

**Changed from California Rare Plant Rank 3 to 1B.2 in the CNPS Inventory on
September 17, 2013**

Rare Plant Status Review: *Brodiaea santarosae*

Proposed Change from California Rare Plant Rank 3, G1Q / S1.3 to 1B.2, G2 / S2

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Background

Brodiaea santarosae is a perennial bulbiferous herb in the Themidaceae that has been included on California Rare Plant Rank (CRPR) 3 of the CNPS Inventory since 2008. It was first proposed for addition to CRPR 1B, but comments from several reviewers (S. Boyd, G. Wallace, M. Elvin, and D. Bramlet) suggested that *B. santarosae* plants may actually be hybrids between *B. filifolia* (currently CRPR 1B.1, State-Endangered, and Federally-Threatened) and *B. orcuttii* (CRPR 1B.1), so it was added to CRPR 3 instead. Subsequent research and analysis suggests that *B. santarosae* likely does merit taxonomic recognition as a species, so CNPS and CNDDDB are now proposing to change its rank to 1B.2.

Brodiaea santarosae is included in *The Jepson Manual, Second Edition (TJM 2;* available online at http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=85321); it was first described by Chester et al. in 2007, so it was not included in *The Jepson Manual (TJM 1993)*. The Themidaceae treatment for the *Flora of North America* is not yet available. *Brodiaea santarosae* is nearly endemic to the basalt soils of the Santa Rosa Plateau, and it occurs between the ranges of *B. filifolia* and *B. orcuttii*; *Brodiaea terrestris* ssp. *kernensis* also occurs in this region (Chester et al. 2007a). *Brodiaea santarosae* differs from *B. filifolia* and *B. orcuttii* in several morphological features: 1) it has markedly larger flowers and longer floral parts (including tepals, anthers, ovaries, and styles). Most of these characters showed minimal overlap among taxa, and there was no overlap in anther length between *B. santarosae* and the other taxa. 2) *Brodiaea santarosae* has longer inflorescence bracts, pedicles, and peduncles (Chester et al. 2007). The difference in peduncle length, however, may result from habitat, as *B. santarosae* must compete more heavily with tall non-native grasses than the other taxa. Habitat differences also separate the taxa, as *B. santarosae* grows on basalt soils in a variety of moisture regimes, while *B. filifolia* and *B. orcuttii* are confined to moist areas and generally do not grow on basalt (Chester et al. 2007a, 2007b).

Despite these differences, several reviewers felt that *B. santarosae* may not be a valid species, but instead may constitute a hybrid swarm between *B. filifolia* and *B. orcuttii*. Boyd et al. (1995) observed considerable morphological variation in the staminodes and staminal filaments of the *Brodiaea* spp. of the Santa Rosa Plateau. However, *B. santarosae* is unique in that it produces different types of flowers on the same plant: about 10% of the flowers in a population of *B. santarosae* have flowers that lack staminodes, a trait that had been previously attributed to *B. orcuttii* (TJM 2; Chester et al. 2007a, 2007b; R. Preston pers. comm. 2012). It was also thought that the larger floral parts of *B. santarosae* could result from a change in ploidy level as a result of

hybridization, explaining why *B. santarosae* flowers are not intermediate between the two putative hybrid parents (M. Elvin pers. comm. 2008). However, tentative counts of the chromosomes of *B. santarosae* indicate a diploid chromosome number in the low 20s, similar to the diploid chromosome number of 24 that is found in *B. filifolia* and *B. orcuttii* (R. Preston pers. comm. 2012; Armstrong 2012). A few fertile *B. filifolia* x *orcuttii* hybrids have been observed where the two parents co-occur near San Marcos, but their floral parts are intermediate between the parents, unlike the flowers found in *B. santarosae* (Armstrong 2012; Chester et al. 2007a). Chester (pers. comm. 2013) also discovered occurrences of hybrids between *B. santarosae* and *B. terrestris* ssp. *kernensis* in the vicinity of Via Volcano Rd. (near *B. santarosae* EO #1). Both parent taxa are known to occur here, and the hybrids are intermediate between their parent taxa. Similarly, Niehaus (1971) documented natural hybrids of *B. elegans* x *pallida*, which were intermediate in morphology between the two parents (R. Preston pers. comm. 2012). Preston (pers. comm. 2012) is currently investigating other instances of hybrid swarms in the genus *Brodiaea*, but in each of these cases, the parent taxa co-occur at the site and the putative hybrid offspring are morphologically intermediate between the parents.

Pires (University of Missouri) has begun molecular investigations to test for the origin of *B. santarosae*, whether it be through hybridization of, or through shared ancestry with *B. filifolia* and *B. orcuttii* (R. Preston pers. comm. 2012). Preliminary data from chloroplast DNA suggest that the three are likely sister taxa, but a hybrid origin of *B. santarosae* would not rule out the possibility that it is now a stabilized species (R. Preston pers. comm. 2012).

The recognition of *B. santarosae* has important management implications for *B. filifolia* and *B. orcuttii*, as some of the *B. santarosae* occurrences are currently attributed to these taxa (Chester et al. 2007a). *Brodiaea filifolia* was listed as Federally-Threatened and not Federally-Endangered because of the protection afforded to the plants on the Santa Rosa Plateau (F. Roberts pers. comm. 2008). Now, a greater percentage of the *B. filifolia* occurrences are known from private land, where successful management will be more challenging. There are currently approximately 16 known occurrences of *B. santarosae*. These include eight occurrences currently attributed to *B. filifolia* (EO #s 3, 5, 29, 37, 38, 39, 52, 101) and eleven occurrences currently attributed to *B. orcuttii* (EO #s 7, 8, 10, 11, 12, 93, 111, 135, 136, 137, 138) in the CNDDDB (2013). *Brodiaea filifolia* is still known from the Santa Rosa Plateau: *B. filifolia* EO #5 still includes some areas with *B. filifolia* mixed with *B. santarosae*, while EO #s 30 and 115 are maintained as *B. filifolia* (T. Chester pers. comm. 2013; CNDDDB 2013). Two records of *B. orcuttii* (EO #s 7 and 11) are based on old survey data in the vicinity of other *B. santarosae* occurrences. Given that *B. orcuttii* does not otherwise occur in this area, we propose to tentatively include them as *B. santarosae* until their identities can be later verified.

The majority of known occurrences of *B. santarosae* are found on protected lands within the Santa Rosa Plateau, and few threats to them have been documented. Seven occurrences are found on the Santa Rosa Plateau Ecological Reserve (on properties owned by the California Department of Fish and Wildlife as well as the Nature

Conservancy), five occurrences are found in the San Mateo Canyon Wilderness (owned by the U.S. Forest Service), and three occurrences are on lands with unknown or private landowners. We obtained information on threats to some of these populations based on current records of *B. filifolia* and *B. orcuttii* in the CNDDDB. Development was noted as a possible threat to three occurrences, while exotic weeds, mining claims, grazing, and ORV use were each listed as a possible threat to one occurrence. Nine of the fourteen occurrences, however, have no documented threats in the CNDDDB (2013).

Based on the available information, CNPS and CNDDDB recommend re-ranking *Brodiaea santarosae* from CRPR 3 to 1B.2. If more information on this plant becomes available in the future, CNPS and CNDDDB will re-evaluate its status at that time.

Recommended Actions

CNPS: Re-rank from 3 to 1B.2

CNDDDB: Re-Rank from G1Q / S1.3 to G2 / S2

Current CNPS Inventory Record

Brodiaea santarosae T. Chester, W. Armstrong, & K. Madore

Santa Rosa Basalt brodiaea

Themidaceae

CRPR 3

Riverside, San Diego

Fallbrook (051A) 33117D3, Margarita Peak (051B) 33117D4, Murrieta (068C) 33117E2, Sifton Peak (069C) 33117E4, Wildomar (069D) 33117E3

Valley and foothill grassland (basaltic); elevation 585 – 1045 meters.

Perennial bulbiferous herb. Blooms May to June.

Known from fewer than 10 occurrences. Not in *The Jepson Manual* (1993). Needs further study. Plants are possibly hybrids between *B. filifolia* and *B. orcuttii*. See *Madroño* 54(2): 187-198 (2007) for original description.

(available online at: <http://www.rareplants.cnps.org/detail/3295.html>)

Revised CNPS Inventory Record

Brodiaea santarosae T. Chester, W. Armstrong, & K. Madore

Santa Rosa Basalt brodiaea

Themidaceae

CRPR 1B.2

Riverside, San Diego

Fallbrook (051A) 33117D3, Margarita Peak (051B) 33117D4, Murrieta (068C) 33117E2, Wildomar (069D) 33117E3

Valley and foothill grassland (basaltic); elevation 565 – 1045 meters.

Perennial bulbiferous herb. Blooms May to June.

Previously CRPR 3; plants were known as possible hybrids between *B. filifolia* and *B. orcuttii*, but are now recognized as distinct. Research into the evolutionary origin of *B. santarosae* is currently underway. Possibly threatened by development. Forms sterile

hybrids with *B. terrestris* ssp. *kernensis*. Not in *TJM* (1993). See *Madroño* 54(2):187-198 (2007) for original description.

Literature Cited

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