

Changed *B. rosea* to *B. rosea* subsp. *rosea* and from CRPR 1B.1 to 3.1, and added *B. rosea* subsp. *vallicola* to CRPR 4.2 in the CNPS Inventory on January 7, 2019

Rare Plant Status Review: *Brodiaea rosea* and *B. rosea* subsp. *vallicola*

Proposed Change of *B. rosea* from California Rare Plant Rank 1B.1, G2 / S2 to 3.1, G2Q / S2

Proposed Addition of *B. rosea* subsp. *vallicola* to California Rare Plant Rank 4.2, G5T3 / S3
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Brodiaea rosea

Background and Taxonomy

Brodiaea rosea (Greene) Baker is a perennial bulbiferous herb in the Themidaceae known from northern California. It is included in the *Jepson eFlora* (Pires and Preston 2012), the Themidaceae treatment in the *Flora of North America North of Mexico* is not yet published. *Brodiaea rosea* occurs in serpentine areas of closed-cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grassland at an approximate elevation of 335 to 1,450 meters and flowers between May and June. It has been included in the *CNPS Inventory* since the first edition (Powell 1974), and became state listed as Endangered in September of 1979 (CNPS 2018).

Brodiaea rosea was originally described as *Hookera rosea* in 1886. Ten years later, in 1896, it was placed in the genus *Brodiaea* and assigned the name that is in use today. This entity has also been treated as an infraspecific taxon within *B. coronaria*, assuming the names *B. coronaria* var. *rosea* (Greene) Hoover and *B. coronaria* subsp. *rosea* T.F. Niehaus (Pires and Preston 2012; Tropicos 2018). *Brodiaea rosea* (Greene) Baker encompasses the taxa *B. rosea* (Greene) Baker subsp. *rosea* and *B. rosea* subsp. *vallicola* R.E. Preston (Preston 2013).

These subspecies of *Brodiaea rosea* are the result of a morphometric analysis of *Brodiaea coronaria* and *B. rosea* by Preston (2013). Herbarium specimens of *B. coronaria* and *B. rosea* from 11 herbaria were examined to determine distribution and to select sampling localities, based on data provided on specimen labels. Fresh plant material was collected from 63 populations throughout the range of *B. coronaria* and five populations of *B. rosea*. Flowers from each population were dissected and various floral characteristics were measured. These measurements were analyzed using principal components analysis, cluster analysis, and discriminant analysis. The results of these analysis do not support previous monographs that distinguish *B. coronaria* and *B. rosea* by flower color or fidelity to serpentine substrates, but do support that qualitative and quantitative morphological characters provide a more useful diagnostic. This study suggests that certain populations previously assigned to *B. coronaria* are more similar to *B. rosea* and should be treated as such. It also suggests that two subspecies of *B. rosea* should be recognized, *B. rosea* subsp. *rosea* and *B. rosea* subsp. *vallicola*.

The nominotypical subspecies, *B. rosea* subsp. *rosea*, is represented by two population groups. One group is restricted to serpentine soils of the inner North Coast Range, southeastern Klamath Range, and southern Cascade Range (Preston 2013). These plants are found in Lake, Colusa, Tehama, Shasta, and Trinity counties. The second group is found on non-serpentine soils in southern Oregon and northeastern California, with disjunct populations in western Washington

and southwestern British Columbia. *Brodiaea rosea* subsp. *vallicola* is found in grasslands, often in association with vernal pools and swales, along the eastern Central Valley and Sierra Nevada Foothills from Butte County south to Calaveras County (Preston 2013).

Conservation status and rarity rankings for *B. rosea* are based on the patterns and trends associated with occurrences found strictly on serpentine substrates in Lake, Colusa, Tehama, Shasta, and Trinity counties (CNDDDB 2018). In light of biosystematic evidence, these serpentine occurrences lack measureable phenotypic differences with many non-serpentine occurrences of *B. coronaria*. The contemporary circumscription of *B. rosea* now accounts for non-serpentine plants with tapered and strongly inrolled staminodes, effectively extending the range of *B. rosea* north into British Columbia (Preston 2013). *Brodiaea rosea* is now considered more common than previously thought, and is currently recognized by two geographically and morphologically distinct subspecies. Evidence suggest that substrate specificity is no longer a defining characteristic of *B. rosea* (Preston 2013). However, according to Preston (pers. comm. 2015), there is still an underlying question that needs to be addressed: “Do the serpentine populations represent an evolutionary lineage, i.e., do they represent genetically distinct collection of populations, worthy of taxonomic status? ... [W]e also know of examples of other species that have ecotypes that are not morphologically distinct, but are genetically and physiologically distinct enough to be recognized as infraspecific taxa. This is a question that could probably be addressed for *B. rosea* through genetic study.” Until this underlying question is addressed, Preston (pers. comm. 2014, 2015) recommends changing *B. rosea* from CRPR 1B.1 to CRPR 3 instead of treating it as *B. rosea* subsp. *rosea* and thereby removing it from the CNPS Inventory as being too common.

Summary

Based on the available information, CNPS and CNDDDB recommend changing *Brodiaea rosea* from California Rare Plant Rank 1B.1 to California Rare Plant Rank 3.1 of the CNPS Inventory. If knowledge on the distribution, threats, and rarity status of *B. rosea* changes in the future, we will re-evaluate its status at that time.

Brodiaea rosea* subsp. *vallicola

Background and Taxonomy

Brodiaea rosea (Greene) Baker subsp. *vallicola* R. E. Preston is a perennial herb in the Themidaceae known from the eastern edge of the Sacramento and San Joaquin Valleys and adjacent Sierra Nevada foothills. It is not included in the *Jepson eFlora* (Pires and Preston 2012). The *Flora of North America North of Mexico* treatment of Themidaceae is not yet been published. *Brodiaea rosea* subsp. *vallicola* was originally described in 2013 by Robert Preston as part of a study on *Brodiaea coronaria*. It is similar to *B. coronaria* and *B. elegans*, and is differentiated in having staminodes that are white or violet-tinged towards the base, strongly inrolled, and tapering to the apex vs. staminodes that are white, flat to incurved, and uniformly wide from base to obtuse apex in *B. coronaria* and *B. elegans*. *Brodiaea rosea* subsp. *vallicola* is differentiated from *B. rosea* subsp. *rosea* in having a dark violet perianth (vs. pink, pale violet or dark violet), tube greater than 11 mm (vs. less than 10 mm), lobes greater or equal to 19 mm (vs. less than 19 mm), style greater than 8 mm (vs. less than or equal to 7 mm), staminodes recurving near tips as flower ages and less than or equal to 1.5 mm longer than stamens (vs. staminodes recurving above the middle as flower ages and greater than or equal to 3 mm longer than stamens), and in being found on old alluvial soils along the eastern edge of the Great Valley and norther and central Sierra Nevada foothills (vs. serpentinic soils [Interior North Coast Ranges

and southeastern Klamath Ranges] or volcanic soils [Cascade Range and Modoc Plateau] for *B. rosea* subsp. *rosea*) (Preston 2013). The specific epithet *vallicola* is Latin for “of the valley” and refers to its distribution along the eastern edge of the Central Valley (Preston 2013).

Ecology

Brodiaea rosea subsp. *vallicola* occurs in valley and foothill grasslands that are interspersed with vernal pools and swales. It generally grows on old alluvial terraces, in alfisols with a duripan and/or a clay-rich subhorizon, and soils are typically loamy, including silt, sandy, and gravelly loams. Some older specimen labels noted that plants occurred in clay banks or desiccating clays, but soils where subsp. *vallicola* occur are saturated during the winter months due to the presence of a perched water table, and not because they are clays. *Brodiaea rosea* subsp. *vallicola* grows at an approximate elevation of 10 to 335 meters, and is known to bloom from April to May, and rarely into June (Preston 2013).

Species associated with *B. rosea* subsp. *vallicola* include *Bromus hordeaceus*, *Festuca perennis*, *F. bromoides*, *F. myuros*, *Hordeum marinum* subsp. *gussoneanum*, *Elymus caput-medusae*, *Aira caryophylla*, *Leontodon saxatilis*, *Hypochaeris glabra*, *Erodium botrys*, *Trifolium hirtum*, *Holocarpha virgata*, *Plagiobothrys fulvus*, *Navarretia tagetina*, *Triteleia hyacinthina*, and *Dichelostemma multiflorum*. It usually grows sympatrically or parapatrically with one or more other *Brodiaea* species, including *B. appendiculata*, *B. coronaria*, *B. elegans*, *B. minor*, and *B. nana* (Preston 2013).

Distribution and Abundance

Brodiaea rosea subsp. *vallicola* is currently known from approximately 41 occurrences in eastern Sacramento Valley and north eastern San Joaquin Valley. Of the 41 occurrences, 18 (18/41, ~44%) are considered historical (occurrences not seen in over 20 years are considered historical by CNDDDB). Two occurrences are located in Phoenix Park, one is located in Prairie City State Vehicular Recreation Area, one is located in the Folsom Lake State Recreation Area, one is located on the Mather Air Force Base, and the remaining 36 occurrences are located on land of unknown ownership.

Status and Threats

Urbanization is the most obvious threat to *B. rosea* subsp. *vallicola*, as the eastern part of the Sacramento and northern San Joaquin Valleys are developing rapidly. More information on all of its occurrences is needed in order to determine additional immediate and possible threats to *B. rosea* subsp. *vallicola*. According to Preston (2013), at least three historical populations are likely extirpated from urbanization. Although it encompasses a relatively broad range (230 km) throughout the length of the Sacramento Valley and north end of San Joaquin Valley, and is locally common where present, Preston (2013) notes that it should be considered a “watchlist” plant because it occurs in a very narrow elevation band within an area that is experiencing substantial population growth.

Summary

Based on the available information, CNPS and CNDDDB recommend adding *Brodiaea rosea* subsp. *vallicola* to California Rare Plant Rank 4.2 of the CNPS Inventory. If knowledge on the distribution, threats, and rarity status of *B. rosea* subsp. *vallicola* changes in the future, we will re-evaluate its status at that time.

Recommended Actions

CNPS: Change *Brodiaea rosea* from CRPR 1B.1 to CRPR 3.1; add *Brodiaea rosea* subsp. *vallicola* to CRPR 4.2

CNDDDB: Change *Brodiaea rosea* from G2 / S2 to G2Q / S2; add *Brodiaea rosea* subsp. *vallicola* to G5T3 / S3

Current CNPS Inventory Record – *Brodiaea rosea*

Brodiaea rosea (Greene) Baker

Indian Valley brodiaea

Themidaceae

CRPR 1B.1

Colusa, Glenn, Lake, Shasta, Tehama, Trinity

Whispering Pines (533C) 3812276, Leesville (547B) 3912224, Wilbur Springs (547C) 3912214, Hough Springs (548A) 3912225, Clearlake Oaks (548C) 3912216, Stonyford (564A) 3912245, Gilmore Peak (564D) 3912235, Riley Ridge (596B) 3912286, Hall Ridge (596C) 3912276, Trinity Dam (667D) 4012277, Chicken Hawk Hill (682C) 4112214

Closed-cone coniferous forest, chaparral, cismontane woodland, valley and foothill grassland / serpentinite; elevation 335-1450 meters.

Perennial bulbiferous herb. Blooms May to June.

Threatened by vehicles, dumping, and horticultural collecting. See *Bulletin of the California Academy of Sciences* 2:137 (1886) for original description, and *American Midland Naturalist* 22:560-561 (1939) for revised nomenclature.

Revised CNPS Inventory Record - *Brodiaea rosea*

Brodiaea rosea (Greene) Baker

Indian Valley brodiaea

Themidaceae

CRPR 3.1

Colusa, Glenn, Lake, Shasta, Tehama, Trinity

Whispering Pines (533C) 3812276, Leesville (547B) 3912224, Wilbur Springs (547C) 3912214, Hough Springs (548A) 3912225, Clearlake Oaks (548C) 3912216, Stonyford (564A) 3912245, Gilmore Peak (564D) 3912235, Riley Ridge (596B) 3912286, Hall Ridge (596C) 3912276, Trinity Dam (667D) 4012277, Chicken Hawk Hill (682C) 4112214

Closed-cone coniferous forest, chaparral, cismontane woodland, valley and foothill grassland / serpentinite; elevation 335-1450 meters.

Perennial bulbiferous herb. Blooms May to June.

Changed from 1B.1 to 3.1 on [YEAR-MM-DD]

Recircumscribed as *B. rosea* ssp. *rosea*; principal components, cluster, and discriminant analyses clearly demonstrate the existence of two morphologically diagnostic taxonomic groups within *B. rosea*, but do not support recognition of serpentine endemic and non-serpentine taxa. Violet-flowered populations with strongly inrolled staminodes, previously assigned to *B. coronaria*, are morphologically more similar to *B. rosea*, thereby greatly increasing its distribution to volcanic, non-serpentine, occurrences in northeastern CA, and north to British Columbia. Treated here as a serpentine ecotype from Interior North Coast and southeastern Klamath Ranges; further genetic and molecular data are needed to assess whether serpentine populations of *B. rosea* represent a morphologically-cryptic ecotype that is worthy of taxonomic status. Threatened by vehicles, dumping, and horticultural collecting. See *Bulletin of the California Academy of Sciences* 2:137 (1886) for original description, *American Midland Naturalist* 22:560-561 (1939) for revised

nomenclature, and *Systematic Botany* 38(4): 1012-1028 (2013) for alternative, revised circumscription.

Draft CNPS Inventory Record - *Brodiaea rosea* subsp. *vallicola*

Brodiaea rosea (Greene) Baker subsp. *vallicola* R.E. Preston

valley brodiaea

Themidaceae

CRPR 4.2

Butte, Calaveras, Nevada, Placer, Sacramento, San Joaquin, Sutter, Yuba

Salt Spring Valley (476C) 3812016, Wallace (477B) 3812028, Valley Springs Sw (477C)

3812018, Jenny Lind (477D) 3812017, Clements (478A) 3812121, Carbondale (495A) 3812141,

Sloughhouse (495B) 3812142, Goose Creek (495D) 3812131, Folsom (511B) 3812162, Buffalo

Creek (511C) 3812152, Citrus Heights (512A) 3812163, Rio Linda (512B) 3812164, Sacramento

East (512C) 3812154, Carmichael (512D) 3812153, Lincoln (528A) 3812183, Pleasant Grove

(528C) 3812174, Roseville (528D) 3812173, Smartville (543A) 3912123, Camp Far West

(543D) 3912113, Honcut (560D) 3912135, Cherokee (576A) 3912165, Hamlin Canyon (576B)

3912166, Shippee (576C) 3912156, Chico (577A) 3912167, Nord (593C) 3912178

Valley and foothill grassland (swales), vernal pools / old alluvial terraces; silty, sandy, and gravelly loam; elevation 10-335 meters.

Perennial bulbiferous herb. Blooms April to May (June).

Threatened by urbanization. Previously assigned to *B. coronaria*; differentiated by staminodes strongly inrolled, tapering to an apex vs. staminodes flat to incurved, uniformly wide from base to obtuse apex in *B. coronaria*. Similar to *B. rosea* ssp. *rosea*, but with perianth always violet, most floral characters longer, and with a disjunct distribution in non-serpentine habitats along the eastern edge of the Great Valley. See *Systematic Botany* 38(4): 1012-1028 (2013) for original description.

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