

2013

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R. K. Brummitt

*Royal Botanic Gardens, Kew, UK*

Sandra M. Namoff

*Rancho Santa Ana Botanic Garden, Claremont, California*

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### Recommended Citation

Brummitt, R. K. and Namoff, Sandra M. (2013) "Calystegia vanzuukiae (Convolvulaceae), a Remarkable New Species From Central California," *Aliso: A Journal of Systematic and Floristic Botany*. Vol. 31: Iss. 1, Article 3.

Available at: <https://scholarship.claremont.edu/aliso/vol31/iss1/3>

CALYSTEGIA VANZUUKIAE (CONVOLVULACEAE), A REMARKABLE NEW SPECIES FROM  
CENTRAL CALIFORNIA

R. K. BRUMMITT<sup>1</sup> AND SANDRA M. NAMOFF<sup>2</sup>

<sup>1</sup>The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK;

<sup>2</sup>Rancho Santa Ana Botanic Garden, 1500 North College Avenue, Claremont, California 91711  
([snamoff@rsabg.org](mailto:snamoff@rsabg.org))

ABSTRACT

A new species is described as *Calystegia vanzuukiae* (Convolvulaceae) from Placer and Eldorado Counties of central California. The species occurs in the western Sierra Nevada in chaparral mixed conifer forests on serpentine and gabbro soils. Gross morphological similarity to *C. occidentalis* suggests that these species may be sister taxa. While leaf morphology differs, habit and ecology are similar for the new taxon and *C. stebbinsii*. Possible evolutionary relationships to *C. stebbinsii* are also considered.

Key words: California, edaphic, endemic, Convolvulaceae, new species, Sierra Nevada.

In 1971 a specimen of a *Calystegia* R.Br. (Convolvulaceae) from Eldorado County in the Sierra Nevada foothills of central California was sent by Professor G. L. Stebbins to the first author (R.B.) with a request for identification. In having leaves and bracteoles deeply pedately divided into linear lobes, it immediately stood out as being probably the most unusual, unexpected and easily recognizable species of the genus, and was described as *Calystegia stebbinsii* (Brummitt 1974). The species has since been recorded also from the neighboring Nevada County, and has recently been the subject of extensive field studies by the second author (S.N.).

In 2010, another remarkable specimen of the genus, from Placer County in the same area of California, was sent by Ms. Kathy Van Zuuk of the USDA Forest Service, Tahoe National Forest, to R.B. with a request for identification. In its habit and narrowly lobed leaves it resembles *C. stebbinsii*, but in its hastate (rather than pedately divided) leaves and bracteoles it is easily distinguished from that species. In June 2012 the authors, accompanied by Barbara Ertter, visited Ms. Van Zuuk to see the plant in the field, and were shown five populations, all within a few miles of Foresthill in Placer County. Four unidentified earlier specimens were also found in the herbaria at Davis (DAV) and the California Department of Agriculture (CDA). Three of these were from Placer County; the last specimen was from Eldorado County. All populations were morphologically very uniform and appeared to represent a new taxon. Notably, all populations observed in the field have bracteoles that vary from simple to toothed on the same individual, which is not observed in any other taxa in the genus. The status and taxonomic position of the plants are not immediately obvious.

Bearing in mind the similarity to *C. stebbinsii* and the close geographical proximity to it, we first considered recognizing it at infraspecific level (subspecies or variety). In Fig. 1, collection locations of *C. stebbinsii* obtained from the California Consortium of Herbaria (CCH) and the California Natural Diversity Database (CNDDDB) are marked by triangles, and collections of the new plant are indicated with stars. The closest populations are 37 km from each other. Although these populations are relatively close geographically, the new taxon (Fig. 2–5) is readily distinguishable from *C. stebbinsii* (Fig. 6) through its leaf and bracteole shape. The two

taxa can be distinguished at a glance, and no intermediates were seen. Indeed, it is more easily separated from *C. stebbinsii* than it is from *C. occidentalis* (A.Gray) Brummitt, which occurs commonly in the same area.

*Calystegia occidentalis* is a relatively widespread species that is notoriously variable in habit and leaf shape. Currently two subspecies are recognized: subsp. *occidentalis* has entire bracteoles (Fig. 7), while subsp. *fulcrata* (A.Gray) Brummitt has lobed or toothed bracteoles. *Calystegia occidentalis* subsp. *occidentalis* extends from Calaveras County north into Oregon, and *C. occidentalis* subsp. *fulcrata* extends from Calaveras County south to San Diego County. Figure 1 shows all known collection sites of the new taxon relative to *Calystegia occidentalis* databased in the CCH. The Placer County plants generally have toothed bracteoles like *C. occidentalis* subsp. *fulcrata*, but occur 120 km north of the nearest localities of *C. occidentalis* subsp. *fulcrata*. Although in the north of its range *C. occidentalis* may have rather narrow leaves, they are never as extreme as the plants from Placer County. We encountered *C. occidentalis* subsp. *occidentalis* fairly close (within 0.5 km) to a population of the unidentified taxon, and it there has broad leaves (Fig. 7). Morphological and geographic evidence suggests that it would be inappropriate to include the new taxon in *C. occidentalis*.

Could the new discovery be a hybrid between *C. occidentalis* and *C. stebbinsii*? The populations we have seen were all very uniform, and there is no hint of the very deeply divided leaves and bracteoles of *C. stebbinsii*. Both of these taxa occur on outcrops of serpentine or gabbro soils, a habitat well known for local endemic taxa in this genus and in other genera. The new taxon and *C. stebbinsii* could both have arisen similarly in the same area. Preliminary molecular evidence based on independent nuclear and chloroplast phylogenetic analyses are consistent with a hybrid origin of the new taxon (S. Namoff, unpubl. data): in the chloroplast reconstruction the new taxon forms a well supported clade with *C. stebbinsii*. In the nuclear gene-based reconstruction the new taxon forms a well supported clade with *C. occidentalis*. This phylogenetic pattern is consistent with a hybrid origin of the new taxon. Complete population-level sampling will be necessary to conclusively assess hybrid origin of the taxon. Furthermore, if

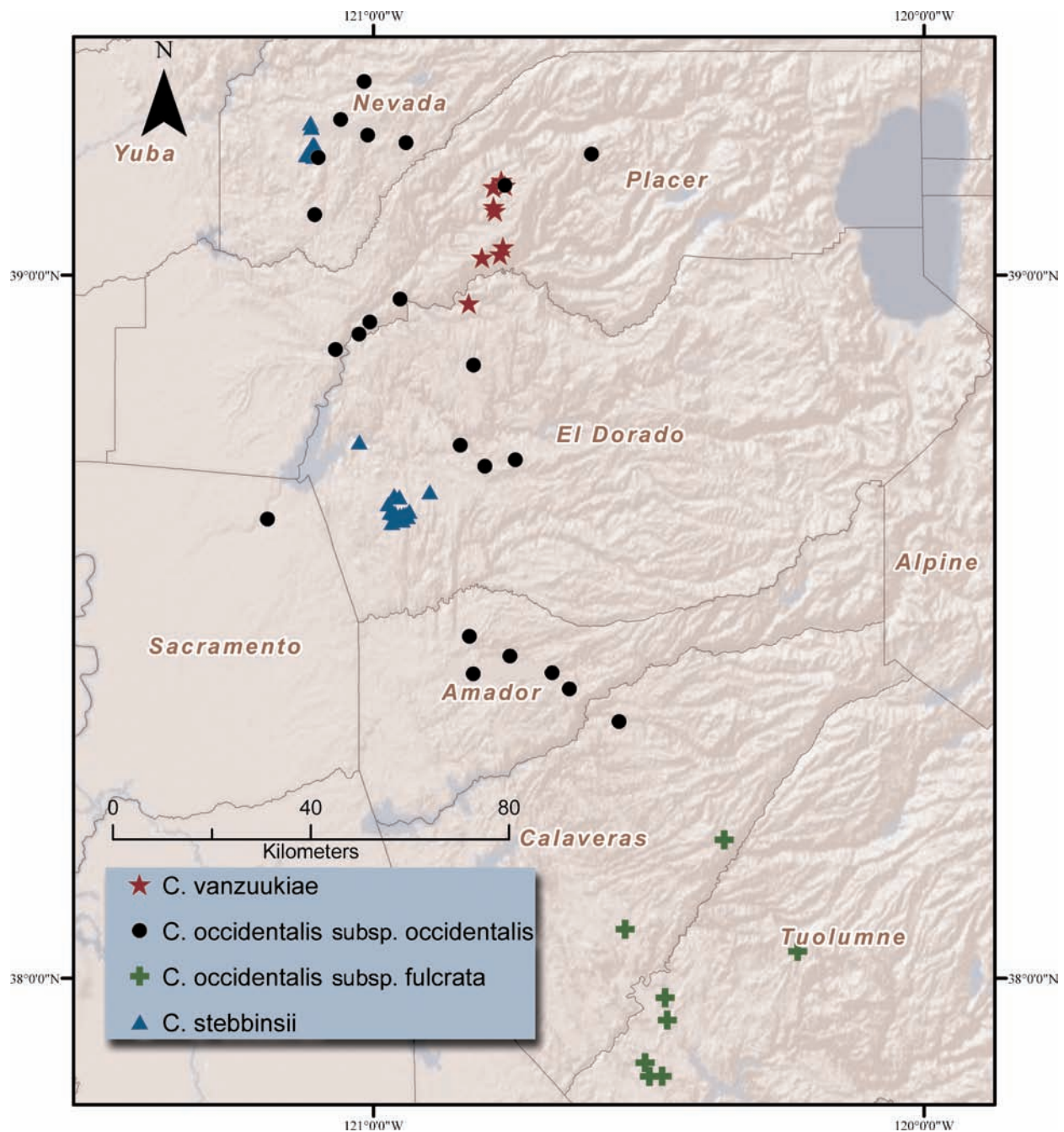


Fig. 1. Distribution of *C. vanzuukiae* and geographically proximal putative relatives. *C. occidentalis* subsp. *occidentalis*, represented by circles, extends north into Oregon, and subsp. *fulcrata*, represented by crosses, extends south to San Diego County. All known occurrences of *C. vanzuukiae* are marked by stars. *Calystegia occidentalis* subsp. *fulcrata* is morphologically similar to *C. vanzuukiae* but is geographically removed from all known populations of *C. vanzuukiae*. All waypoints were field collected or are based on CCH and CNDDDB records. Map created in ArcGIS 10. ESRI Redlands, CA: Environmental Systems Research Institute.

the taxon is of hybrid origin, it will be relevant to determine whether it is a homoploid or a polyploid hybrid. A decision is required for the imminent account of the genus in the *Flora of North America* (Flora of North America Editorial Committee 1993+). We prefer to treat the newly discovered taxon as a new local endemic species, closely paralleling *C. stebbinsii*. We are naming it in honor of Ms. Van Zuuk who has drawn attention to it and very kindly assisted us in our investigation in the field.

***Calystegia vanzuukiae*** Brummitt & Namoff, sp. nov.—TYPE: USA. California, Placer County: Tahoe National Forest (Township 14N, Range 11E, Sect 20/29), 3 mi NE of Foresthill, on Western States Trail 1 mi from Michigan Bluff Road, 39.0394N, 120.7644W, mixed chaparral conifer open woodland on serpentine and gabbro soil, alt. 1091 m, 12 Jun 2012, R.K. Brummitt, S.M. Namoff, K. Van Zuuk & B. Ertter 22047 (holotype RSA; isotypes BM, CAS, CHSC, DAV, E, K, MO, NY, UC, US).

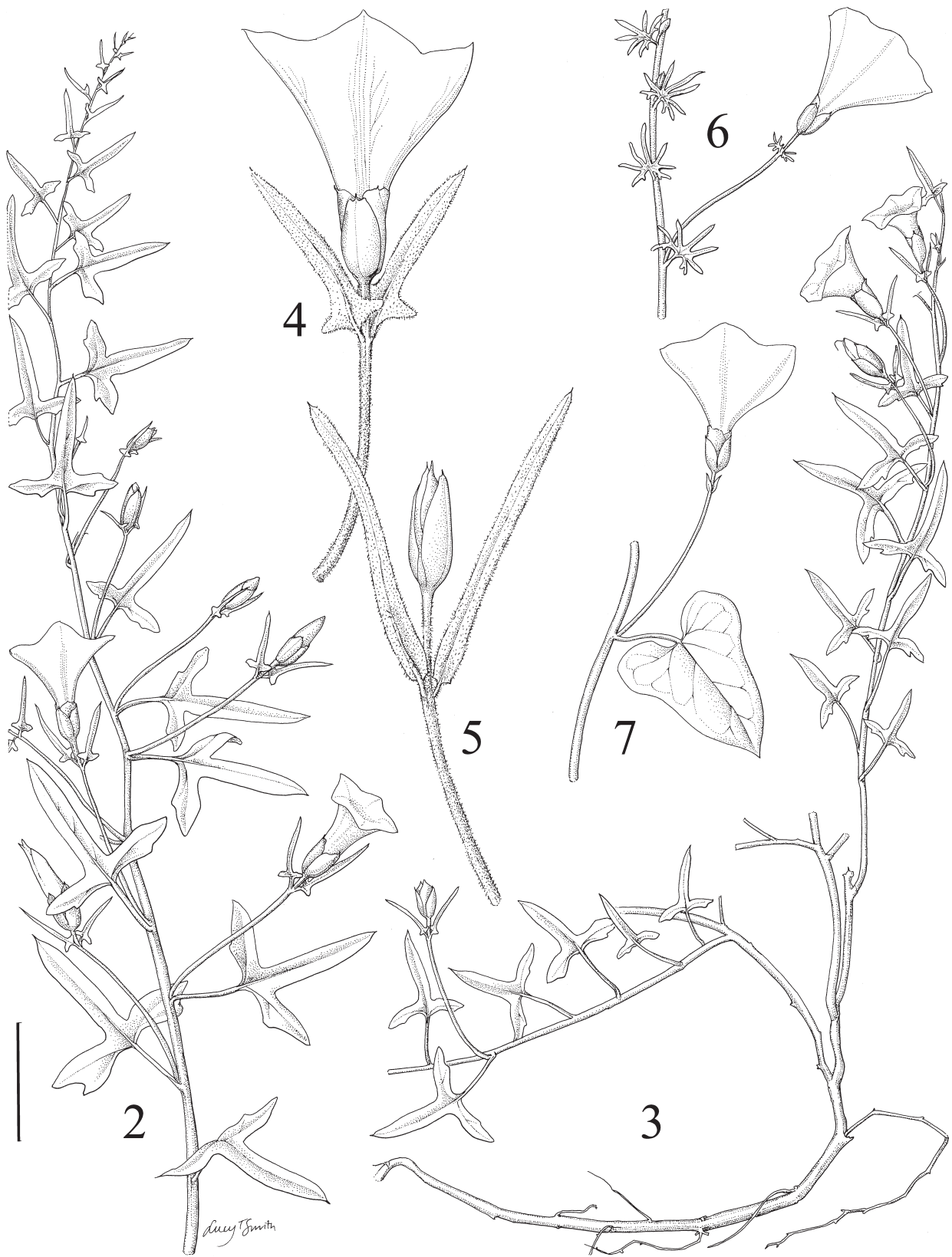


Fig. 2–7. Comparative illustrations of *C. vanzuukiae* and putative relatives.—2. Habit of *C. vanzuukiae* showing inflorescences on solitary peduncles, equalling to slightly exceeding the subtending leaf, each peduncle bearing one to three flowers.—3. Habit of *C. vanzuukiae* showing slightly woody rhizome.—4–5. Variation in bracteole morphology in *C. vanzuukiae*.—6. Leaf, bracteoles, and flower of *C. stebbinsii*.—7. Leaf, bracteoles, and flower of *C. occidentalis* subsp. *occidentalis* from populations adjacent to *C. vanzuukiae*. Magnifications: for Fig. 2–5, scale bar = 2.5 cm; for Fig. 6 and 7, scale bar = 1 cm. Drawn from: Fig. 2–5, R.K. Brummitt et al. 22047 (type collection); Fig. 6, R.K. Brummitt et al. 22055; Fig. 7, R.K. Brummitt et al. 22054; all specimens at Kew. Line drawings by Lucy Smith.

Rhizomatous perennial herb, the rhizomes dark and often woody. Aerial stems herbaceous, mostly 40–100 cm long, trailing to weakly climbing at their tip, finely pubescent with short, appressed to crisped or slightly ascending hairs. Leaves: petiole 0.5–2.5 cm; lamina dagger-shaped, the surface minutely pubescent with appressed to crisped hairs; central lamina linear-triangular or linear-oblong to linear-elliptic or linear, usually 4–8 times as long as broad,  $2-4 \times (1-2-7(-9))$  mm or the small upper leaves more or less linear, acute at the apex, cuneate at the base; basal lobes spreading at (45–)70–100 degrees from the midrib, oblong to obtriangular to more or less linear, entire to usually deeply bifid or 2-lobed, the lobes usually unequal (proximal one the smaller). Inflorescences on solitary peduncles up to 7.7 cm long and subglabrous to minutely pubescent, equalling to slightly exceeding the subtending leaf, each peduncle bearing 1–3 flowers. Primary bracteoles more or less linear and characteristically either entire or hastately lobed even on the same plant, more or less mimicking the leaves in shape, inserted 1–2 mm below the calyx but not concealing it,  $5-16(-20) \times 0.5-1.5$  mm, sometimes with secondary bracteoles and flowers in their axils. Sepals 9–11  $\times$  4–6 mm, broadly ovate to broadly elliptic, obtuse-apiculate at apex, scarios, glabrous or with few appressed hairs. Corolla 27–36 mm, white.

*Distribution.*—California, known only from Placer and Eldorado Counties (Fig. 1); in open mixed, usually coniferous, woodland, usually (or exclusively) on serpentine or gabbro soils.

*Other specimens seen.*—USA. California, Placer County: 20 mi out of Auburn along Foresthill Road, E-facing slope, chaparral with *Ceanothus* and *Adenostoma*, 39.024907N, 120.80311W, alt. 1036 m, 20 May 1989, *D.L. Pflieger 4* (DAV); Hughes Mill, along Finning Mill Road, approx. 3 mi N of Foresthill Road, approx. 3 mi E of Foresthill, serpentine open forest, bogs, flats, and slopes, area disturbed, alt. 1067 m, 22 May 2002, 39.0967E, 120.7819W, *M.I. Wibawa et al. 243* (CDA); Finning Mill Road, 1 mi to Hughes Mill, road side, 12 Aug 2010, 39.0908W, 120.7791N, *D. Wood s.n.* (CDA); Tahoe National Forest (Township 14N, Range 11E, Sect. 20/29), 2.5 mi NE of Foresthill, on Western States Trail 2.3 mi from

Michigan Bluff Road, 39.0296N, 120.7707W, alt. 1042 m, mixed conifer open woodland on serpentine and gabbro soil, 12 Jun 2012, *R.K. Brummitt et al. 22048* (K, RSA); Tahoe National Forest (Township 15N, Range 11E, Sect. 20), 8.2 mi NE of Foresthill, on Sugar Pine Road 4.4 mi from Foresthill Road, 39.1335N, 120.7679W, alt. 1170 m, mixed conifer open woodland, on serpentine soil, 12 Jun 2012, *R.K. Brummitt et al. 22051* (CAS, DAV, K, MO, NY, RSA, UC, US); Tahoe National Forest (Dutch Flat Quadrangle, Township 15N; Range 11E, Sect. 20), 7.9 mi NE of Foresthill, on Sugar Pine Road 3.6 mi from Foresthill Road, directly opposite Parker Flat OHV staging area, 39.1268N, 120.7611W, alt. 1181 m, mixed conifer open woodland, serpentine influence, 12 Jun 2012, *R.K. Brummitt et al. 22052* (K, RSA, UC); Tahoe National Forest (Dutch Flat Quadrangle, Township 15N, Range 11E, Sect. 30), Finning Mill Road 5.6 miles from Foresthill Road, 39.1245N, 120.7825W, alt. 1098 m, serpentine outcrop, 12 Jun 2012, *R.K. Brummitt et al. 22053* (DAV, K, RSA, UC). El Dorado County: Otter Creek, 21 May 1939, *R.A. Pendleton s.n.* (DAV).

#### ACKNOWLEDGMENTS

We are grateful to Lucy Smith (Kew) for preparing the illustration. We would also like to thank Kathy Van Zuuk for encouraging our interest in this species and for very kindly showing it to us in the field. Additionally we would like to thank Barbara Ertter, Beth Brenneman, Julie Wynia, Jeremiah Karuzas, and the California Native Plant Society Red Bud Chapter.

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