

**Added to California Rare Plant Rank 2B.2 of the CNPS Inventory on September 20, 2018**

**Rare Plant Status Review: *Downingia willamettensis***

**Proposed Addition to California Rare Plant Rank 2B.2, G4 / S2**

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Changes made to the original document are in blue text.

**Background and Taxonomy**

*Downingia willamettensis* M. Peck is an annual herb in the Campanulaceae known from northwestern California, north through Oregon and into Washington. It is included in the *Jepson eFlora* (Schultheis 2012). The *Flora of North America* treatment for Campanulaceae has not yet been published. In California, *D. willamettensis* is most similar to *D. pulcherrima* and can be distinguished by primarily being found at elevations lower than 200 meters in the northwestern corner of California (vs. being found between 500-1550 meters in the Klamath and Cascade Ranges for *D. pulcherrima*) (Schultheis 2012).

*Downingia willamettensis* was originally described in 1934 by M. Peck, who considered it to be “Apparently of infrequent occurrence in the Willamette Valley” of Marion County, Oregon. Peck (1934) indicated that it appeared to have been confused with *D. pulchella*, and that it differs from this California species in the following characters:

“...ascending rather than spreading calyx segments, erect instead of spreading lobes of the upper lip of the corolla, in having sinuses cut below the dilated part of the lower lip, with the lobes of the latter strongly divergent, and in the absence of folds and dark spots in the throat.”

Nearly ten years later, McVaugh (1943) treated *D. willamettensis* as a variety of *D. yina*: *D. yina* var. *major*. However, *Downingia yina* was long known as a cytologically and morphologically variable species that had been variously lumped and split throughout its history (Schultheis 2001), and its varieties weren't generally recognized in later work. In a 2001 phylogenetic analysis of *Downingia* by Schultheis, *D. yina* was identified as likely in need of a revised circumscription based on patterns of possessing molecular variation and previously documented infraspecific variation for chromosome number (Foster 1972, Weiler 1962). Also, in both ITS and 3' *trnK* analyses, samples of *D. yina* fell into two clades, with either *D. elegans* or *D. bacigalupii*. Based on this outcome, Schultheis (2010) later conducted a study of the *D. yina* complex. She collected specimens of *D. elegans*, *D. bacigalupii*, and *D. yina* from their range across the northwest, along with five additional species of *Downingia* used as outgroup taxa. The specimens were put through several different kinds of tests, including DNA sequencing, morphometric analyses, crossing, and cytological analyses. From each of the tests a very clear pattern emerged showing *D. yina* breaking out into three distinct groups, primarily distinguishable by geographic location, with *D. yina* being found only in Oregon, *D. willamettensis* being located west of the North Coast Ranges in California as well as west of the Cascades in Oregon and Washington, and *D. pulcherrima* being located in the Klamath and Siskiyou regions in California as well as east of the Cascades in Oregon and Washington. Therefore, based on Schultheis (2010), *D. yina* does not occur in California, and plants previously considered *D. yina* in California are either *D. willamettensis* or *D. pulcherrima*.

Sent to: NW, N. Morin, L. Schultheis on 08/16/2018

Nancy Morin (pers. comm. 2018), author of the forthcoming Campanulaceae treatment for the *Flora of Oregon* (Morin 2017), believes the geography, cytology, and DNA evidence for recognizing *D. willamettensis* as presented by Schultheis (2010) is solid. Even though Schultheis says *D. willamettensis* is morphologically indistinguishable (see quotation below), Morin predicts that there are characteristics not quantified by recent authors that would make it possible to identify; however, even without noticeable morphological traits at this time, she feels that its distribution alone should make it possible to protect this species. An excerpt from Schultheis' draft *Flora of North America* treatment (provided by N. Morin, pers. comm. 2018) is as follows:

“*Downingia willamettensis* is morphologically indistinguishable from *D. pulcherrima* and *D. yina* (see discussion under 12. *D. yina*). Compared to the other two species, the flowers of *D. willamettensis* tend to have more divergent lower corolla lobes, anthers that are less bent relative to the filaments, and wider floral bracts. Most chromosome counts for the species are  $2n = 20$ , with smaller counts documented in Oregon ( $2n = 16$ , Lane county;  $2n = 12$ , Marion county)(R. I. Foster 1972).”

### Biology

In California, *Downingia willamettensis* occurs along the edges of lakes and ponds and in vernal pools in valley and foothill grasslands (Schultheis 2012; Consortium of California Herbaria 2018). One occurrence indicates it was along margins of a lake “on serpentine substrate surrounded by open mixed forest” (Ertter *et al.* 18401, UC2043169; Consortium of California Herbaria 2018). In Humboldt and Del Norte counties, it mostly occurs at elevations from 15 to 110 meters; in Lake, Mendocino, and Siskiyou counties, it grows at elevations from 665 to 1,110 meters (Consortium of California Herbaria 2018; Google Inc. 2015). *Downingia willamettensis* is known to mostly flower from June to July, with ~~one historical collection from May of 1905 (Foster 96), and~~ two historical collections from September of 1936 (Belshaw 2675, Morrison 1895). ~~There is one collection (Foster 96) reported as being collected in May of 1905, but this date is incorrect; Foster published her thesis in 1972 and did many of her collections in 1970, and the months of her collections are difficult to determine (Schultheis, L. pers. comm. 2018).~~

Only two California collections indicate associated species with *D. willamettensis*: *Amaranthus californicus* (Belshaw 2675, UC1925881), and *Eryngium* and *Pogogyne* (Ertter *et al.* 18401, UC2043169) (Consortium of California Herbaria 2018).

### Distribution

In California, *Downingia willamettensis* is currently known from about 940 Element Occurrences (EOs) scattered across Del Norte (one EO), Humboldt (four EOs), Lake (three EOs), ~~and Mendocino (one EO), and Siskiyou (one EO)~~ counties. Of the 940 occurrences, ~~eight~~ ~~nine~~ are considered historical (occurrences not seen in over 20 years are considered historical by CNDDDB). ~~One occurrence is located in Jedediah Smith Redwoods State Park (record 4),~~ ~~Two~~ occurrences are located in Mendocino National Forest (records 6 and 9), and the remaining seven occurrences are located on land of unknown ownership.

Population size information for *D. willamettensis* is only documented from two occurrences; being “scattered” at one location and “locally abundant” at another (Consortium of California Herbaria 2018). Since this species specifically occurs along dry lake beds, lake margins, ponds,

and vernal pools, its population sizes are dependent upon these specific habitat sites, and as such it should be considered very local where it occurs.

Although *Downingia willamettensis* is currently only known from ~~940~~ occurrences, it has a relatively widespread distribution, occurring within ~~four~~five counties throughout the North Coast Ranges of California—indicating that additional occurrences will likely be discovered. Since *D. willamettensis* was previously considered *D. yina*, all California specimens of *D. yina* have been included in the Locations tab of the attached “NewAdd\_DowningiaWillamettensis” spreadsheet for further evaluation. Specimens labeled as *D. yina* that occur outside of the range of *D. willamettensis*, as delineated by Schultheis (2010), have been discounted as likely being *D. pulcherrima* or another taxon, and are shown in pink highlight. These specimens should be reviewed and annotated to determine their actual identity.

### Status

*Downingia willamettensis* is currently unranked in Oregon and Washington, and is not included in NatureServe Explorer (2018).

### Threats

There are currently no known specific threats to *Downingia willamettensis*. However, since this plant is endemic to wetland habitats, which are sensitive and often threatened, it is likely that *D. willamettensis* is impacted by things such as improper grazing, hydrological changes, and climate change, among other threats that are known to impact wetland ecosystems.

### Summary

Based on the available information, CNPS and CNDDDB recommend adding *Downingia willamettensis* to California Rare Plant Rank 2B.2 of the CNPS Inventory. Although no direct threats to *D. willamettensis* are known at this time, we propose a threat rank of .2 based on the historical status of all but one of its occurrences, and its occurrence in sensitive vernal pool and lake margin habitat. If knowledge on the distribution, threats, and rarity status of *D. willamettensis* changes in the future, we will re-evaluate its status at that time.

### Recommended Actions

CNPS: Add *Downingia willamettensis* to CRPR 2B.2

CNDDDB: Add *Downingia willamettensis* to G4 / S2

### Draft CNPS Inventory Record

*Downingia willamettensis*

Cascade downingia

Campanulaceae

CRPR 2B.2

Oregon, Washington

Del Norte, Humboldt, Lake, Mendocino, ~~Siskiyou~~

Whispering Pines (533C) 3812276, Potato Hill (565D) 3912237, Jamison Ridge (582B)

3912362, Fortuna (654C) 4012452, Hydesville (654D) 4012451, ~~Secret Spring Mtn. (732B)~~

~~4412282~~, Hiouchi (740D) 4112471

Cismontane woodland (lake margins), valley foothill grassland (lake margins), vernal pools; elevation 15-1,110 meters.

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Annual herb. Blooms ~~(May)~~ June – July (September).

May be morphologically indistinguishable from *D. pulcherrima* and *D. yina*, but distinct based on geography, cytology, and DNA. Previously assigned to *D. yina*, which does not occur in CA; plants previously considered *D. yina* in CA are either *D. pulcherrima* or *D. willamettensis*. See *Proceedings of the Biological Society of Washington* 47(34): 187-188 (1934) for original description, and *Madroño* 57(1): 20-41 (2010) for taxonomic treatment.

### Literature Cited

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