corolla blue, purple, white, or yellow, banner glabrous to densely hairy, centrally grooved, sides reflexed, wing tips +- fused, keel generally beaked; stamens 10, filaments fused, 5 long with short anthers, 5 short with long anthers; style brush-like. Fruit: dehiscent, generally oblong. Seed: 2--12, generally smooth.

Species Description – Habit: Perennial herb < 1 dm, silver-silky. Stem: +- prostrate, short. Leaf: cauline, clustered near base; stipules 4--5 mm; petiole 2--4.5 cm; leaflets 6--8, 10--20 mm. Inflorescence: 2--7 cm, flowers in few spaced whorls; peduncle 5--10 cm; pedicels 2--4 mm; bracts 4--5 mm, generally deciduous. Flower: 9--12 mm; calyx upper lip 4--5 mm, notched, lower 5--6 mm, +- 3-toothed; petals +- violet, banner back generally hairy, spot yellow, keel upper margins ciliate, lower glabrous. Fruit: not seen. eFlora Treatment Author: Teresa Sholars & Rhonda Riggins.

Status:

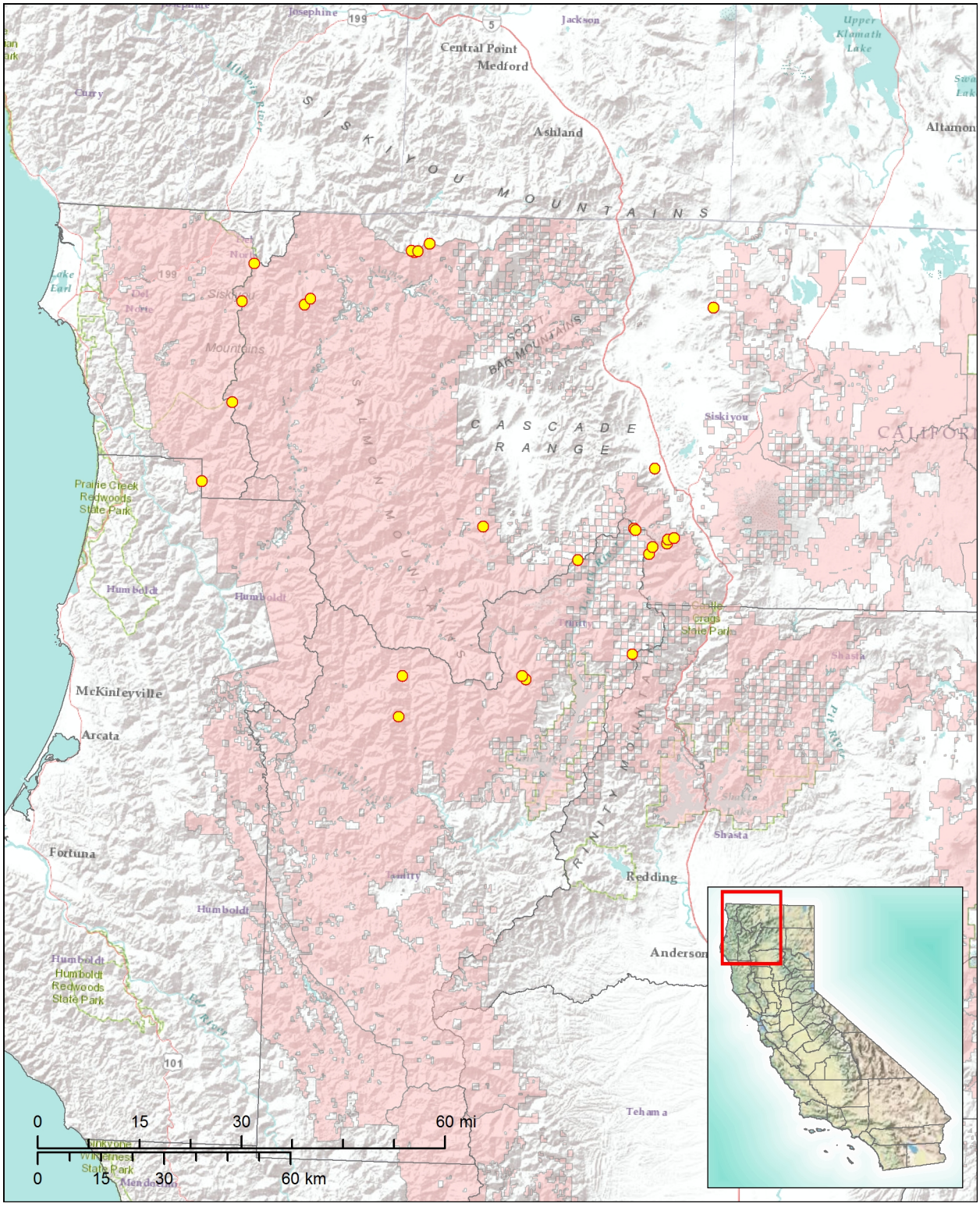
Note: Federally recognized Endangered, Threatened, Proposed, or Candidate species under the Endangered Species Act are omitted as they do not meet the definition of a Species of Conservation Concern (FSH 1909.12 § 12.52).

State Listing	G-rank	S-rank	CRPR	R5 FSS	NFP SM	CA BLM
CA: Not listed NV: Not listed OR: Not listed	G4	CA: S4 NV: Not listed OR: Not listed	4.3	Not listed	Not listed	Not listed

SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	Not listed	Not listed	Not listed

Expanded abbreviations and citations: State Listing=California Endangered Species Act Listing (CDFW 2018b), Nevada Division of Forestry Fully Protected Plant Species (NAC 527) (NDF 2012), Oregon Department of Agriculture Listed Plants (ODA 2014); G-rank=Global Conservation Status (CDFW 2018a; NatureServe 2018); S-rank=Subnational (state or province-level) Conservation Status (CDFW 2018a; NatureServe 2018; NNHP 2017; ORBIC 2016); CRPR=California Rare Plant Rank (CNPS 2018); R5 FSS=USDA Forest Service Region 5 Regional Forester Sensitive Plant Species List (USDA 2013); NFP SM=Forest Service and Bureau of Land Management Northwest Forest Plan Survey and Manage Species (USDA 2001); CA BLM=California Bureau of Land Management Designated Sensitive Species (BLM 2010); SWAP=California State Wildlife Action Plan Status (CDFW 2015); NNHP=Nevada Natural Heritage Program Status (NNHP 2017); NNPS=Nevada Native Plant Society Status (NNHP 2017); ORBIC=Oregon Biological Information Center Status (ORBIC 2016); OCS=Oregon Conservation Strategy Species (ODFW 2016); IUCN=International Union for Conservation of Nature Red List Status (IUCN 2017).

Distribution: Western North America; distribution is restricted to northwest California with occurrence records found in eastern Klamath Ranges (e KR) bioregion (Sholars and Riggins 2018). Occurrences are located within Del Norte, Siskiyou, and Trinity counties. A majority (20/25; 80%) of occurrence records are located on NFS lands within Shasta-Trinity NF (11/20; ~55%), Klamath NF (6/20; ~30%), and Six Rivers NF (3/20; ~15%) (Calflora 2017; CCH 2017).



Sources: *Distribution*: Calflora 2017, CCH 2017. *Layers*: USDA Forest Service, Pacific Southwest National Forests: CPAD 2016. California counties: CDF 2009. *Basemaps*: California inset map: © 2013 National Geographic Society, i-cubed (Esri 2017a). Main map: Esri, DeLorme, USGS, NPS (Esri 2012) and Esri, USGS, NOAA (Esri 2017b).

Locations within California:

Record numbers indicate sites that contain an individual, population, or groups of populations located within ¼ mile of each other, per the California Natural Diversity Database (CNDDB 2017) definition of Element Occurrences (EOs) in California. Official EO numbers for plants in California are determined solely by the CNDDB and are included within the Reference (Source) column for CNDDB data. Duplicate records from the same site are given the same record number and included in red. The Population Info column includes total number of individuals and total number and size of populations/sub-populations when provided. Elevations provided in meters from source have been converted to feet. If not provided in original source, Land Manager information was obtained using the California Protected Areas Database (CPAD 2016) and Quad information was obtained using 24K Quads, SDE Feature Class (CDFG 2013). All other information is directly from the Reference (Source) unless additional citation is given.

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
1	North Fork Trinity River, Hobo Gulch Camp and vicinity. (18 mi. NW of Weaverville.) 2 mi west of Hobo Gulch	Trinity	Thurston Peaks (4012382)	CCH, Jan 2017 (CAS563496)	21-Jun-1972			Shasta-Trinity NF	5550
1	North Fork Trinity River, Hobo Gulch Camp and vicinity. (18 mi. NW of Weaverville) 2 mi. west of Hobo Gulch	Trinity	Thurston Peaks (4012382)	CCH, Jan 2017 (CAS556831)	13-Jul-1971			Shasta-Trinity NF	5550
2	North Fork Trinity River, Hobo Gulch Camp and vicinity. (18 mi. NW of Weaverville.) Along the Morrison Gulch Trail	Trinity	Cecil Lake (4112312)	CCH, Jan 2017 (CAS570373)	20-Jun-1973			Shasta-Trinity NF	5400
3	near head Parker Creek (a tributary of Parker Creek); Trinity Alps, nr head Parker Cr, tributary of Swift Creek	Trinity	Ycatapom Peak (4112217)	CCH, Jan 2017 (JEPS75966)	8-Jul-1976			Shasta-Trinity NF	6300
4	Trinity Alps of Northern California 41° N, 123° W. Near head of Parker Cr., a tributary of Swift Cr.	Trinity	Ycatapom Peak (4112217)	CCH, Jan 2017 (CAS601454)	8-Jul-1976			Shasta-Trinity NF	6300
4	Near head of Parker Creek, a tributary of Swift Cr.	Trinity	Ycatapom Peak (4112217)	CCH, Jan 2017 (HSC46786)	8-Jul-1976			Shasta-Trinity NF	6302

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
4	Trinity County: Trinity Alps; Parker Creek Trail, 1 mile northwest of junction with Deer Flat Trail	Trinity	Ycatapom Peak (4112217)	CCH, Jan 2017 (UCD107951)	8-Jul-1976			Shasta-Trinity NF	6200
5	saddle at southerly base of Gozem Peak, Trinty Mountains (0.5 mi West of Pond Lily Lake)	Trinity	Whisky Bill Peak (4112215)	CCH, Jan 2017 (JEPS109594)	28-Jun-2002			Shasta-Trinity NF	5800
6	Along Hwy. 3, N of Scott Mtn. Summit, at junction with FS Rd. 40N03	Siskiyou	Scott Mountain (4112236)	CCH, Jan 2017 (HSC82558)	26-May-1979			Klamath NF	5000
7	On the long E-W ridge of Mt. Eddy	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (RSA104574)	9-Jul-1919			Shasta-Trinity NF	8002
7	long e-w ridge Mt. Eddy; ; Mt. Eddy, Siskiyou Co.	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (UC725978)	9-Jul-1919			Shasta-Trinity NF	8000
8	S face of Mt. Eddy draining into the N fork of the Sacramento River	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (HSC41641)	30-Jun-1976			Shasta-Trinity NF	8202
8	S face of Mount Eddy draining into the N Fork of the Sacramento River	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (HSC92404)	11-Jun-1976			Shasta-Trinity NF	7201
9	SE slope of Mt. Eddy draining into the N Fork of the Sacramento River	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (HSC41642)	12-Jun-1976			Shasta-Trinity NF	7201
10	Mt. Eddy. Near the little lake above the head of Wagon creek.	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (DS113281)	9-Jul-1920			Shasta-Trinity NF	8000

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
10	Near the little lake above the head of Wagon creek, Mt. Eddy....in the Hudsonian zone	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (NY15921)	9-Jul-1920			Shasta-Trinity NF	8500
11	ca 4 airmi w Mt. Shasta City (Wagon Creek on e-side of Mt. Eddy); e side Mt. Eddy, Wagon Creek	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (JEPS87961)	14-Jul-1990			Shasta-Trinity NF	6400
11	ca 4 airmi w Mt. Shasta City (Wagon Creek on e-side of Mt. Eddy); e side Mt. Eddy, Wagon Creek	Siskiyou	Mount Eddy (4112234)	CCH, Jan 2017 (UC1607590)	14-Jul-1990			Shasta-Trinity NF	6400
12	Near Syphon Lake, Salmon Mt	Siskiyou	Eaton Peak (4112238)	CCH, Jan 2017 (CHSC25080)	15-Aug-1965			Klamath NF	7100
13	Along Forest Service road 17 at summit at county line	Trinity	South China Mtn. (4112235)	CCH, Jan 2017 (CAS748117)	17-Jul-1980			Shasta-Trinity NF	6800
13	Along FS Rd. 17 at summit at county line	Trinity	South China Mtn. (4112235)	CCH, Jan 2017 (HSC81808)	17-Jul-1980			Shasta-Trinity NF	6801
13	Parks Creek Road summit	Siskiyou	South China Mtn. (4112235)	Calflora, Jan 2022 (mu21244)	18-Jun-2020	50-100		Shasta-Trinity NF	
14	Barren Butte along FS Rd. 12N03	Del Norte	Blue Creek Mtn. (4112347)	CCH, Jan 2017 (HSC49711)	1-Jul-1977			Six Rivers NF	4301
15	Along Old Highway 99, 3.2 miles south of Gazelle or 4.2 miles north of its junction with Old Stage Road	Siskiyou	Weed (4112244)	CCH, Jan 2017 (CAS982191)	6-May-1989				2913

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
15	Along Old Hwy 99, 3.2 miles south of Gazelle or 4.2 miles north of its jct with Old Stage Road; T42N R6W S24	Siskiyou	Weed (4112244)	CCH, Jan 2017 (RSA523664)	6-May-1989				2913
15	Along Old Hwy 99, 3.2 mi S of Gazelle or 4.2 mi N of its junction with Old Stage Road.	Siskiyou	Weed (4112244)	CCH, Jan 2017 (UC1766160)	6-May-1989				2913
16	Chimney Rock , Chimney Rock (Elk Valley)	Del Norte	Chimney Rock (4112356)	CCH, Jan 2017 (UC1223293)	19-Jul-1950			Six Rivers NF	4400
17	Baldy Mt. Road, NW of Happy Camp, Siskiyou Mts.	Siskiyou	Happy Camp (4112374)	CCH, Jan 2017 (RSA78687)	2-Jul-1952			Klamath NF	4900
18	Six Rivers National Forest, Devil's Punchbowl Quad, Bear Basin, Bear Mtn. area.	Del Norte	Devils Punchbowl (4112376)	CCH, Jan 2017 (HSC103252)	28-May-2014			Klamath NF	5072
19	Road to Baldy Mt. n.w. of Happy Camp, Siskiyou Mts.	Siskiyou	Happy Camp (4112374)	CCH, Jan 2017 (CAS393886)	2-Jul-1952			Klamath NF	4900
20	Along Forest Sevice Road 47N03	Siskiyou	Dewey Gulch (4112273)	CCH, Jan 2017 (RSA256589)	27-May-1974				4199
21	Sanger Pass Road, stoney hilltop south of marker for Del Norte-Siskiyou county line on the road to Youngs Valley	Siskiyou	Broken Rib Mtn. (4112386)	CCH, Jan 2017 (SD88546)	4-Jul-1972			Six Rivers NF	0
21	Ranger Peak road, stoney hilltop just south of Del Norte, marker near Youngs Valley.	Siskiyou	Broken Rib Mtn. (4112386)	CCH, Jan 2017 (SDSU4985)	4-Jul-1972			Six Rivers NF	5699
22	along dirt road about 3 1/2 mi w of Cook and Greene Pass	Siskiyou	Kangaroo Mtn. (4112382)	CCH, Jan 2017 (JEPS93185)	4-Jul-1997			Rogue River NF	0

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
23	E slope of Kangaroo Mtn., above Toehead Lake.	Siskiyou	Kangaroo Mtn. (4112382)	CCH, Jan 2017 (HSC27342)	3-Jul-1972			Rogue River NF	6201
24	PCT 0.2 mi past Bee Camp -- Cook & Green Pass, Siskiyou NF	Siskiyou	Kangaroo Mtn. (4112382)	Calflora, May 2017 (wb1194-2061)	8-Aug-2011	1+ individuals		Klamath NF	5774
25	Cook and Green Pass	Siskiyou	Kangaroo Mtn. (4112382)	Calflora, May 2017 (jgr21274)	4-Jul-1997	1+ individuals		Rogue River NF	4823

Distribution on National Forest System (NFS) Lands:

(Please see Reference column of Locations table above for references pertaining to Record Numbers indicated on NFS lands.)

National Forest System (NFS) lands	Record #s (from Locations table above)	CNDDB EOs	Non-CNDDB Records	Recent (seen in past 20 yrs.)	Historic (not seen in past 20 yrs.)	Most Recent Obs.	EOs/ Recs. (5 mile buffer)	Total Records on NFS lands
Angeles:	-	-	-	-	-	-	-	0
Cleveland:	-	-	-	-	-	-	-	0
Eldorado:	-	-	-	-	-	-	-	0
Inyo:	-	-	-	-	-	-	-	0
Klamath:	6,12,17,18,19,24	-	6	2	4	28-May-2014	9	6
Lake Tahoe Basin MU:	-	-	-	-	-	-	-	0
Lassen:	-	-	-	-	-	-	-	0
Los Padres:	-	-	-	-	-	-	-	0
Mendocino:	-	-	-	-	-	-	-	0
Modoc:	-	-	-	-	-	-	-	0
Plumas:	-	-	-	-	-	-	-	0
San Bernardino:	-	-	-	-	-	-	-	0
Sequoia:	-	-	-	-	-	-	-	0
Shasta-Trinity:	1,2,3,4,5,7,8,9,10,11,13	-	11	2	9	18-Jun-2020	3	11
Sierra:	-	-	-	-	-	-	-	0
Six Rivers:	14,16,21	-	3	-	3	1-Jul-1977	1	3
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	0	20	4	16	N/A	13	20

Demographic and Population Trends: Total number of occurrences for this taxon were estimated using GIS tools and methods described by Green and Sims (2018). A majority (22/25; 88%) of occurrence records are historic and have not been documented in over 20 years. Demographic and population trends are lacking for *L. lapidicola* (Calflora 2017; CCH 2017). Further documentation and fieldwork is needed.

Life History: *Lupinus lapidicola* is a perennial herb that typically blooms during the month of July (CNPS 2018). *Lupinus* is a nitrogen fixing legume that develops root nodules that house

diazotrophic bacteria in the genera *Bradyrhizobium* and *Rhizobium* (Barrera et al. 1997). These microbes are able to fix atmospheric nitrogen into bioavailable ammonia, which the host plant incorporates into developing tissue. Nitrogen fixation in legumes also enriches soil fertility around the host plant through the decomposition of aged roots and nodules (Ledgard and Steele 1992). Certain members of *Lupinus* are known to be toxic to livestock (Keeler and Panter 1989). Within-species variation in response to seed vernalisation is known for plants in the genus *Lupinus*. Seed production is often greater among perennial lupines. Physical dormancy of seeds via hardened seed coats that are often impermeable to water or gases is common in Fabaceae. Permeability of seed coats increases with greater moisture content (*L. digitatus* seed coat fully permeable above 14% moisture). Seeds are entirely impermeable when moisture is very low (below 11% in *L. digitatus*).

Plants in the genus *Lupinus* are known to produce sticky pollen that is not conducive to wind dispersal (OGTR 2013). Members of *Lupinus* are visited by an assortment of insect pollinators, including anthophorine bees (*Anthophora* spp.), bumble bees (*Bombus* spp.), carpenter bees (*Xylocopa* spp.), honey bees (*Apis* spp.), leaf-cutting bees (*Anthidium*, *Anthidiellum*, *Megachile*, *Osmia*, and *Protosmia* spp.), long-horned bees (*Eucera* spp.), beetles (Coleoptera), blues butterflies (*Echinargus* and *Plebejus* spp.), brush-footed butterflies (*Vanessa*, *Junonia*, *Phyciodes*, and *Limenitis* spp.), hairstreak butterflies (*Satyrium* spp.), skipper butterflies (*Pholisora, Polites, Hesperia, Oarisma, Paratrytone, Erynnis, Epargyreus*, and *Euphyes* spp.), sulphur butterflies (*Colias* spp.), swallowtail butterflies (*Papilio* spp.), root-maggot flies (*Delia* spp.), and syrphid flies (*Eristalis* spp.) (CPC 2018). An extended discussion on the biology of plants in the genus *Lupinus* is found in the included document from the Australian Office of the Gene Technology Regulator (OGTR 2013).

Diversity: *Lupinus* is a prominent member of Faboideae. This subfamily is represented by upward of 500 genera and approximately 14,000 species with zygomorphic flowers that have a prominent banner sitting outside the lateral wings, have dry and elongate fruit that dehisce along two edges, and nodule forming roots that house diazotrophic microbes (Stevens 2001). *Lupinus* is group of roughly 250 species in the Genisteae (Drummond 2008; Stevens 2001). The Genisteae is a tribe of roughly 25 northern temperate genera. Plants commonly referred to as "brooms" or "gorse" in the genera *Cytisus, Genista*, and *Ulex* are also members of this tribe alongside *Lupinus* (Stevens 2001). Roughly 12 species of *Lupinus* are found in Mediterranean Europe. Eastern South America is home to roughly 24 species, whereas eight are found in eastern North America. A bulk of the diversity is represented by taxa in the highlands of Mexico and Central America (~30 species), the Andes of western South America (~85 species), and western North America in the Rockies, Great Basin, and along the Pacific slope (~88 species).

Studies on molecular divergence times of taxa in Fabaceae demonstrate that *Lupinus* and *Spartium* split nearly 16.0 Mya. Data based on cpDNA suggest that *Lupinus* arose 5.8-10.0 Mya, long after the breakup of Gondwanaland (~100 Mya) and the breakdown of the North Atlantic land bridge (~50 Mya). This suggests amphi-Atlantic distributions are best explained by long-distance dispersal. Mapping of ancestral biogeography places the origin of *Lupinus* in the Old World, indicating later migration into the New World and subsequent radiation among the

species-rich western New World clade (200 of the roughly 250 species in *Lupinus*). Andean-Mexican perennials and western North American perennials occupy a single clade among the western New World taxa, where each regional subclade underwent respective radiations 0.8-3.4 Mya and 0.7-2.1 Mya. Speciation rates among both Andean-Mexican and Western North American subclades are substantially higher than what is measured elsewhere. The positive correlation between perennials and high elevation habitat suggests that speciation in these perennial groups is linked to habitat formation as a result of uplift of the Andes (2-4 Mya) and the mountain ranges of the Pacific Slope (2-5 Mya) (Drummond 2008).

Habitat: *Lupinus lapidicola* grows in gravelly conditions on granitic or serpentine substrates within lower, upper, or subalpine montane coniferous forests (CNPS 2018). It is a strong indicator of ultramafic substrate, with over 65% of occurrences on ultramafics (Safford and Miller 2020).

Habitat Status or Trend: Fire suppression impacts the open forest habitat preferred by *L. lapidicola*. Forest openings behave as microsites for species intolerant of shade. Significant changes to the size and spatial characteristics of openings within forests of the Klamath Mountains of California have taken place during the last one-hundred years (Skinner 1995). As a montane species with limited regional distribution, it may be vulnerable to climate change. If rising temperatures spur upward migration, the amount of suitable habitat available for this species will shrink as a function of geometry.

Capacity for the Species to Disperse: Members of the genus *Lupinus* produce dense seeds without appendages that are not conducive to wind dispersal over long distances. Waterways, animals, and human activities may foster long distance dispersal in some cases. A feeding study demonstrated a low rate of *L. arboreus* seed survival after ingestion by deer. Most lupines exhibit mechanical dispersal and are commonly dispersed one to several meters from parent plants each year (OTGR 2013).

Threats: Direct threats to this taxon remain unreported (CNPS 2018), and the overall threat impact to this species is considered low (NatureServe 2018).

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Molly S. Wiebush, Rare Plant Botanist Coordinator, California Native Plant Society. 02 February 2022.

Reviewer(s) and Date:

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Julie Ann Kierstead, USDA Forest Service Region 5 Ecosystem Planning, 7 January 2022.

Formatting: Form is set up as 508 compliant. Please use the "styles" if further formatting is necessary.

Purpose: This is to maintain the best available science on a species that could be used by the Forest Service in a variety of functions. Specifically, there would be additional steps and evaluations to determine whether or not this species would be considered a Species of Conservation Concern under the 2012 Planning Rule or a Sensitive Species under the 1982 Planning Rule.

Additional Considerations at the Forest Level: Habitat amount and juxtaposition of both the species and habitat locations.