Plant Species Evaluation Form

Boechera koehleri (Howell) Al-Shehbaz

KOEHLER'S STIPITATE ROCKCRESS

Family: Brassicaceae (CNPS 2018)

PLANTS Symbol: ARKOS (USDA 2018)

Calif. Endemic: No (CNPS 2018)

Synonyms/Other Names: *Boechera koehleri* was described as *Arabis koehleri* by T.J. Howell in 1897 from material collected in Douglas County, Oregon in 1887. It was renamed *Arabis arbuscula* by E.L. Greene in 1910 but this name did not gain acceptance. Rollins (1941) observed a greater number of cauline leaves and a greater curve to fruits on plants from Josephine County, so he separated these from the Douglas County populations as variety *stipitata*. *Arabis koehleri* was transferred to the genus *Boechera* based on the presences of curved "falcate" fruits and multiply branched "subdendritic" leaf trichomes by Al-Shehbaz (2003), who also synonymized Rollins' varieties. Subsequent treatments (CNPS 2018; Al-Shehbaz and Windham 2010; Windham and Al-Shehbaz 2012) do not recognize varieties in *Boechera koehleri* (Howell) Al-Shehbaz.

Identification Issues: Rollins (1941) notes that the caudex of *B. koehleri* is woody, strongly developed and highly branched, which gives it a distinctive appearance. It can further be distinguished from other *Boechera* species by its caudex-branches covered with stiff peg-like leaf bases, resembling naked spruce twigs. These traits can be used to distinguish it from other species with which it is occasionally reported to co-occur: *B. holboellii, B. oregana, B. subpinnatifida*, and *B. suffrutescens*.

Rollins (1941) asserts that *B. koehleri* is most closely related to *B. breweri* (with which it shares bright reddish-purple flowers, a branched caudex, arched fruits and an affinity for rock outcrops). Phylogenetic analysis confirms this close relationship (Alexander et al. 2013). However, according to Rollins (1941), *B. koehleri* differs markedly from *B. breweri* in having truly stellate pubescence (Al-Shehbaz calls its pubescence dendritic) on the basal and lower cauline leaves but with a glabrous (or nearly so) upper stem and fruit pedicels. In contrast, *B. breweri* has leaves covered in forked or dendritic trichomes and the stems and pedicels are hirsute with mostly simple spreading hairs.

Taxonomy:

Species In Genus: 110+ species: temperate North America, Russian Far East. Etymology: T.W. Boecher, Danish cytogeneticist, 1909—1983. Note: Previously included in *Arabis*, but the 2 genera in different tribes.

Genus Description – Habit: Perennial herb (biennial); caudex simple or branched, persistent leaf bases generally absent; rosetted or not; rosette at ground surface or elevated on woody base; hairs simple or 2--14-rayed, stalked or sessile. Stem: simple or branched, leafy. Leaf: basal petioled, simple, generally entire or dentate, generally hairy; cauline sessile, base generally lobed, entire or dentate. Inflorescence: generally elongated. Flower: sepals bases generally not sac-like; petals generally white, lavender, or purple, claw present or 0; pollen ellipsoid in sexual pls, spheric in plants with asexual seeds. Fruit: silique, dehiscent, generally linear, edges

generally parallel, unsegmented, flat parallel to septum; stigma entire or 2-lobed. Seed: in 1 or 2 rows, winged or not.

Species Description – Habit: Caudex woody; crowded, persistent leaf bases present. Stem: Generally 1 per caudex branch, from center of basal rosette elevated on woody base; 0.8--4.5 dm, proximally with short-stalked, 2--4-rayed hairs to 0.5 mm, some simple hairs to 1 mm. Leaf: basal 1--3 mm wide, entire; hairs short-stalked, 2--4-rayed, 0.1--0.3 mm; cauline 3--30, distal glabrous, basal lobes 0.5--2.5 mm. Inflorescence: 6--35-flowered, not 1-sided in fruit; fruit pedicel spreading-ascending to horizontal, straight, 10--18 mm, glabrous or hairs few, simple and 2-rayed. Flower: sepals hairy; petals 8--12 mm, 2.5--4 mm wide, purple to magenta; pollen ellipsoid. Fruit: spreading-ascending to pendent, not appressed, 5--7.5 cm, 1.8--2.5 mm wide, glabrous; style < 0.2 mm; ovules 58--94. Seed: in 1 row, 1.3--1.8 mm; wing 0.1--0.2 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	G3	CA: S2S3 NV: Not listed OR: S3	1B.3	Sensitive	Not listed	Not listed

SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	4: Watch	Not listed	Not listed

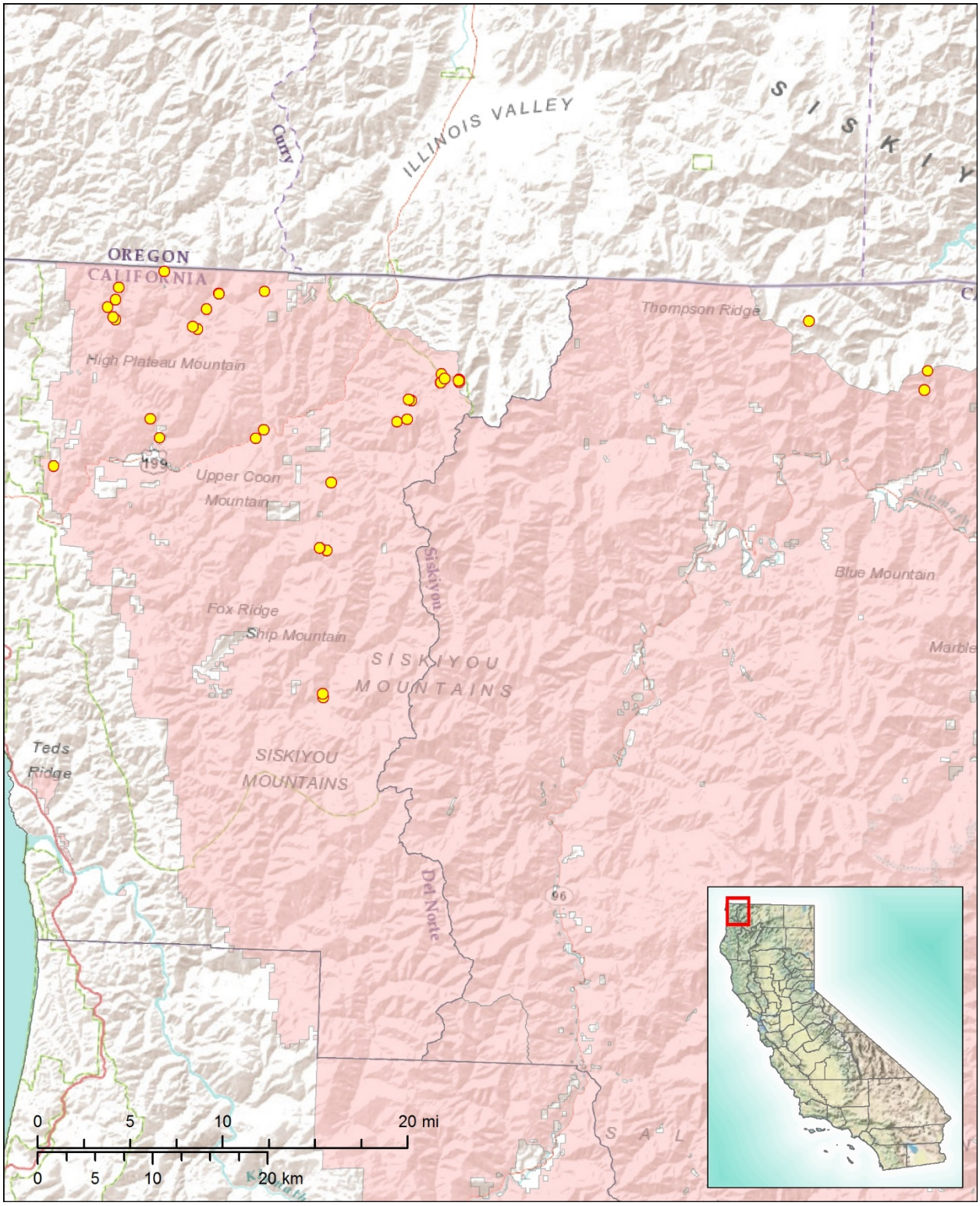
Expanded abbreviations and citations: State Listing=California Endangered Species Act Listing (CDFW 2018b), Nevada Division of Forestry Fully Protected Plant Species (NAC 527) (NDF 2012), Oregon Department of Agriculture Listed Plants (ODA 2014); G-rank=Global Conservation Status (CDFW 2018a; NatureServe 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).

Boechera koehleri was added to the equivalency of California Rare Plant Rank (CRPR) as *Arabis koehleri* var. *stipitata* to the fourth edition of the CNPS *Inventory*, when rarity and endangerment information was needed (Smith and Berg 1988). It was subsequently changed to CRPR 1B in the fifth edition of the *Inventory* (Skinner and Pavlik 1994), and in 2012 its name was changed from *A. koehleri* var. *stipitata* to *Boechera koehleri* in the *Inventory* to reflect Windham and Al-Shehbaz (2012) (Sims and Bittman 2012).

Distribution: The genus *Boechera* is primarily distributed in western North America, with a few species in northeastern North America and one species each in Siberia and Greenland (Kiefer et al. 2009).

Boechera koehleri is known from Oregon and California only. In Oregon, there are two clusters of populations, one in Douglas County, in the Cascade Ranges bioregion of central Oregon, (formerly recognized as var. *koehleri*) and a second cluster, primarily in Josephine County, with one site in southern Jackson County (formerly recognized as var. *stipitata*) (NaturServe 2018; CPNWH 2018). This southern cluster is contiguous with the California populations primarily in Del Norte County, and adjacent Siskiyou County, which share the Klamath Ranges bioregion (CNDDB 2018).

Within the Klamath bioregion, *B. koehleri* is scattered in distribution, apparently a result of it being limited to serpentine substrate. It is typically found as clusters of very small populations on rock outcrops of this substrate type (CNDDB 2018).



Sources: *Distribution*: CNDDB 2017, NRIS 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	NEAR SMITH RIVER, 0.15 MILE NNE OF GUNBARREL CAMPSITE, SOUTH FORK, SIX RIVERS NATIONAL FOREST.	Del Norte	Ship Mountain (4112367)	CNDDB, May 2017 (EO 1)	10-Aug-1995	14 CLUMPS OF PLANTS OBSERVED IN 1995. 1980 COLLECTION BY NEWTON FROM NEAR SMITH RIVER ATTRIBUTED TO THIS SITE.	SLIDE HAS DECREASED HABITAT.	Six Rivers NF	1498
1	Six Rivers NF	Del Norte	Ship Mountain (4112367)	NRIS, Feb 2017 (510100006_ARKOS)	10-Aug-1995	14 individuals		Six Rivers NF	
2	EASTERN TABLE MOUNTAIN, 1 MILE DUE WEST OF HURDYGURDY BUTTE, SIX RIVERS NATIONAL FOREST.	Del Norte	Hurdygurdy Butte (4112377)	CNDDB, May 2017 (EO 12)	7-Sep-1995	9 PLANTS OBSERVED IN 1995.		Six Rivers NF	4400
2	Six Rivers NF	Del Norte	Hurdygurdy Butte (4112377)	NRIS, Feb 2017 (510070004_ARKOS)	7-Sep-1995	9 individuals		Six Rivers NF	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
3	EASTERN SUMMIT OF TABLE MOUNTAIN, 1.4 AIR MILES WNW OF HURDYGURDY BUTTE, SIX RIVERS NATIONAL FOREST.	Del Norte	Hurdygurdy Butte (4112377)	CNDDB, May 2017 (EO 11)	7-Sep-1995	8 PLANTS OBSERVED IN 1995.		Six Rivers NF	4440
3	Six Rivers NF	Del Norte	Hurdygurdy Butte (4112377)	NRIS, Feb 2017 (510070003)	7-Sep-1995	8 individuals		Six Rivers NF	
4	WEST OF PEA VINE LAKE, 3.8 AIR MILES NNW OF HURDYGURDY BUTTE, SIX RIVERS NATIONAL FOREST.	Del Norte	Hurdygurdy Butte (4112377)	CNDDB, May 2017 (EO 10)	27-Jul-1995	26 ROSETTES OBSERVED IN 1995. SITE SHOULD BE CHECKED EARLIER IN THE SEASON.		Six Rivers NF	3680
4	Six Rivers NF	Del Norte	Hurdygurdy Butte (4112377)	NRIS, Feb 2017 (510070006)	4-Aug-2005	95 individuals		Six Rivers NF	
4	Six Rivers NF	Del Norte	Hurdygurdy Butte (4112377)	NRIS, Feb 2017 (510070006)	27-Jul-1995	26 individuals		Six Rivers NF	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
5	MYRTLE CREEK, WEST OF SIGNAL PEAK.	Del Norte	Hiouchi (4112471)	CNDDB, May 2017 (EO 9)	30-Apr-1964	ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1964 COLLECTION BY VAN DEVENTER.		Six Rivers NF	1300
6	VICINITY OF STONY CREEK NEAR CONFLUENCE WITH NORTH FORK SMITH RIVER, NORTH OF GASQUET.	Del Norte	Gasquet (4112378)	CNDDB, May 2017 (EO 2)	3-Apr-1979	VICINITY REPORTED IN FOUR COLLECTIONS: J.L. HOBSON SN HSU #31975 & 31976 IN 1974, G.S. LESTER SN HSU #32443 IN 1974, J.P. SMITH SN HSU #27732 IN 1973, AND JIMERSON #936 UCR IN 1979.		Six Rivers NF	600
7	ON NORTH SIDE OF HIGHWAY 99 APPROXIMATE-LY 1.25 MILES WEST OF PATRICKS CREEK LODGE ENTRANCE, MIDDLE FORK SMITH RIVER.	Del Norte	Hurdygurdy Butte (4112377)	CNDDB, May 2017 (EO 14)	11-Sep-2002	3 PLANTS SEEN IN 2002. THIS AND OCCURRENCE #13 ARE BELIEVED TO BE THE SOUTHERMOST POPULATIONS OF ARABIS KOEHLERI VAR. STIPITATA ACCORDING TO KRISTIAAN STUART.	PLANTS FOUND ON STEEP ROAD CUTBANK ADJACENT TO HIGHWAY 199, EROSION IS A THREAT.	Six Rivers NF	745
8	ON NORTH SIDE OF HIGHWAY 99 APPROXIMATE-LY 0.5 MILE WEST OF PATRICKS CREEK LODGE ENTRANCE, MIDDLE FORK SMITH RIVER.	Del Norte	Hurdygurdy Butte (4112377)	CNDDB, May 2017 (EO 13)	11-Sep-2002	4 PLANTS SEEN IN 2002. THIS AND OCCURRENCE #14 ARE BELIEVED TO BE THE SOUTHERMOST POPULATIONS OF ARABIS KOEHLERI VAR. STIPITATA ACCORDING TO KRISTIAAN STUART.	PLANTS FOUND ON STEEP ROAD CUTBANK ADJACENT TO HIGHWAY 199, EROSION IS A THREAT.	Six Rivers NF	825

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
9	; Plot center cairn with rebar with orange and white flagging.	Del Norte	High Plateau Mtn. (4112388)	NRIS, Feb 2017 (0510_51_ARKOS_INC 10_JDM507)	27-May-2010	5 individuals		Six Rivers NF	
10	HEADWATERS OF PACKSADDLE CREEK, 1.25 MILES WSW OF BROKEN RIB MTN SUMMIT, BROKEN RIB MOUNTAIN BOTANICAL AREA.	Del Norte	Broken Rib Mtn. (4112386)	CNDDB, May 2017 (EO 17)	25-Jul-2002	19 PLANTS SEEN IN 2002. SITE IS WITHIN A BOTANICAL AREA.	NONE NOTED IN 2002.	Six Rivers NF	3490
10	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510019001_ARKOS)	23-Jul-2002	21 individuals		Six Rivers NF	
11	HEADWATERS OF PACKSADDLE CREEK, 0.75 MILE WSW OF BROKEN RIB MTN SUMMIT, BROKEN RIB MOUNTAIN BOTANICAL AREA.	Del Norte	Broken Rib Mtn. (4112386)	CNDDB, May 2017 (EO 18)	23-Jul-2002	21 PLANTS SEEN IN 2002. SITE IS WITHIN A BOTANICAL AREA.	NONE NOTED IN 2002.	Six Rivers NF	4400

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
11	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510019004_ ARKOS)	23-Jul-2002	21 individuals		Six Rivers NF	
12	NW SLOPES OF BROKEN RIB MTN, 0.83 MILE NORTHWEST OF THE SUMMIT, BROKEN RIB MOUNTAIN BOTANICAL AREA.	Del Norte	Broken Rib Mtn. (4112386)	CNDDB, May 2017 (EO 16)	25-Jul-2002	12 PLANTS SEEN IN 2002 AT WESTERN COLONY AND ONE PLANT SEEN AT EASTERN COLONY. SITE IS WITHIN A BOTANICAL AREA.	NONE NOTED IN 2002.	Six Rivers NF	4210
12	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510019002_ ARKOS)	25-Jul-2002	1 individuals		Six Rivers NF	
12	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510019003_ ARKOS)	25-Jul-2002	12 individuals		Six Rivers NF	
13	SANGER PEAK TRAIL JUST WEST OF USFS ROAD 4803, SOUTHEAST SLOPE OF SANGER PEAK.	Del Norte	Broken Rib Mtn. (4112386)	CNDDB, May 2017 (EO 6)	25-Jul-2002	2 PLANTS OBSERVED AT NORTHERN COLONY IN 1995. 4 PLANTS SEEN AT SOUTHERN COLONY IN 2002.		Six Rivers NF	5440

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
13	Siskiyou NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (0510_ARKOS_105100001)	8-Jul-1995	2 individuals		Six Rivers NF	
13	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510070003)	25-Jul-2002	4 individuals		Six Rivers NF	
14	SOUTHWEST SLOPE OF SANGER PEAK ABOUT 0.8 MI SW OF THE SUMMIT, MIDDLE FORK SMITH RIVER, BROKEN RIB MTN BOTANICAL AREA.	Del Norte	Broken Rib Mtn. (4112386)	CNDDB, May 2017 (EO 15)	25-Jul-2002	29 PLANTS OBSERVED BETWEEN THREE SITES IN 2002. SITE IS WITHIN A BOTANICAL AREA.	NONE NOTED IN 2002.	Six Rivers NF	4400
15	RIDGE SOUTH OF HAYSTACK MOUNTAIN, 0.7 MILE WNW OF SANGER PEAK, SIX RIVERS NATIONAL FOREST.	Del Norte	Broken Rib Mtn. (4112386)	CNDDB, May 2017 (EO 7)	7-Jul-1983	IN 1995 92 CLUMPS OF PLANTS COUNTED, ESTIMATED TOTAL POPULATION AT 900-2000 INDIVIDUALS ON ENTIRE RIDGE. 1983 COLLECTION BY JIMERSON FROM RIDGE SOUTH OF HAYSTACK ATTRIBUTED TO THIS SITE.		Six Rivers NF	3800
15	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510010001)	25-Jul-2002	29 individuals		Six Rivers NF	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
15	Six Rivers NF	Del Norte	Broken Rib Mtn. (4112386)	NRIS, Feb 2017 (510010001_ARKOS)	8-Jul-1995	92 individuals		Six Rivers NF	
16	WEST FORK SEIAD CREEK ABOUT 1.2 MILES EAST OF LILY PAD LAKE, SOUTH OF COOK & GREEN BUTTE.	Siskiyou	Kangaroo Mtn. (4112382)	CNDDB, May 2017 (EO 4)	10-Jun-1905	5 PLANTS OBSERVED IN SUMMER OF 1988.	NO THREATS OBSERVED.	Klamath NF	4000
17	ON KLAMATH RIVER/ APPLEGATE RIVER DIVIDE, SOUTHEAST OF COOK & GREEN BUTTE.	Siskiyou	Kangaroo Mtn. (4112382)	CNDDB, May 2017 (EO 3)	10-Jun-1905	3 PLANTS OBSERVED IN SUMMER OF 1988.	NO THREATS OBSERVED.	Six Rivers NF; RogueRiver_SiskiyouNF	5960
18	NEAR HIGH PLATEAU CREEK, NORTH OF GASQUET.	Del Norte	High Plateau Mtn. (4112388)	CNDDB, May 2017 (EO 8)	24-Jul-1979	ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1979 COLLECTION BY MUTH.		Six Rivers NF	1250
18	Six Rivers NF	Del Norte	High Plateau Mtn. (4112388)	NRIS, Feb 2017 (510030048_ARKOS)	1-Jan-1903	individuals		Six Rivers NF	
19	Six Rivers NF	Del Norte	High Divide (4112481)	NRIS, Feb 2017 (0510_51_ARKOS_INC10_JDM501)	26-May-2010	5 individuals		Six Rivers NF	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
19	Six Rivers NF	Del Norte	High Divide (4112481)	NRIS, Feb 2017 (0510_51_ARKOS_INC10_JDM502)	26-May-2010	5 individuals		Six Rivers NF	
20	Six Rivers NF	Del Norte	High Divide (4112481)	NRIS, Feb 2017 (0510_51_ARKOS_INC11_TEC01)	19-May-2011	individuals		Six Rivers NF	
21	Six Rivers NF	Del Norte	High Plateau Mtn. (4112388)	NRIS, Feb 2017 (510030046_ARKOS)		individuals		Six Rivers NF	
22	Six Rivers NF	Del Norte	High Divide (4112481)	NRIS, Feb 2017 (0510_51_ARKOS_INC11_JDM02)	17-May-2011	6 individuals		Six Rivers NF	
23	RIDGE EAST OF BUCK PEAK, JUST WEST OF PACK TRAIL UP SWEATY GULCH, 0.7 MILE ENE OF AZALEA LAKE.	Siskiyou	Figurehead Mtn. (4112383)	CNDDB, May 2017 (EO 5)	3-Jul-1983	2 PLANTS OBSERVED IN 1983.	NO THREATS OBSERVED.	Rogue River-Siskiyou NF	5600

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
24	NEAR THE CONFLUENCE OF WIMER AND DIAMOND CREEKS, 1.3 AIR MILES SOUTH OF THE OREGON BORDER.	Del Norte	High Plateau Mtn. (4112388)	CNDDB, May 2017 (EO 20)	11-Jun-2003	12 PLANTS OBSERVED IN 2003.		Six Rivers NF	1400
24	Six Rivers NF	Del Norte	High Plateau Mtn. (4112388)	NRIS, Feb 2017 (510030041)	11-Jun-2003	12 individuals		Six Rivers NF	
25	Six Rivers NF	Del Norte	High Divide (4112481)	NRIS, Feb 2017 (0510_51_ARKOS_INC11_JDM01)	17-May-2011	12 individuals		Six Rivers NF	
26	Six Rivers NF	Del Norte	Shelly Creek Ridge (4112387)	NRIS, Feb 2017 (510020012_ARKOS)	1-Jan-1903	individuals		Six Rivers NF	
27	Six Rivers NF	Del Norte	1097	NRIS, Feb 2017 (510030034_ARKOS)	1-Jan-1903	individuals		Six Rivers NF	

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:	16	-	1	-	1	10-Jun-1905	11	1
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, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27	17	8	13	12	17-May-2011	-	25
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	17	9	13	13	N/A	11	26

Demographic and Population Trends: *Bochera koehleri* is known from approximately 26 occurrences in California, 19 of which are included in the CNDDB as Element Occurrences (EOs). The seven records not in CNDDB are NRIS records that are mapped more than 0.25 mi from existing EOs. Of the 26 occurrences, 25 are on the Six Rivers NF, and one is on the Klamath NF. All EOs are listed as extant, with eight EOs having been visited in the last 20 years,

and the rest not visited since 1995 or earlier. Of the EOs, 4 are ranked as Excellent, and 15 as Unknown (CNDDB 2017; NRIS 2017).

Population sizes are well documented, as they have been estimated for 74% of the known populations, including four of the NRIS records. Censusing efforts were concentrated in the years 1995 and 2002. Of these, only a single population has been estimated in at least one year to likely be over 1,000 individuals, which is EO 7, with 92 plants counted, and 900-2,000 estimated in 1995 to occur in the vicinity. The remaining populations with counts are reported to be quite small, the next largest consisting of 29 individuals. The rest of the populations with census data collected average 10.5 individuals. Taking the average of the range estimate for the single very large population, one can add all the censused populations and estimate the documented statewide population to be fewer than 2,000 individuals.

Boechera koehleri has distinctive peg-like leaf scars that allow confirmation of ID in vegetative condition year-round, although in spring and summer, its unusually large, bright purple flowers and prominently arched fruits can best attract observers' attention from a distance. It appears to prefer rocky habitat with little competition from other plants, so relatively easy to discern in the field at any time of year, as reflected in the wide variety of dates associated with EOs (CNDDB 2017). Poor detectability is therefore unlikely to be a cause of low number of occurrences recorded to date.

Boechera koehleri is a long-lived perennial, so although the presence of seedlings may vary considerably due to mortality (Bloom et al. 2001), adult population numbers are expected to be stable from year to year. All of the EOs have their trend listed as unknown (CNDDB 2017). This is due to lack of data, as none have been censused in more than one year.

Life History: *Bochera koehleri* is a long-lived perennial herb to low sub-shrub that forms a multiply-branched woody caudex with age (Al-Shehbaz and Windham 2010; CNPS 2018). It blooms as early as March, and as late as July, but typically from April to May (Windham and Al-Shehbaz 2012; CNPS 2018). It begins forming fruits right away and these are usually visible until late summer (CCH 2018; CPNWH 2018).

Bloom et al. (2001) studied survivorship of *B. laevigata*, a short-lived perennial of stable rock outcrop environments similar to those of *B. koehleri*. Some findings from this study that are likely descriptive of *B. koehleri* life history is that mortality is highest in seedlings, especially in the first two months after germination and appears related to dessication and/or temperature, with just over 4% of seedlings surviving their first year. Thereafter, smaller plants have a greater probability of dying (plant size being indicative of quality of microhabitat).

Pollinator studies for this or related species of *Boechera* were not found. *Boechera* species are highly variable in their breeding system, and can be outcrossed, selfing, apomictic, or a combination of these (Dobes et al. 2007).

Diversity: The genus *Boechera* is an ecologically and morphologically diverse group that has mainly radiated in alpine, montane and desert regions of western North America within the last two million years (Schranz et al. 2005). The taxa within *Boechera* are thus incompletely isolated genetically, and crossing studies and DNA sequence analysis within *Boechera* indicate high potential for hybridization among species within the genus, with hybrids often being triploid (sometimes diploid) and reproducing asexually by apomyxis (Al-Shehbaz and Windham 2010). Of the 110 recognized species in the genus, 72 are sexually reproducing diploid species and 38 are apomictic triploid species (Kiefer et al. 2009; Al-Shehbaz and Windham 2010). According to an analysis of cpDNA haplotypes, the Klamath-Siskiyou region is a center of genetic diversity for *Boechera*, both for lineages that appear to have survived there in glacial refugia but also to

lineages that expanded there from the Sierra Nevada more recently, raising the potential for hybridization to have occurred in this region (Kiefer et al 2009). There is no chromosome count available for *B. koehleri*, although its ellipsoid pollen grains suggest that it is a diploid (Al-Shehbaz 2003; Al-Shehbaz and Windham 2010). Dobes et al. (2005), however, assert that unpublished data on ITS polymorphisms suggests this species is hybrid in origin.

Rollins (1941) noted some minor differences in traits between the cluster of populations in Douglas County, Oregon, and the cluster in Josephine and Jackson counties, Oregon plus Del Norte, Siskiyou, and Trinity counties in California: plants in the southern cluster of populations have more numerous crowded cauline leaves, broader basal leaves and rather strongly recurved, shortly stipitate siliques. Specimen data does not mention serpentine as a substrate in the Douglas County collections, although it is commonly mentioned in collections from the Klamath-Siskiyou region (CPNWH 2018), so there may be some habitat preference differences between these two clusters of localities as well. These differences are not recognized as meriting varietal status in the currently accepted taxonomy (Al-Shehbaz 2003; Al-Shehbaz and Windham 2010; Windham and Al-Shehbaz 2012).

Habitat: The general habitat for *B. koehleri* is characterized as rocky ground in chaparral or lower montane coniferous forest (CNPS 2018). The rocky ground has been described most often as outcrops, bluffs or cliffs, and less often as cobbly soil, serpentine barrens, and in one case, a long-disused road (CNDDB 2018). The topographic siting varies widely in site descriptions, from ridgeline, to slide area, to "rocky area along creek". In one case a 75% slope was specified, but in all other cases steep slope can be inferred from descriptors like "rocky bluffs" (CNDDB 2018). The substrate rock for the California populations is described as entirely or predominantly serpentine with other minerals such as weathered peridotite also present. Occurrence one (EO 1) is the sole exception, as the rock type reported is igneous or meta-igneous substrate (CNDDB 2017). Safford et al. (2005) categorize this species as a strict endemic of serpentine. In contrast, the former var. *koehleri* is found on open basalt rock outcrops and cliffs with grassland-type communities in Douglas County, Oregon (NaturServe 2018).

Sources (CCH 2018; CNPS 2018; Windham and Al-Shehbaz 2012) disagree about elevation range for *B. koehleri*; occurrences mapped for this study in California range from 600 to 6,000 feet.

Boechera koehleri appears to prefer low vegetation cover or competition, plus a good measure of exposure as "opening in forest" or "rocky outcrop in chaparral" are typically mentioned in site descriptions. Quantitative measures are given in only two occurrences: in EO 1, the crown closure is specified as 30%, in EO 19, a south-southeast aspect is specified (CNDDB 2018). Although soil cover is not mentioned in site reports, Bloom et al. (2003) studied survivorship in relation to leaf litter for *Boechera laevigata*, which also occupies rocky outcrops. They found that young plants had a higher survival rate in microsites with less litter cover, with the species being absent from sites with thick and persistent litter cover.

Associated species frequently mentioned (CCH 2018, CNDDB 2018; CPNWH 2018) are common chaparral shrubs of drier sites: *Arctostaphylos greenei, Ceanothus cuneatus, C. prostratus, Garrya buxifolia*, and *Quercus vacinifolia*. Similarly, herbs mentioned as associates are those of dry, rocky openings of chaparral and forest: *Festuca idahoensis, Sedum laxum, Polygala corymbosa, Erysimum capitatum* var. *capitatum, Galium ambiguum* subsp. *siskiyouense*. Trees of surrounding forests mentioned on the specimen labels are regionally common species of dry to mesic forests: *Arbutus menziesii, Calocedrus decurrens, Pinus jeffreyi, P. ponderosa*, and *Pseudotsuga menziesii*.

Habitat Status or Trend: The natural fire regime has been suppressed over the past 100-150 years throughout the range of *B. koehleri*, resulting in shrub encroachment, and increased fuel loads, potentially leading to hotter fires and consequently increased erosion (Kagan et al. 2006).

Boechera koehleri occurs on serpentine substrate which is high in metals, and large scale mining operations for nickel, chromium, copper and gold have affected this habitat in the past (Kagan et al. 2006). A portion of *B. koehleri* populations occur on steep road cutbanks and are thus vulnerable to road maintenance and improvement disturbances, and instability of the roadside habitat (CNDDB 2018).

Capacity for the Species to Disperse: Pollen dispersal/pollinator studies were not found for *B. koehleri* or related species. Schranz (2005) found that apomyxis in *Boechera* species requires fertilization, so pollen dispersal is an important factor whether or not *B. koehleri* turns out to be a sexual species. Windham and Al-Shehbaz (2007) assert that it is probably a sexual diploid, but whether it is outcrossing or selfing is unknown.

Boechera koehleri does not spread vegetatively, and is not known to root from broken-off parts, so the dispersal and spread of this plant occurs via seed alone. Seed dispersal from Brassicaceae fruits occurs via splitting open of tissue on either side of the central axis (schizocarp) which can be explosive in some species (e.g. *Cardamine*), but is passive in *Boechera* (Bloom et al. 2002). Bloom et al. (2002) studied seed dispersal characteristics of *B. laevigata*, which has similar silique size, shape and similar seed size to *B. koehleri*. They found that most seed fall 0.25 meters from the parent plant, with far fewer seed dispersing between 0.5 and 3 meters, a typical leptokurtic pattern. *Boechera laevigata* seeds have narrow (+/- 0.1 mm) diameter wings similar to *B. koehleri*, which Bloom et al. (2002) assert does not have an effect on wind dispersal distances. They further speculate that short dispersal distance is advantageous for establishment in long-persisting habitats close to the parent plant.

Bloom et al (2002) also measured the timing of seed dispersal, and found that onset of seed dispersal occurred between June and November, and ranged from 14 to 586 days, with the mean of 202 +/- 12.8 days, and observed that longer seed retention tended to occur in wind-protected locations. Bloom et al. (2002) state that long seed retention has been documented in several rock outcrop species, and that long seed retention may buffer against loss of seed bank by wash-off from the hard surfaces of rocky sites.

Threats: Most EO records indicate no threats are observed. Erosion is the sole reported threat, cited in three sites (EOs 1, 13, 14). This plant's predilection for open, rocky areas has led to its appearance on road-cuts. One record, EO 12, reported the species growing on a long disused road and two (EOs 13 and 14) record it as growing on steep road cut-bank above Highway 99 (CNDDB 2018). Other road-associated disturbances (weed competition, roadside fire, maintenance work) might reduce the survival of these populations relative to steep areas subject only to natural impacts such as landslides and erosion.

The striking pattern in census information for *B. koehleri* occurrences is the small number of individuals recorded at each site (an average of 10.5 individuals) (CNDDB 2018). Most of the EOs (16 of 19) report counts of individuals observed, and it appears from these counts that *B. koehleri* populations are very small. This may be a natural result of habitat size constraints, as rock outcrops are a naturally discrete and contain limited permissive microhabitat (cracks in rocks). The survival strategy for this species would be that individuals, once established, live a long time in this stable habitat type, with reasonably high colonization rate between adjacent sites replacing extirpated subpopulations (Bloom et al. 2002). Under this scenario, a conservation strategy would need to focus on assuring substantial numbers of these small populations occur in the region.

Literature Cited

Alexander, P. J., M. D. Winham, J. B. Beck, I. A. Al-Shehbaz, L. Allphin, and C. D. Bailey. 2013. Molecular phylogenetics and taxonomy of the genus *Boechera* and related genera (Brassicaceae: Boechereae). *Systematic Botany* 38(1): 192-209.

Al-Shehbaz, I. A. 2003. Transfer of most North American species of *Arabis* to *Boechera* (Brassicaceae). *Novon* 13(4): 381-391.

Al-Shehbaz, I. A. and M. D. Windham. 2010. *Boechera.* Pp. 347-412 *in*: Flora of North America Editorial Committee (eds.), *Flora of North America North of Mexico,* Vol. 7. New York and Oxford.

Bloom, T. C., J. M. Baskin, and C. C. Baskin. 2001. Ecological life history of the facultative woodland biennial *Arabis laevigata* variety *laevigata* (Brassicaceae): Survivorship. *Journal of the Torrey Botanical Society* 128(2): 93-108.

____. 2002. Ecological life history of the facultative woodland biennial *Arabis laevigata* variety *laevigata* (Brassicaceae): Seed dispersal. *Journal of the Torrey Botanical Society* 129(1): 21-28.

____. 2003. Ecological life history of the facultative woodland biennial *Arabis laevigata* variety *laevigata* (Brassicaceae): Effects of leaf litter cover, herbivory, and substrate-type on bolting and fecundity. *Journal of the Torrey Botanical Society* 130(1): 16-22.

[BLM] Bureau of Land Management. 2010. Special Status Plants in California, Including BLM Designated Sensitive Species. February 8, 2010. Available at: https://www.blm.gov/ca/dir/pdfs/2010/im/CAIM2010-008ATT2B.pdf [accessed 25 May 2017].

[CDFG] California Department of Fish and Game. 2013. 24K Quads, SDE Feature Class. Index for 1:24,000-scale (24K), 7.5-minute by 7.5-minute, paper U.S. Geological Survey maps in California.

[CDFW] California Department of Fish and Wildlife. 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians; Volume II, Appendix C: Species of Greatest Conservation Need. Gonzales, A. G. and J. Hoshi (eds.). Prepared with assistance from Ascent Environmental, Inc., Sacramento, CA. Available at: https://www.wildlife.ca.gov/swap/final [accessed 11 May 2017].

[CNDDB] California Department of Fish and Wildlife, Natural Diversity Database. 2017. RareFind 5 [Internet application] and CNDDB Maps and Data. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data [Government Version, May 2017].

____. 2018. RareFind 5 [Internet application] and CNDDB Maps and Data. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data [Government Version, March 2018].

[CDFW] California Department of Fish and Wildlife, Natural Diversity Database. 2018a. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication, January 2018. 127 pp. Available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109383 [accessed 22 January 2018].

____. 2018b. State and Federally Listed Endangered, Threatened, and Rare Plants of California. Last updated January 2018. 6 pp. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline [accessed 22 January 2018].

[CDF] California Department of Forestry and Fire Protection. 2009. 1:24,000 County Boundaries (cnty24k09_1_poly) [shapefile]. California Department of Forestry and Fire Protection,

California Department of Fish and Game. Berkeley Library Geodata. Available at: https://geodata.lib.berkeley.edu/catalog/ark28722-s73w23 [10 December 2017].

[CNPS] California Native Plant Society, Rare Plant Program. 2018. *Inventory of Rare and Endangered Plants of California* (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 22 January 2018].

[CPAD] California Protected Areas Database. 2016. Version 2016b1. GreenInfo Network. Available at: http://www.calands.org/.

[CCH] Consortium of California Herbaria. 2018. Data provided by the participants of the Consortium of California Herbaria. Regents of the University of California, Berkeley. Website http://ucjeps.berkeley.edu/consortium/ [accessed 11 June 2018].

[CPNWH] Consortium of Pacific Northwest Herbaria. 2018. Data provided by the participants of the Consortium of Pacific Northwest Herbaria. University of Washington Herbarium. Website http://www.pnwherbaria.org/data/search.php [accessed 22 January 2018].

Dobeš, C., T. F. Sharbel, and M. Koch. 2007. Towards understanding the dynamics of hybridization and apomixes in the evolution of the genus *Boechera* (Brassicaceae). *Systematics and Biodiversity* 5(3): 321-331.

Esri. 2012. World Reference Overlay [basemap overlay]. Scale Range: 1:591,657,528 down to 1:72,224. Esri, DeLorme, USGS, NPS. Updated 2 September 2017. Available at: http://www.arcgis.com/home/item.html?id=9763d83ba63048da8a2e0a71ccea4416 [8 December 2017].

____. 2017a. USA Topo Maps [basemap]. Scale Range: 1:591,657,528 down to 1:18,056. National Geographic Society, i-cubed, 2013. Updated 5 October 2017. Available at: http://www.arcgis.com/home/item.html?id=99cd5fbd98934028802b4f797c4b1732 [8 December 2017].

____. 2017b. World Terrain Base [basemap]. Scale Range: 1:591,657,528 down to 1:72,224. Esri, USGS, NOAA. Updated 9 February 2017. Available at: http://www.arcgis.com/home/item.html?id=c61ad8ab017d49e1a82f580ee1298931 [8 December 2017].

Greene, E. L. 1910. *Arabis arbuscula. Leaflets of Botanical Observation and Criticism* 2(4): 77.

Howell, T. J. 1897. *Arabis koehleri.* A flora of Northwest America containing brief descriptions of all the known indigenous and naturalized plants growing without cultivation north of California, west of Utah, and south of British Columbia 1: 44.

[IUCN] International Union for Conservation of Nature. 2017. The IUCN Red List of Threatened Species. Website http://www.iucnredlist.org/ [accessed 26 May 2017].

Kagan, J., L. Hoover, J. McRae, W. Rolle, M. Mousseaux, L. Mazzu, and S. Friedman. 2006. Conservation Agreement for *Hastingsia bracteosa, H. atropurpurea, Gentiana setigera, Epilobium oreganum*, and *Viola primulifolia* ssp. *occidentalis* on serpentine *Darlingtonia* wetlands and fens from Southwestern Oregon and Northwestern California. Participating agencies: U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service. Available at https://www.fws.gov/oregonfwo/ToolsForLandowners/HabitatConservationPlans/ConsvAgreements/SerpentineFen-CA_6-2006.pdf [accessed 23 April 2018].

Kiefer, C., C. Dobeš, T. F. Sharbel, and M. A. Koch. 2009. Phylogeographic structure of the chloroplast DNA gene pool in North American *Boechera* – A genus and continental-wide perspective. *Molecular Phylogenetics and Evolution* 52: 303-311.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Website http://explorer.natureserve.org [accessed 22 January 2018].

[NDF] Nevada Division of Forestry. 2012. NAC 527.010 List of fully protected species of native flora. April 2012. Available at: https://www.leg.state.nv.us/NAC/NAC-527.html#NAC527Sec010 [accessed 12 May 2017].

[NNHP] Nevada Natural Heritage Program. 2017. Species Lists. Department of Conservation and Natural Resources. Available at: http://heritage.nv.gov/species/lists.php [accessed 25 May 2017].

[ODA] Oregon Department of Agriculture. 2014. Oregon listed and candidate plants - complete list. Native Plant Conservation Program. August 13, 2014. Available at: https://data.oregon.gov/Natural-Resources/Oregon-listed-and-candidate-plants-complete-list/8s3k-ygh2 [accessed 25 May 2017].

[ODFW] Oregon Department of Fish and Wildlife. 2016. Oregon Conservation Strategy, Chapter 6: Strategy Species. Oregon Department of Fish and Wildlife, Salem, Oregon. PDF content last updated December 30, 2016. Available at: http://oregonconservationstrategy.org/ [accessed 25 May 2017].

[ORBIC] Oregon Biodiversity Information Center. 2016. Rare, Threatened and Endangered Species of Oregon. Institute for Natural Resources, Portland State University, Portland, OR. 130 pp. Available at: http://inr.oregonstate.edu/sites/inr.oregonstate.edu/files/2016-rte-book.pdf [accessed 25 May 2017].

Rollins, R. C. 1941. A monographic study of *Arabis* in western North America. *Rhodora*. 43(511): 289-325.

Safford, H. D., J. H. Viers, and S. P. Harrison. 2005. Serpentine endemism in the California flora: A database of serpentine affinity. *Madroño* 52(4): 222-257.

Schranz, M. E., C. Dobes, M. A. Koch, and T. Mitchell-Olds. 2005. Sexual reproduction, hybridization, apomyxis, and polyploidization in the genus *Boechera* (Brassicaceae). *American Journal of Botany* 92(11): 1797-1810.

Sims, A. and R. Bittman. 2012. Non-Substantive Name Changes in the CNPS Inventory to Reflect *The Jepson Manual, Second Edition*. Rare Plant Program report, 24 April 2012. California Native Plant Society, Sacramento, CA. 3 pp.

Skinner, M. W. and B. M. Pavlik. 1994. *Inventory of Rare and Endangered Vascular Plants of California.* Special Publication No. 1 (5th Edition). California Native Plant Society, Sacramento, CA. 338 pp.

Smith, J. P., Jr. and K. Berg. 1988. *Inventory of Rare and Endangered Vascular Plants of California*. Special Publication No. 1 (4th Edition). California Native Plant Society, Sacramento, CA. 168 pp.

Tropicos. 2018. Missouri Botanical Garden. Website http://www.tropicos.org [accessed 22 January 2018].

[NRIS] U.S. Department of Agriculture Forest Service, Natural Resource Information System. 2017. Natural Resource Information System; Threatened, Endangered and Sensitive Plants—Invasive Plants [accessed December 2016 and February 2017].

[USDA] U.S. Department of Agriculture Forest Service, Pacific Southwest Region. 2013. Regional Forester Sensitive Species List. Available at: http://www.fs.usda.gov/main/r5/plants-animals/plants [accessed 9 May 2017].

[USDA] U.S. Department of Agriculture Forest Service and U.S. Department of Interior Bureau of Land Management. 2001. List of Survey and Manage Species in Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures; as amended by Annual Species Reviews 2001-2003. Available at: https://www.blm.gov/or/plans/surveyandmanage/files/sm-fs-enc3-table1-1-dec2003wrtv.pdf [accessed 12 September 2017].

[USDA] U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. PLANTS Database. Website http://plants.usda.gov/ [accessed 22 January 2018].

Windham, M. D. and I. A. Al-Shehbaz. 2007. New and noteworthy species of *Boechera* (Brassicaceae) II: Apomictic hybrids. *Harvard Papers in Botany* 11(2): 257-274.

____. 2012. *Boechera koehleri. In*: Jepson Flora Project (eds.), *Jepson eFlora.* Website http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=91729 [accessed 9 July 2018].

Persons Contacted:

Carlberg, T. 2017. USDA Forest Service, Six-Rivers National Forest; President, California Lichen Society. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Loleta, CA. Contacted 16-18 November 2017.

Goldsworthy, E. 2017. Botanist, Green Diamond Resource Company, Arcata, CA. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Eureka, CA. Contacted 16-18 November 2017.

Hoover, L., J. McRae, and S. Carothers. 2017. Hoover and McRae: Forest Botanists, Six Rivers NF, Eureka, CA; Carothers: Botanical Contractor, Arcata, CA. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Loleta, CA. Contacted 16-18 November 2017.

O'Connell, G., G. Lester, D. York, B. Clare, G. Laural, P. Clint. 2017. California North Coast botanists. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Loleta, CA. Contacted 16-18 November 2017.

Taylor, D. Wm. 2017. Environmental contractor, Aptos, CA. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Eureka, CA. Contacted 16-18 November 2017.

Author(s) and Date:

Alison Colwell, Assistant Rare Plant Botanist, California Native Plant Society, (916) 738-7619, acolwell@cnps.org;

Aaron E. Sims, Rare Plant Botanist, California Native Plant Society, (916) 324-3816, asims@cnps.org. September 25, 2018.

Reviewer(s) and Date:

David Magney, Rare Plant Program Manager, California Native Plant Society, (916) 447-2677 ext. 205, dmagney@cnps.org. September 25, 2018.

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.