Plant Species Evaluation Form

Cryptantha rostellata (Greene) Greene

RED-STEMMED CRYPTANTHA

Family: Boraginaceae (CNPS 2018) | **PLANTS Symbol:** CRRO4 (USDA 2018) | **Calif. Endemic:** No (CNPS 2018)

Synonyms/Other Names: *Cryptantha rostellata* was originally described as *Krynitzkia rostellata* in 1886 by Edward Lee Greene, who then, a year later, expanded the genus *Cryptantha* to include North American species that had been placed in the genus *Krynitzkia* (Green 1887). In the 1925 and 1993 Jepson manuals, *C. rostellata* was not given full recognition, and instead included within a note under *C. flaccida*: "[Plants] from n CA-FP with nutlets ± plump, groove ± closed have been called *C. rostellata* (E. Greene) E. Greene incl var. *spithamea* (I.M. Johnson) Jepson." (Kelley and Wilken 1993). The more recent treatment (Kelley et al. 2012) has separated *C. rostellata* from *C. flaccida* based on the characteristics of the nutlet attachment scar (Greene et al. 2018).

In 1931, August Brand treated *C. suksdorfii* (a species described from Oregon and Washington) as a variety of *C. rostellata*. Twelve years later, in 1943, Willis Linn Jepson treated *C. spithamaea* (a species originally described by I. M. Johnston in 1939) as a novel variety of *C. rostellata* as well (Tropicos 2018). *Cryptantha rostellata* var. *spithamaea* was included in Munz and Keck (1973), but no varieties of *C. rostellata* are accepted in current taxonomy. The specific epithet *rostellata* comes from the Latin word rostellum, meaning little beak, and likely referring to the beak-shaped nutlet (Charters 2017) (Green et al. 2018).

Identification Issues: Differentiation of species within *Cryptantha* requires both flower and fruit associated characters. Provided that is possible, identification of *C. rostellata* poses no special difficulty (Kelley et al. 2012).

Cryptantha rostellata is most similar to *C. spithamaea*, a taxon not included in *The Jepson Manual* (Kelley and Wilken 1993), but later included in the *Jepson eFlora* (Kelley et al. 2012). *Cryptantha rostellata* var. *spithamaea* is treated as a synonym of *C. spithamaea* in the *eFlora* (Kelley et al. 2012). *Cryptantha rostellata* is differentiated from *C. spithamaea* in having a smaller corolla limb that is 1-2 mm in diameter (vs. 3-6 mm in diameter), calyx lobe midveins that have many stout hooked/curved bristles (vs. appressed to ascending curved hairs with hooked/curved bristles only at tip), and a larger nutlet that is 2.3-2.8 mm (vs. 1.6-2 mm in *C. spithamaea*) (Kelley et al. 2012) (Green et al. 2018).

Taxonomy:

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Species In Genus: +- 200 species: western North America, western South America, northeastern Asia (1 sp.). Etymology: (Greek: hidden flowers, from cleistogamous flowers of some South American species). Note: Generally homostylous. The tissue between ovary lobes, interpreted as a receptacle and/or style (style sometimes 0, then stigma attached to top of receptacle), extends to various degrees in fruit, forming what is often called the gynobase (here "fruit axis"), to which the nutlets are laterally attached at maturity, leaving an attachment scar. Annual species without yellow corolla appendages generally self-pollinating; perennial herb species generally homostylous in California. Some species, e.g., *Cryptantha angustifolia, Cryptantha ambigua, Cryptantha barbigera, Cryptantha mariposae*, hybridize with co-occurring species. Observation

of nutlets, hairs best at 10+× generally critical for identification. Corolla limb diam generally < at end of flower period, especially for annual species *Cryptantha sobolifera* Payson does not occur in California.

Habit: Annual 5--20+ cm, +- stout, stiff. Stem: branches few, above to occasionally throughout; +- red, strigose and canescent. Leaf: generally several opposite pairs below inflorescence; ascending, 1--1.5 cm, +- oblanceolate,+- thick, persistent, hairs ascending to spreading. Inflorescence: in 1s or 2s, +- stiff; bracts 0; pedicel < 0.5 mm, spreading to ascending. Flower: calyx 2--3 mm, 3--3.5(4) mm in fruit, +- persistent, lobes lanceolate, margins sparse-ciliate, midvein with many stout, hooked or curved bristles occasionally basally encrusted with exudate; corolla limb 1--2 mm diam, appendages minute, pale yellow. Fruit: nutlet 1, 2.3--2.8 mm, lance-ovate to lanceolate, shiny, margin rounded to sharp-angled, base wide-truncate, tip +- beaked; abaxially rounded, ridge 0; adaxially flat, attachment scar edges abutted near tip, +- gapped lower 1/3, wide-forked at base; axis not to nutlet tip. eFlora Treatment Author: Ronald B. Kelley, Michael G. Simpson & Kristen E. Hasenstab-Lehman.

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: S3 NV: Not listed OR: SNR	4.2	Not listed	Not listed	Not listed

SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	3: Review	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).

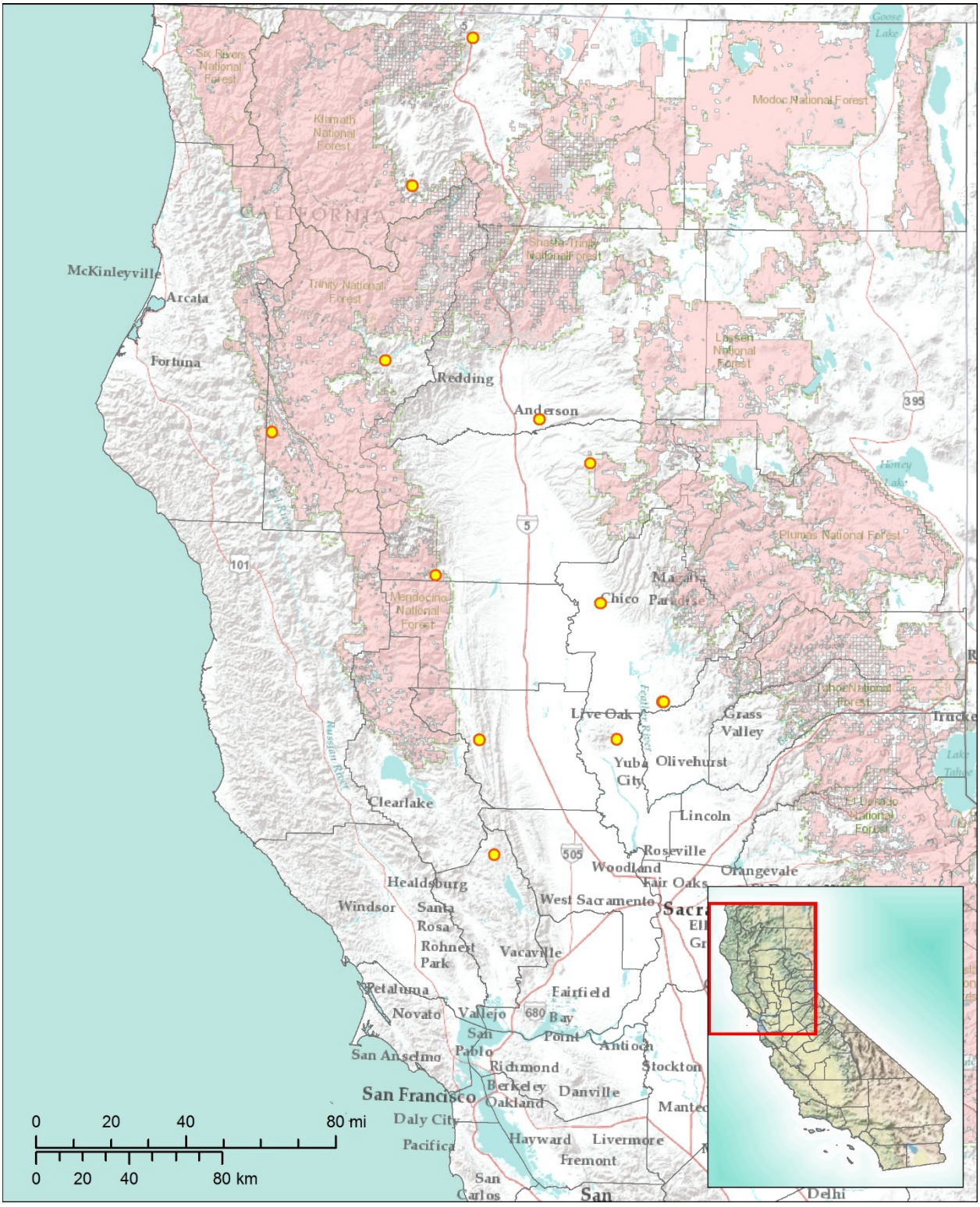
Cryptantha rostellata was added to California Rare Plant Rank (CRPR) 4.2 (limited distribution/watchlist) of the CNPS Inventory on June 26, 2018. It is known from an estimated 14 occurrences in California, with 13 of them being considered historical, having not been documented in over 20 years. Although the number of its occurrences are few, and the vast majority of them are historical, it was still placed on CRPR 4 instead of 2B (rare in California, common elsewhere) due to the likelihood that it is more common than the records indicate. There is likely to be a large amount of suitable habitat located on private land that has yet to be surveyed (Nelson, J. K. pers. comm. 2018), and according to the *Jepson eFlora* treatment author, Ron Kelley (pers. comm. 2013), CRPR 4 is the correct placement for this species because it is scattered throughout northern California and is correlated with a relatively common substrate. Furthermore, the plants are always short in stature and small flowered, likely resulting in under-collection by field botanists (Green et al. 2018).

The review of *C. rostellata* for addition to the CNPS *Inventory* was prioritized and initiated in response to it possibly meeting the criteria for being reviewed for Species of Conservation Concern (SCC) status. Even though *C. rostellata* has a relatively low rank as a G4 (apparently

secure) species, with S3 (vulnerable) status in California, it should be considered for SCC status based on being known from single occurrences on Stanislaus, Six Rivers, and Mendocino National Forests (Nelson, J. K. pers. comm. 2018b). Also, since it has only recently been added to the *Inventory*, it has not had special attention or priority interest by botanists to survey for or collect it prior, and further field work is required in order to determine whether or not it's severely limited and/or threatened on a given National Forest.

Although NatureServe (2018) indicates that *Cryptantha rostellata* is considered vulnerable (S3) in Oregon, it is actually currently on their Review List with a state rank of SNR since they are not certain about its rank (Vrilakas, S. pers. comm. 2018). *Cryptantha rostellata* is considered imperiled (S2) in Washington (NatureServe 2018).

Distribution: *Cryptantha rostellata* is found in eastern Washington, eastern Oregon, and northern California, with a single collection record from western Idaho (CPNWH 2018). In the *Jepson eFlora*, *C. rostellata* is reported to occur only in the Inner North Coast Ranges (NCoRI), Sacramento Valley (ScV), northern Sierra Nevada Foothills (n SNF), Modoc Plateau (MP), and Warner Mountains (Wrn) bioregions (Kelley et al. 2012); however, scattered collection records indicate it also occurs in the Klamath Ranges (KR), outer North Coast Ranges (NCoRI), and Cascade Range Foothills (CaRF) (CCH 2018). Counties in which this taxon has been recorded include Butte, Colusa, Glenn, Mariposa, Napa, Shasta, Siskiyou, Sutter, Tehama, and Trinity. National Forest System lands on which *C. rostellata* occurs include Mendocino, Six Rivers, and Stanislaus National Forests (CCH 2018; Green et al. 2018). In addition, it is found within the five-mile buffer zones of Klamath, Lassen, and Shasta-Trinity National Forests (CCH 2018).



Sources: *Distribution*: CCH 2018, Green et al. 2018. *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	Leesville (wrote "Leesburg, Lake(?) Co." on label; later corrected to Leesville Mounted on sheet with CAS 733135 (barcode 123346) collected at Merced, 1885, not a type specimen.;	Colusa	Leesville	CCH 2018	01-May-1884				1449
2	Chico	Butte	Chico	CCH 2018	01-April-1887				215
3	Hornbrook	Siskiyou	Hornbrook	CCH 2018	10-May-1889				2167
4	between Mud Flat and Bennett Springs (on the Newville-Covelo road); Coast Range on a n slope in open gravelly places, in the digger pine belt, but chaparral growth predominating	Glenn	Hall Ridge	CCH 2018	3-Jun-1915			Mendocino NF	3016
5	3 mi ne Coulterville on ridge in hard soil under pines	Mariposa	Coulterville	CCH 2018	16-May-1938			Stanislaus NF	3410
6	Peter Ahart Ranch, Honcut. Valley grassland. [1983 R. Schlising annotation says 'style > length nutlet. Probably C. rostellata Greene']. USGS quad: NULL;	Butte	Honcut	CCH 2018	8-May-1968				131
6	Peter Ahart Ranch, Honcut. Valley Grassland. Small plant. On dry hard bare soil. [1983 R. Schlising annotation says 'Ok as det? Style < 1/2 length nutlet; areola is vaguely present. = *C. rostellata* Greene?']. USGS quad: NULL;	Butte	Honcut	CCH 2018	8-May-1972				131

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
7	Along 1S07, Shanty Creek, 5 mi. W of Ruth Dam. Mixed conifer forest <coords cont.: 29N6E29, 30 >; Elevation about 4400 feet. Douglas fir, ponderosa pine, incense cedar woodland.	Trinity	Black Lassic	CCH 2018	15-Jul-1971			Six Rivers NF	3696
8	Along Rd. 8, 0.9 mi. from its junction with Hwy. 3 Jeffrey pine woodland serpentine 40N09W11 <coords cont.: >;	Siskiyou	Callahan	CCH 2018	25-May-1974				3144
9	Above drainage running NE from Adams Creek (site 163) Rock outcrop 10N04W06 <coords cont.: NW 1/4 of NE 1/4>;	Napa	Walter Springs	CCH 2018	19-Apr-1977			BLM	1641
10	Flood plain of Trinity River at Douglas City BLM Campground Rocky alluvium 32N10W12 <coords cont.: >;	Trinity	Weaverville	CCH 2018	13-May-1979			BLM	1607
11	On a gravel bar along the edge of a large wash, Peter Ahart Ranch, about 1 1/2 miles north and 1 1/4 miles east of Honcut, about 12 miles south of Oroville. Valley Grassland. Small size plants, growing on dry gravelly soil on a gravel bar along the edge of a large wash. Uncommon. Flowers white. USGS quad: NULL;	Butte	Honcut	CCH 2018	20-May-1979				161
11	Peter Ahart Ranch, about 1.25 mi e of Honcut and 12 mi s of Oroville. On a gravel bar along a small wash in annual grassland. T17N R4E.	Butte	Honcut	CCH 2018	18-May-1984				161
12	Road cut, about 1/4 mile west of the fourth gate to the Dean Ranch, near the power lines, about 3 1/4 miles north of Sutter, Sutter Buttes. Foothill Woodland. On dry bare gray disturbed soil of a road cut. Uncommon. Flowers white. USGS quad: NULL;	Sutter	Sutter	CCH 2018	4-May-1986				156

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
12	Road cut, about 1/4 mile west of the fourth gate to the Dean Ranch, near the power line, about 3 1/4 miles north of Sutter, Sutter Buttes. Foothill Woodland. On dry bare gray disturbed soil of a road cut. Uncommon. Flowers white. USGS quad: NULL;	Sutter	Sutter	CCH 2018	24-May-1986				156
13	Hogsback Rd. (Belle Mill Rd. or Forest Rd. 28N24), 18.6 mi (odometer) E of Hwy. 99, 2.0 mi (odometer) E of the power transmission lines, ca. 4.75 mi (air) SSE of Paynes Creek. Foothill Woodland. Scattered plants in thin, gravelly soil on Tuscan bedrock in rocky oak savanna. [Vernon H. Oswald 5/27/1992 annotation label says 'Dr. Walter Kelley, Mesa State College, Grande Junction, Colorado, has examined a portion of this collection. The states that the material fits *Cryptantha rostellata* (E. Greene) E. Greene in the narrow sense. However, all members of the section Flaccidae (*C. flaccida, C. sparsiflora*, and *C. rostellata*) are being combined under *C. flaccida* (Lehm.) E. Greene in the revised Jepson Manual']. 28N01E19 <coords cont.: NE1/4 of NE1/4>; USGS quad: NULL;	Tehama	Inskip Hill	CCH 2018	21-Apr-1992				2461
14	Ash Creek Road ca. 2 miles from intersection with Parkville Road, 7 mles east of Anderson. Oak woodland/annual grassland, growing on gravel/dirt roadside. Nutlets smooth, shiny, mottled, one per flower. ;	Shasta	Balls Ferry	CCH 2018	9-May-2014				471

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	0
Lake Tahoe Basin MU:	-	-	-	-	-	-	-	0
Lassen:	-	-	-	-	-	-	1	0
Los Padres:	-	-	-	-	-	-	-	0
Mendocino:	4	0	1	0	1	3-Jun-1915	-	1
Modoc:	-	-	-	-	-	-	-	0
Plumas:	-	-	-	-	-	-	-	0
San Bernardino:	-	-	-	-	-	-	-	0
Sequoia:	-	-	-	-	-	-	-	0
Shasta-Trinity:	-	-	-	-	-	-	1	0
Sierra:	-	-	-	-	-	-	-	0
Six Rivers:	7	0	1	0	1	15-Jul-1971	-	1
Stanislaus:	5	0	1	0	1	16-May-1938	-	1
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	0	3	0	3	N/A	4	3

Demographic and Population Trends: Total number of occurrences for this taxon were estimated by georeferencing available records in CCH (2018), and through personal communication with collectors when possible. *Cryptantha rostellata* is known from approximately 14 occurrences in California, 13 of which are historical, having not been documented in over 20 years. None of its 14 occurrences offer information related to population biology or demography (CCH 2018; Green et al. 2018). Very little can be adduced from available data; a better understanding of this species' populations will require fieldwork.

Life History: *Cryptantha rostellata* is an annual herb that blooms between April and June (Kelley et al. 2012). While the pollination biology of this species is unknown, other members of *Cryptantha* are visited by an array of Diptera, Hymenoptera, and Lepidoptera. Among the Diptera, Bombyliidae are most often observed; among the Hymenoptera, Andrenidae, Colletidae, Halictidae, and Megachilidae; and among the Lepidoptera, Hesperiidae, Lycaenidae, Nymphalidae, and Pieridae are prominent (CPC 2018).

Diversity: Boraginaceae has been subject to substantial taxonomic revision over the last decade or so, as molecular phylogenetic methods clarified relationships. One result has been the splitting of *Cryptantha* into five genera: *Eremocarya, Greeneocharis, Johnstonella, Oreocarya*, and the redefined *Cryptantha sensu stricto* (Hasenstab-Lehman and Simpson 2012). More recently, a genome-skimming approach revealed that even the redefined *Cryptantha s.s.* is polyphletic, comprising three well-supported groups, dubbed the *Johnstonella*/*Albidae*, *Maritimae*, and *Cryptantha* core clades. Collectively, these groups exhibit a distinctive amphitropical distribution, confined to the extratropical parts of North and South America. Their shared area of origin is somewhere in western North America, with at least four separate dispersal events accounting for the colonization of South America, coincident with the advent of mesic habitats associated with the Andean orogeny (Mabry and Simpson 2018).

Habitat: This species occurs in dry, rocky sites within chaparral and foothill woodland habitats, especially in open or disturbed areas. In California it is known from valley and foothill grasslands and cismontane woodlands, generally in gravelly openings and along roadsides, at an approximate elevation of 40 to 800 meters (CCH 2018; Kelley et al. 2012). *Cryptantha rostellata* is edaphically correlated to barren extrusive igneous substrates (Kelley, R. pers. comm. 2013). Potential associated species include *Quercus douglasii* and *Plagiobothrys* spp. (Nelson, J. K. pers. comm. 2018). There is limited evidence for tolerance of serpentine substrates (CCH 2018).

Habitat Status or Trend: *Cryptantha rostellata* occurs in dry woodlands across several bioregions; in all these areas, considerable anthropogenic impacts have occurred.

The North Coast Ranges and Sierra Nevada Foothills bioregions have been subject to both logging and fire abatement during the past century; large, fire-resistant trees were removed, while overall forest density increased as much as two-fold (Knapp et al. 2013). The result is a considerable reduction in forest gap size and frequency (Skinner 1995), as well as shading-out of understory shrubs and herbaceous taxa (Knapp et al. 2013). Given its affinity for open areas and chaparral, these trends have likely impacted *C. rostellata* populations. A similar history of fire suppression obtains in the greater Modoc bioregion (including the Warner Mountains and adjacent parts of the Columbia Plateau). This area was also subject to intense livestock grazing during the 19th and early 20th centuries, with pockets of overgrazing continuing to the present. Pronounced shifts in vegetation community membership and structure have ensued, with ramifying effects for native species like *C. rostellata* (Vale 1977). In the Sacramento Valley, meanwhile, agricultural land conversion is the main threat: 6,900 km^2 (15.1%) of the valley's land area underwent conversion between 1973 and 2010, mostly resulting from the removal of 22% of grassland/shrubland in favor of agriculture and development. One seventh of those losses occurred in the ten years between 2000 and 2010, during which time non-agricultural development increased by 9.3% (Soulard and Wilson 2015).

Throughout California, ongoing climate change will produce a longer fire season, while also increasing landscape productivity, augmenting already-high fuel loads (Lenihan et al. 2003).

Intense burns and short fire return intervals can have dramatic effects on plant community composition, potentially shifting ecosystems to alternative stable states (Callaway and Davis 1993; Zedler et al. 1983). It remains to be seen how these changes will impact *C. rostellata*.

Capacity for the Species to Disperse: Species in *Cryptantha* employ both wind- and animal-mediated dispersal mechanisms, sometimes moving substantial distances in a single generation. A recent phylogeographic analysis revealed that the genus has dispersed from North America to southern South America at least four times. The first of these events corresponds to the initial Andean uplift ~20Ma; subsequent arrivals date to ~6Ma and ~3Ma, and one species (*C. albida*) exhibits an amphitropical distribution, suggesting very recent dispersal. While the mechanism behind these events remains speculative, it is likely that the hispid calyces enclosing *Cryptantha* seeds facilitate long-distance phoretic transport by migrating birds (Mabry and Simpson 2018). The same mechanism probably operates at smaller geographic scales. In one species, *C. flava*, it has been shown that the retained hispid calyx also aids in wind dispersal, often transporting the seed 30m or more from the parent plant, and that pre-programed ovule abortion promotes wind dispersal by reducing diaspore mass (Casper 1987; Casper and Wiens 1981). The hispid calyx also protects against seed predation by rodents and ants, further improving the chances of successful germination and establishment (Casper 1987).

Threats: Specific conservation threats are not known for this taxon, but allied species occurring in similar areas face pressures from development, vehicle activity, and grazing. Across much of its range, competition from invasive plants may also be significant (CNPS 2018).

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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.