Plant Species Evaluation Form

Arabis aculeolata Greene

WALDO ROCKCRESS

Family: Brassicaceae (CNPS 2017) | **PLANTS Symbol:** ARAC4 (USDA 2017) | **Calif. Endemic:** No (CNPS 2017)

Synonyms/Other Names: The original description for *Arabis aculeolata* Greene (*Leaflets of Botanical Observation and Criticism* 2(4): 69–70 (1910) has remained unchallenged.

Identification Issues: The genus *Arabis* often has ambiguous species boundaries; this appears to be the result of autogamy in most cases, rather than hybridization. However, *A. aculeolata* is known to hybridize with *A. modesta*, a closely allied species that occurs sympatrically in at least part of *A. aculeolata*'s range. The hybrids occur on serpentine soil like *A. aculeolata*, but evince microhabitat preferences more characteristic of *A. modesta*—deeper soil on steep slopes (Vorobik 1985, Al-Shehbaz 2012).

Arabis mcdonaldiana is also very similar to *A. aculeolata*, with which it appears to be intermediate with at many sites in California (Slakey et al. 2012). *Arabis mcdonaldiana* differs from *A. aculeolata* in being entirely glabrous, smaller in stature, and possessing slender, truncate petals (Rollins 1941). *Arabis aculeolata* also has wider, more numerous cauline leaves, longer fruiting pedicels, longer and wider petals, longer fruits, and more ovules per ovary compared to *A. mcdonaldiana* (Al-Shehbaz 2010). For the most part, the California plants in question are similar to A. *aculeolata* in terms of their hairiness, but more like *A. mcdonaldiana* in other characters, such as trichome shape and overall plant size (Rollins 1973; Imper 1983; L. Vorobik pers comm. ca. 1993).

Due to the number of similarities of *A. aculeolata* with *A. mcdonaldiana* in California occurrences, *A. aculeolata* was ommitted from occurring in California in the *Flora of North America* (Al-Shehbaz 2010) and was not treated in *The Jepson Manual, Second Edition* (Al-Shehbaz 2012). Its ommision from the California flora in these works resulted in a *CNPS Inventory* status review of *A. aculeolata* in March of 2012, which ensued in its continued inclusion in the *CNPS Inventory* as a California Rare Plant Rank (CRPR) 2B.2 species (see Slakey et al. 2012). Many of the California occurrences of *A. aculeolata* are still not well-documented with herbarium vouchers, and we encourage field surveys and vouchering of all California occurrences to help substantiate its distribution and status in California.

Taxonomy:

From *Flora of North America North of Mexico, Volume 7* (Al-Shehbaz 2010):

> "Species In Genus: < 70 species: temperate North America, Eurasia, northern Africa. Etymology: (Latin: of Arabia) Note: Most species of *Arabis* in TJM (1993) moved to *Boechera*; *Arabis glabra* to *Turritis*.

Species description: Perennials; (caudex simple or branched, covered with persistent petiolar remains); sparsely to moderately pubescent, trichomes sub-setiform, bulbous-based, simple, (to 1.5 mm), often mixed with fewer, forked, stalked ones. Stems simple or few from base (caudex), erect, unbranched, (0.6-)1.5-3.5(-4.5) dm, (sparsely to densely hirsute basally or throughout). Basal leaves: petiole 0.3-1.5 cm, (ciliate); blade oblanceolate to obovate, (0.5-)1-3(-4) cm × (2-)3-6 (-10) mm, margins entire, repand, or obtusely dentate, (ciliate), apex obtuse, surfaces pubescent, trichomes usually simple, sometimes mixed with fewer forked ones, rarely subglabrate. Cauline leaves 3-6 (or 7); blade oblong, 0.4-1(-1.5) cm × (1-)2-4 mm, base not auriculate, margins entire or repand, apex obtuse. Racemes simple, (dense). Fruiting pedicelsascending to suberect, 8-12(-15) mm, (subglabrate or sparsely pubescent). Flowers: sepals (purple), oblong, 4-8 × 1.5-2.5 mm, lateral pair saccate basally; petals purple, spatulate, (9-)10-18(-20) × (2.5-)3.5-6(-8) mm, apex obtuse; filaments 4-9 mm; anthers oblong, 1.5-2 mm. Fruits ascending to suberect, not torulose, sometimes slightly curved, 3.5-6.5 cm × 1.5-2 mm; valves each with prominent midvein extending full length; ovules 24-36 per ovary; style (0.7-)1-2 mm. Seeds narrowly winged nearly throughout except wider distally, oblong, 1.5-2.3 × 1-1.3 mm; wing 0.1-0.3 mm wide."

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).

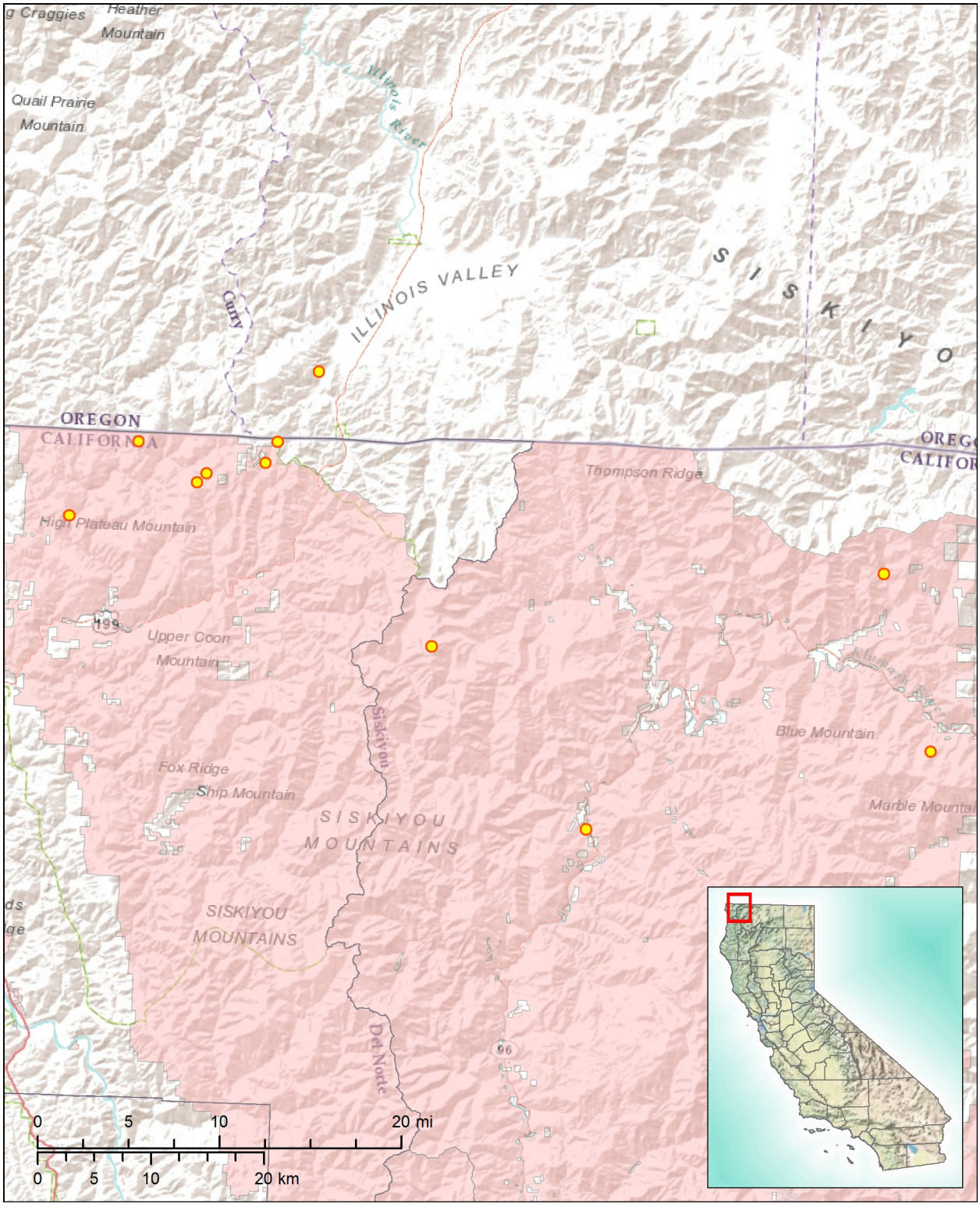
State Listing	G-rank	S-rank	CRPR	R5 FSS	NFP SM	CA BLM
CA: Not listed NV: Not listed OR: Not listed	G4	CA: S2 NV: Not listed OR: Not listed	2B.2	Not listed	Not listed	Not listed

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 2017b), 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 2017a; NatureServe 2017); S-rank=Subnational (state or province-level) Conservation Status (CDFW 2017a; NatureServe 2017; NNHP 2017; ORBIC 2016); CRPR=California Rare Plant Rank (CNPS 2017); 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: *Arabis aculeolata* is found in the Klamath and Siskiyou regions of California and Oregon. Within California, it is only known from Del Norte and Siskiyou counties, and occurs at an approximate elevation of 410 to 1,800 meters (CNPS 2017). There are only eight element occurrences in the California Natural Diversity Database (CNDDB 2017) for this species. An additional three records (records 9, 10, and 11) exist for this species that are represented from the Consortium of California Herbaria (CCH 2017) and Calflora (2017); these records should be reviewed and verified for potential inclusion in the CNDDB.

In Oregon, *Arabis aculeolata* is reported as occurring only from Curry, Douglas, and Josephine counties (Al-Shehbaz 2010; Oregon Flora Project 2018). There are a couple voucher collections of it reported from Jackson County, Oregon that should be checked for accuracy in identification and location (CPNWH 2018). Due to the paucity of collections and number of collections from the same locations in Oregon, *A. aculeolata* appears to be fairly restricted there; its conservation status in Oregon may need to be evaluated, which could in tern affect its global conservation and CRPR status.



Map Sources: *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:

(Note: 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) definition of Element Occurrences in California). Official Element Occurrence (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 in meters from source were 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) column unless additional citation is given.)

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
1	JUST S OF WHERE WIMER ROAD CROSSES THE OR/CA BORDER, ABOUT 1.5 MI NNE OF MONUMENTAL, N END OF MONKEY CREEK RIDGE.	Del Norte	Shelly Creek Ridge (4112387)	CNDDB, May 2017 (EO 3)	2005	AT LEAST 25 PLANTS OBSERVED IN 2005. SOME PREVIOUS ARABIS ACULEOLATA OBSERVATIONS FROM THIS AREA HAVE BEEN ANNOTATED TO A. MCDONALDIANA; ID NEEDS CONFIRMATION.		Six Rivers NF	3000
2	RATTLESNAKE MEADOW AND NEAR SUMMIT OF PRESTON PEAK, KLAMATH NATIONAL FOREST.	Siskiyou	Preston Peak (4112375)	CNDDB, May 2017 (EO 4)	15-Jun-2013	OCCURRENCE IS BASED ON A 1970 GROUND COLLECTION FROM RATTLESNAKE MEADOW AND A 2013 YORK PHOTO FROM "PRESTON PEAK NEAR SUMMIT." ARABIS MCDONALDIANA ALSO REPORTED TO OCCUR FROM THIS AREA.		Klamath NF	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
3	JUST NORTH OF DOUGLAS CREEK ALONG WEST SIDE OF KLAMATH RIVER, SOUTHWEST OF HAPPY CAMP, KLAMATH NATIONAL FOREST.	Siskiyou	Clear Creek (4112364)	CNDDB, May 2017 (EO 6)	5-May-1986	500 PLANTS SEEN IN 1980. ABOUT 150+ PLANTS SEEN IN 1981. MORE THAN 100 PLANTS SEEN IN 1986. IDENTIFICATION UNCERTAIN.	SLOPE SLIPPING AWAY, PARTIALLY ASSOCIATED WITH ROAD. LOGGING A POTENTIAL THREAT.	Klamath NF	1340
4	EAST SIDE OF MITCHELL CREEK, ABOUT 1.7 MILES SW OF HAMBURG ON THE KLAMATH RIVER, KLAMATH NATIONAL FOREST.	Siskiyou	Hamburg (4112371)	CNDDB, May 2017 (EO 7)	17-Jun-1981	10 PLANTS SEEN IN A 5-10 SQ METER AREA IN 1981.	WITHIN PROPOSED LOGGING HELICOPTER SANITATION UNIT.	Klamath NF	4160

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
5	SOUTHEAST OF DIAMOND CREEK, ABOUT 1.5 MILES NNW OF HIGH DOME, SIX RIVERS NATIONAL FOREST.	Del Norte	Shelly Creek Ridge (4112387)	CNDDB, May 2017 (EO 8)	25-Apr-1995	UNKNOWN NUMBER OF PLANTS OBSERVED IN 1995. THERE IS EVIDENCE OF INTERGRADATION BETWEEN ARABIS MCDONALDIANA AND A. ACULEOLATA IN THIS AREA; PLANTS AT HIGHER ELEVATION ARE MORE SIMILAR TO A. ACULEOLATA.		Six Rivers NF	3300
6	ALONG COOK AND GREEN PASS ROAD AND TRAIL TO THE SISKIYOU CYPRESS STAND JUST OFF OF ROAD, KLAMATH NATIONAL FOREST.	Siskiyou	Kangaroo Mtn. (4112382)	CNDDB, May 2017 (EO 9)	5-May-1973	OCCURRENCE IS BASED ON THREE SMITH COLLECTIONS FROM 1973. THERE ARE THREE CORRESPONDING ARABIS OREGANA COLLECTIONS FROM SAME DATE AND LOCALITY; ID NEEDS CONFIRMATION.		Klamath NF	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
7	SOUTHEAST OF DIAMOND CREEK, APPROXIMATELY 1.4 AIR MILES NORTHWEST OF HIGH DOME, SIX RIVERS NATIONAL FOREST.	Del Norte	Shelly Creek Ridge (4112387)	CNDDB, May 2017 (EO 10)	Unknown	ONLY SOURCE OF INFORMATION IS MAP ATTACHED TO A 1995 DICENTRA SURVEY FORM; UNKNOWN WHEN OR HOW MANY ARABIS PLANTS SEEN. THERE IS EVIDENCE OF INTERGRADATION BETWEEN A. MCDONALDIANA AND A. ACULEOLATA IN THIS AREA.		Six Rivers NF	2800
8	L.E. HORTON RESEARCH NATURAL AREA, SIX RIVERS NATIONAL FOREST.	Del Norte	High Divide (4112481)	CNDDB, May 2017 (EO 11)	Unknown	ONLY SOURCE OF INFORMATION FOR THIS OCCURRENCE IS 2004 REPORT, UNKNOWN WHEN OR HOW MANY PLANTS SEEN. ARABIS MCDONALDIANA ALSO HAS BEEN REPORTED FROM THIS AREA; ID MAY NEED CONFIRMATION.		Six Rivers NF	
8	L. E. Horton Research Natural Area Six Rivers National Forest aka STONE CORRAL-JOSEPHINE PERIDOTITE	Del Norte	High Divide (4112481)	Calflora, May 2017 (ce407)	1-Jan-1986	1+ individuals		Six Rivers NF	1286

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
9	North Fork Smith River, from State Hwy 101 at town of Smith River, take Rowdy Creek Rd (rt 308) to Wimer Rd (Rt 305) to Rt 206, vicinity of Cleopatra mine.	Del Norte	High Plateau Mtn. (4112388)	CCH, Jan 2017 (HSC101008)	16-May-2012			Six Rivers NF	2592
9	North Fork Smith River, from State Hwy 101 at town of Smith River, take Rowdy Creek Rd (rt 308) to Wimer Rd (Rt 305) to Rt 206, vicinity of Cleopatra mine at hairpin turn, north side of road.	Del Norte	High Plateau Mtn. (4112388)	CCH, Jan 2017 (HSC101009)	16-May-2012			Six Rivers NF	3002
10	state line n. of Monumental (at head of Shelley Creek, CA side, summit of ridge); Shelley Creek	Del Norte	Shelly Creek Ridge (4112387)	CCH, Jan 2017 (UC1198305)	13-Jun-1936			Six Rivers NF	3100
11	Illinois Valley; Hwy 199 N from Crescent City to Ore. border, L on Arrowhead Dr.	Del Norte	O'Brien (4212316)	Calflora, May 2017 (xr326607)	1-Jan-2005	1+ individuals		Unknown	1955

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:	2, 3, 4, 6	4	0	1	3	15-Jun-13	0	4
Lake Tahoe Basin MU:	-	-	-	-	-	-	-	0
Lassen:	-	-	-	-	-	-	-	0
Los Padres:	-	-	-	-	-	-	-	0
Mendocino:	-	-	-	-	-	-	-	0
Modoc:	-	-	-	-	-	-	-	0
Plumas:	-	-	-	-	-	-	-	0
San Bernardino:	-	-	-	-	-	-	-	0
Sequoia:	-	-	-	-	-	-	-	0
Shasta-Trinity:	-	-	-	-	-	-	-	0
Sierra:	-	-	-	-	-	-	-	0
Six Rivers:	1, 5, 7, 8, 9, 10, 11, 12	4	4	3	4	16-May-12	0	8
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	8	4	4	7	N/A	0	12

Demographic and Population Trends: The number and size of *A. aculeolata* populations in California are not well known, with estimated population sizes for less than half of the occurrences in the CNDDB (2017), and no estimates from other records. From the three occurrences in California that do have population count estimates (EO 3, 6, and 7), *A. aculeolata* is known from an estimated 135 to 535 plants based on reports from 1980 to 2005. The largest number of plants reported is from occu rrence six (EO 6), which has had a range of more than

100 plants to 500 plants observed from 1980 to 1986. In constrast, the smallest occurrence reported (EO 7) is only known from 10 plants observed in a 5-10 sqare meter area in 1981. Field surveys are needed in order to provide current status and trend information for this species in California.

Life History: *Arabis aculeolata* is a perennial herb that blooms from April to June (CNPS 2017). It is regarded as a strict serpentine endemic taxon (sensu Safford et al. 2005). The species is obligately outcrossing, and requires the pollination services of honeybees and digger-bees (Vorobik 1985).

Diversity: Encompassing some 70 species, *Arabis* is distributed throughout the temperate areas of the northern hemisphere, except Mexico and northern Africa. The North American taxa comprise a monophyletic group of ten species, within which is a well-defined group of five red- or purple-flowered species: *Arabis modesta, A. blepharophylla, A. macdonaldiana, A. oregana*, and *A. aculeolata* (Koch et al. 2010). Very little is known about the phenotypic-, genetic- or ecological diversity of *A. aculeolata* specifically.

Habitat: *Arabis aculeolata* is often—but not exclusively—associated with serpentine soils, and tends to occur on steep, rocky slopes between 410 and 1,800 meters in elevation (CNPS 2017). Occurrence records in CNDDB (2017) include rock habitats within Jeffrey Pine forest, subalpine forest, dwarf forest and on bare ground above treeline.

Habitat Status or Trend: The status and prospects for *A. aculeolata*'s habitat in California are not well understood. It is mostly restricted to habitats that are associated with serpentine soils, and its habitat availability is therefore limited. Plant communities on infertile serpentine soils may be less sensitive to climate change, however, any such advantage may be lessended by the sparser overstorey cover exhibited in these plant community types (Harrison et al. 2015).

Capacity for the Species to Disperse: *Arabis aculeolata* is a self-incompatible tetraploid and an obligate outbreeder (Vorobik 1985). While promoting genetic diversity, these characteristics are inimical to stochastic dispersal events, which often involve single individuals or very small groups.

Threats: *Arabis aculeolata* requires honeybees and/or digger-bees for pollination, and cannot reproduce by selfing (Vorobik 1985). This taxon may therefore be impacted by declining bee populations. It is reported to be threatened by logging and mining, and was previously on a conservation 'watch list' in Oregon (CNPS 2017). Two occurrences (EO 6 and 7) have logging indicated as a potential threat, with one (EO 6) also indicating that erosion is threatening the population (CNDDB 2017).

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Persons Contacted:

Vorobik, L. A. ca. 1993. PhD botanist, illustrator, and educator. Email correspondence with CNPS Rare Plant Program regarding identity of *Arabis aculeolata* plants in California (date of communication unknown, but likely 1993 based on content).

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January 19, 2018

Reviewer(s) and Date:

None.

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.