

Deleted from CNPS Inventory on January 3, 2013

Rare Plant Status Review: *Camissonia tanacetifolia* ssp. *quadriperforata*
Proposed Rank Change ~~Deletion~~ from Rank 4.3, G5T3 / S3 to Rank 3.3, G5T3Q / S3
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 November 28, 2012

Changes made to the original document appear in blue text.

Background

Camissonia tanacetifolia ssp. *quadriperforata* is a Rank 4.3 plant in the Onagraceae family that has been included in the CNPS Inventory since 1980 (2nd Edition). It was included in *The Jepson Manual* (TJM 1993), but in *The Jepson Manual, Second Edition* (TJM 2), the species was treated as *Taraxia tanacetifolia* and the subspecies were not recognized. The *Flora of North America* (FNA) treatment of Onagraceae is not yet available. *Camissonia tanacetifolia* ssp. *quadriperforata* was differentiated from the typical variety by Raven (1969) on the basis of pollen grain and plant hair morphology, as well as chromosome number. The two subspecies are most easily differentiated by examining the pollen grains: ssp. *quadriperforata* has a higher proportion (>10%) of 4-pored pollen grains, while ssp. *tanacetifolia* has <5% 4-pored pollen grains (the other pollen grains are 3-pored). Additionally, ssp. *quadriperforata* plants are densely gray-pubescent. Plants of ssp. *tanacetifolia* neighboring the range of ssp. *quadriperforata* share this trait, but most populations of ssp. *tanacetifolia* in other parts of its range do not (TJM 1993, Raven 1969). The difference in pollen grain morphology is attributable to the greater chromosome number in ssp. *quadriperforata* (Raven 1969, Wagner et al. 2007). *Camissonia tanacetifolia* ssp. *quadriperforata* is a hexaploid (n=21), while ssp. *tanacetifolia* is either diploid (n=7) or tetraploid (n=14) (Raven 1969). However, only one diploid plant has been documented in central Oregon. Raven (1969) hypothesized that ssp. *tanacetifolia* is an autopolyploid (not of hybrid origin) that arose via an unreduced gamete fairly recently, and came to inhabit its current area of occupancy because it is physiologically superior to ssp. *tanacetifolia* in that region. The hypothesis of an autopolyploid origin of ssp. *quadriperforata* was based on the morphological similarity of the two subspecies as well as the behavior of its chromosomes during meiosis (Raven 1969). *Camissonia tanacetifolia* ssp. *quadriperforata* is geographically restricted to a small area less than 25 miles across, and is not known to co-occur with ssp. *tanacetifolia*, although populations of the two subspecies have been found only nine miles apart (Raven 1969).

In a monograph of the Onagraceae family, Wagner et al. (2007) moved *Camissonia tanacetifolia* to the genus *Taraxia* and did not recognize its subspecies; the same classification was used in TJM 2. They chose not to recognize the infraspecific variation because the subspecies can only be reliably identified based on differences in pollen grain morphology, which is correlated with the greater chromosome number, and therefore cell size, of ssp. *quadriperforata* pollen grains. Plant taxonomists have traditionally not recognized cryptic autopolyploids as distinct species, as they often do

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not adhere to a morphology-based species concept (Rieseberg and Willis 2007, Soltis et al. 2007, Wood et al. 2009). Autopolyploids (which arise within a single species) in particular are less likely to be recognized taxonomically than allopolyploids (which arise through hybridization), probably because allopolyploids are more often morphologically distinct from their parent taxa (Rieseberg and Willis 2007, Soltis et al. 2007). A recent, unpublished study that examined 2,467 species in the California flora found that 13% of named species have multiple cytotypes (plants of different chromosome number), and recognition of those cytotypes would result in the addition of 483 species to the flora; more would certainly be added if the entire California flora were examined (Soltis et al. 2007). Wholesale naming of cytotypes is clearly not warranted, as it would create a nightmare for field biologists, and taxa would not fit many species concepts. For example, in some cases, different cytotypes have arisen multiple times, and are capable of producing fertile offspring with each other (see the case study of *Galax urceolata* in Soltis et al. 2007). However, recent intensive studies on several taxa have shown that different cytotypes do merit taxonomic recognition in some instances. The two cytotypes of *Tolmiea menziesii* (diploid and tetraploid), for example, were shown to have non-overlapping geographic ranges, and artificial crosses between the cytotypes rarely produced viable tetraploid seed. Although the cytotypes show only slight morphological differentiation, the cytotypes were described as distinct species, *T. menziesii* and *T. diplomenziesii*, by Judd et al. (2007), and this nomenclature was adopted in *TJM 2*.

The case of *C. tanacetifolia* ssp. *quadriperforata* is rare in that very few cytotypes of autopolyploids have been formally described (Soltis et al. 2007). Based on the evidence presented by Raven (1969), more work is still needed to determine if the different cytotypes merit taxonomic recognition (P. Soltis pers. comm. 2012). For example, it is unclear if the tetraploid and hexaploid plants are capable of producing viable offspring, and more extensive sampling could reveal if populations with individuals of both ploidy levels are found in nature. Genetic testing could be helpful in confirming the autopolyploid origin of ssp. *quadriperforata*.

Although restricted in its range, *Camissonia tanacetifolia* ssp. *quadriperforata* is often locally common where it is found (C. Witham 1993), and it has no known threats, so it is not of particular conservation concern (S. Scott, L. Hanson pers. comms. 1998). Furthermore, it has often been found in disturbed areas along roadsides (L. Hanson pers. comm. 2012). Based on the available information, CNPS and CNDDB recommend ~~changing~~ deleting *Camissonia tanacetifolia* ssp. *quadriperforata* ~~to~~ from Rank 3-3 4.3 in the Inventory, ~~due to the following: its apparent lack of restricted range and possible taxonomic distinctiveness from ssp. tanacetifolia; absence of known threats, and therefore lack of particular conservation concern; commonness where found; and its apparent affinity for disturbed habitats.~~ Although placing the plant in the genus *Taraxia* would better reflect our current understanding of the Onagraceae phylogeny, the combination *T. tanacetifolia* ssp. *quadriperforata* has never been published, so it must be maintained in the genus *Camissonia*. If more information on

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this plant becomes available in the future, CNPS and CNDDDB will re-evaluate its status at that time.

Recommended Actions

CNPS: ~~Change to~~ Delete from Rank ~~3.3~~ 4.3
 CNDDDB: ~~Change to~~ Delete from G5T3Q / S3

Revised Current CNPS Inventory Record

Camissonia tanacetifolia (Torr. & A. Gray) P.H. Raven ssp. *quadriperforata* P.H. Raven
 Sierra Valley evening primrose

Onagraceae

Rank ~~3.3~~ 4.3

Lassen, Plumas, Sierra

Loyalton (570B) 39120F2, Antelope Valley (571A) 39120F3, Sattley (571C) 39120E4, Constantia (586A) 39120H1, Frenchman Lake (586B) 39120H2, Chilcoot (586C) 39120G2, Beckwourth Pass (586D) 39120G1, Crocker Mtn. (587B) 39120H4, Portola (587C) 39120G4, Reconnaissance Peak (587D) 39120G3, Grizzly Valley (588A) 39120H5, Johnsville (588C) 39120G6, Blairsden (588D) 39120G5, Doyle (602D) 40120A1

Great Basin scrub, lower montane coniferous forest / clay, sandy; elevation 1300 – 1770 meters.

Perennial herb. Blooms May – July.

Difficult to identify from ssp. *tanacetifolia*; ~~ssp. *quadriperforata* is densely gray-pubescent, has a higher proportion of 4-pored pollen grains, and greater chromosome number compared to ssp. *tanacetifolia*. Plants of ssp. *tanacetifolia* neighboring the range of ssp. *quadriperforata* share traits, but most populations of ssp. *tanacetifolia* in other parts of its range do not; needs further study. A synonym of *Taraxia tanacetifolia* in *TJM-2*. See *Contributions from the U.S. National Herbarium* 37(5):248 (1969) for original description, and *Systematic Botany Monographs* 83:117-119 (2007) for alternate taxonomic treatment.~~

Revised CNPS Inventory Record

Camissonia tanacetifolia (Torr. & A. Gray) P.H. Raven ssp. *quadriperforata* P.H. Raven
 Considered But Rejected: A synonym of *C. tanacetifolia*; a common taxon.

Literature Cited

Judd, W.S., D.E. Soltis, P.S. Soltis, and G. Ionta. 2007. *Tolmiea diplomenziesii*: a new species from the Pacific Northwest and the diploid sister taxon of the autotetraploid *T. menziesii* (Saxifragaceae). *Brittonia* 59(3): 217-225.

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Wagner, W.L., P.C. Hoch, and P.H. Raven. 2007. Revised classification of Onagraceae. *Systematic botany monographs* 83:117-119.

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