Plant Species Evaluation Form

Downingia willamettensis M. Peck

CASCADE DOWNINGIA

Family: Campanulaceae (CNPS 2018) | **PLANTS Symbol:** N/A (USDA 2018) | **Calif. Endemic:** No (CNPS 2018)

Synonyms/Other Names: *Downingia yina* var. *major* McVaugh (Shultheis 2001; Tropicos 2018).

Identification Issues: Similar to *Downingia pulcherrima* and *D. yina*; previously identified as either of these taxa in California (Shultheis 2010). 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 (Schultheis 2010; Sims et al. 2018).

Taxonomy:

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Species In Genus: 15 species: western North America, Chile. Etymology: (A.J. Downing, American horticulturist, 1815--1852). Note: Flower part positions ("upper" is adaxial; "lower" is abaxial) given at full bloom. Corolla measurements are from base of tube to tip of longest lobe, color including albino for +- all species. Based on geography, interfertility, cytology, and sequences of nuclear as well as chloroplast DNA, *Downingia yina* Applegate (as recognized in TJM (1993)) split here into 3 morphologically indistinguishable species whose limits need further study, only 2 of which are documented for California: *Downingia pulcherrima*, *Downingia willamettensis*. Unabridged Note: Flower part positions ("upper" is next to stem; "lower" is away from stem) given at full bloom. Corolla measurements are from base of tube to tip of longest lobe, color including albino for +- all species. Based on geography, interfertility, cytology, and sequences of nuclear as well as chloroplast DNA, *Downingia yina* (as recognized in TJM (1993)) split here into 3 morphologically indistinguishable species whose limits need further study: *Downingia yina* (as now circumscribed, not in California, although possibly in -- yet not documented for -- northern CaR), *Downingia pulcherrima*, and *Downingia willamettensis*. The present treatment comes after *Downingia pulcherrima* and *Downingia willamettensis* had been united under *Downingia willamettensis*, and that taxon in turn had been transferred to *Downingia yina*, as *Downingia yina* var. *major* (leaving the remainder of that sp. under *Downingia yina* var. *yina*).

Genus Description – Habit: Annual, glabrous. Stem: decumbent to erect, (10)20--40 cm. Leaf: cauline, often deciduous before flower, 0.5--2(4) mm wide, lanceolate to awl-like (uppermost wider or not), sessile, generally entire. Inflorescence: spike; terminal flowers often aborted, overtopped by fertile; pedicels 0. Flower: bilateral, generally inverted at full bloom by twisted ovary; corolla generally >> calyx, blue to pink or white, generally with a symmetric white or yellow spot on lower lip, tube entire, limb strongly 2-lipped, upper lip lobes 2, lower lip generally with 2 low ridges, these often with 2 knob-like projections near throat, lobes 3, > upper, generally obovate, obtuse-mucronate; stamens fused (filaments, anthers in tubes), generally 2 smallest anthers each with terminal tuft of bristles, 1 bristle triangular or horn-like,

generally 0.2--0.5 mm, others linear, shorter; ovary inferior, long, narrow, +- pedicel-like, chambers 1--2, placentas parietal or axile. Fruit: dehiscent on sides by 3--5 sometimes translucent slits, tardily so or not.

Species Description – Flower: upper 3 sepals +- > lower 2; corolla 7--10 mm, glabrous, lateral sinuses generally > upper, lower lip blue with central white area including 2 yellow spots alternate 3 purple spots near throat; anthers < 45° to filaments, 3 upper, larger glabrous to +- hairy at tips; ovary glabrous to minutely papillate-scabrous, 1-chambered, placentas parietal. Fruit: 20--30 mm; lateral walls thin, easily fractured, lines generally not translucent. Seed: with longitudinal lines. Chromosomes: n=6,8,10. eFlora Treatment Author: Lisa M. Schultheis.

Status:

Note: Federally recognized Endangered, Threatened, Proposed, or Candidate species under the Endangered Species Act are omitted as they do not meet the definition of a Species of Conservation Concern (FSH 1909.12 § 12.52).

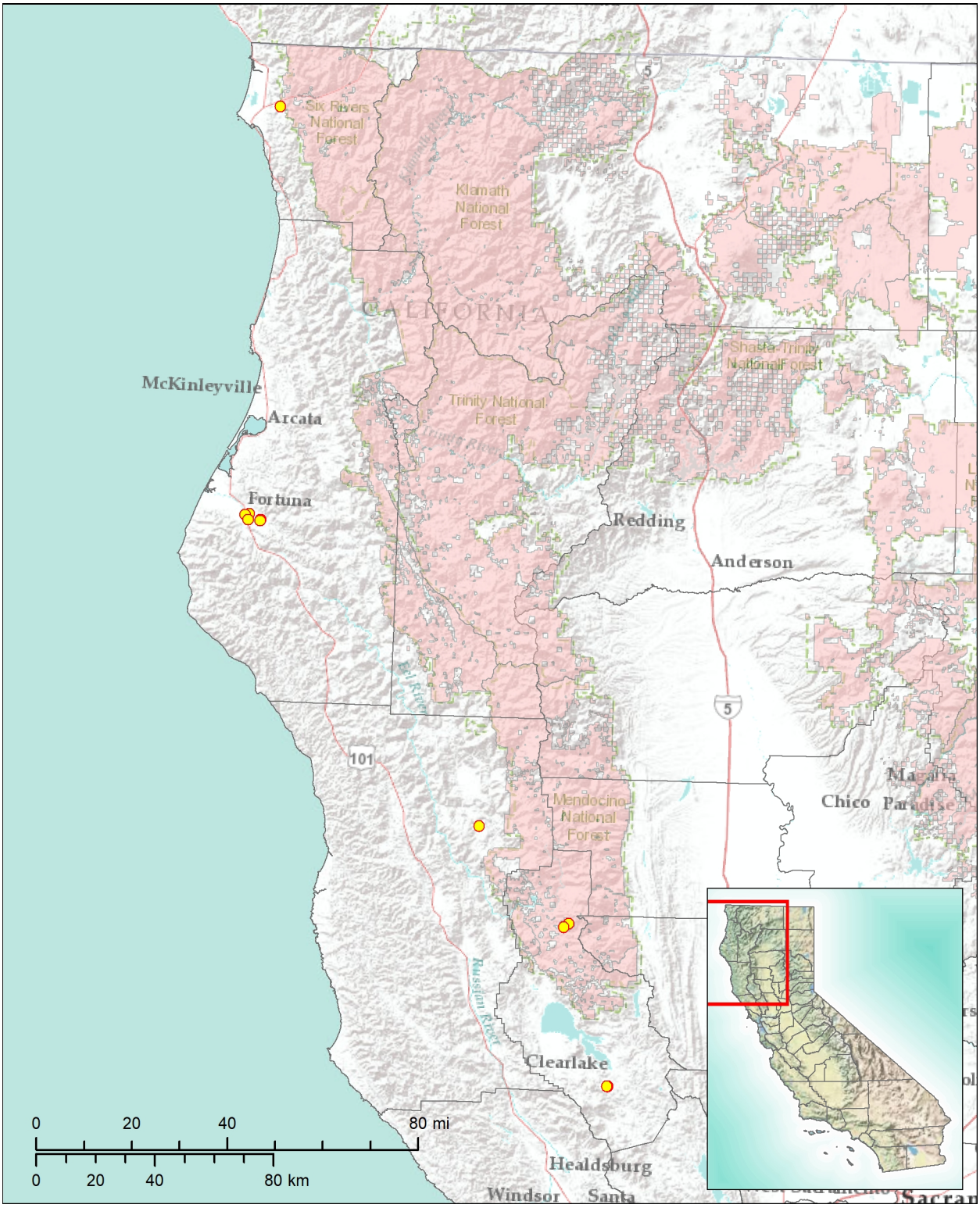
State Listing	G-rank	S-rank	CRPR	R5 FSS	NFP SM	CA BLM
CA: Not listed NV: Not listed OR: Not listed	G4	CA: S2 NV: Not listed OR: Not listed	2B.2	Not listed	Not listed	Not listed

SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	Not listed	Not listed	Not listed

Expanded abbreviations and citations: State Listing=California Endangered Species Act Listing (CDFW 2018b), Nevada Division of Forestry Fully Protected Plant Species (NAC 527) (NDF 2012), Oregon Department of Agriculture Listed Plants (ODA 2014); G-rank=Global Conservation Status (CDFW 2018a; NatureServe 2018); S-rank=Subnational (state or province-level) Conservation Status (CDFW 2018a; NatureServe 2018; NNHP 2017; ORBIC 2016); CRPR=California Rare Plant Rank (CNPS 2018); R5 FSS=USDA Forest Service Region 5 Regional Forester Sensitive Plant Species List (USDA 2013); NFP SM=Forest Service and Bureau of Land Management Northwest Forest Plan Survey and Manage Species (USDA 2001); CA BLM=California Bureau of Land Management Designated Sensitive Species (BLM 2010); SWAP=California State Wildlife Action Plan Status (CDFW 2015); NNHP=Nevada Natural Heritage Program Status (NNHP 2017); NNPS=Nevada Native Plant Society Status (NNHP 2017); ORBIC=Oregon Biological Information Center Status (ORBIC 2016); OCS=Oregon Conservation Strategy Species (ODFW 2016); IUCN=International Union for Conservation of Nature Red List Status (IUCN 2017).

Downingia willamettensis was added to California Rare Plant Rank 2B.2 of the CNPS *Inventory* on September 20, 2018. It is currently unranked in Oregon and Washington, and is not included in NatureServe Explorer (2018) (Sims et al. 2018).

Distribution: In California, *Downingia willamettensis* is currently known from approximately nine Element Occurrences (EOs) scattered across Del Norte (one EO), Humboldt (four EOs), Lake (three EOs), and Mendocino (one EO) counties. Two occurrences are located in Mendocino National Forest (records 6 and 9), and the remaining seven occurrences are located on land of unknown ownership (Sims et al. 2018). Considering *D. willamettensis* was previously regarded as *D. yina*, 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 on the locations table submitted with this document. These specimens should be reviewed and annotated to determine their actual identity. Although *D. willamettensis* is currently only known from nine occurrences, it has a relatively widespread distribution, occurring within four counties throughout the North Coast Ranges of California—indicating that additional occurrences will likely be found (Sims et al. 2018).



Sources: *Distribution*: CCH 2018, Sims et al. 2018. *Layers*: USDA Forest Service, Pacific Southwest National Forests: CPAD 2016. California counties: CDF 2009. *Basemaps*: California inset map: © 2013 National Geographic Society, i-cubed (Esri 2017a). Main map: Esri, DeLorme, USGS, NPS (Esri 2012) and Esri, USGS, NOAA (Esri 2017b).

Locations within California:

Record numbers indicate sites that contain an individual, population, or groups of populations located within ¼ mile of each other, per the California Natural Diversity Database (CNDDB 2017) definition of Element Occurrences (EOs) in California. Official EO numbers for plants in California are determined solely by the CNDDB and are included within the Reference (Source) column for CNDDB data. Duplicate records from the same site are given the same record number and included in red. The Population Info column includes total number of individuals and total number and size of populations/sub-populations when provided. Elevations provided in meters from source have been converted to feet. If not provided in original source, Land Manager information was obtained using the California Protected Areas Database (CPAD 2016) and Quad information was obtained using 24K Quads, SDE Feature Class (CDFG 2013). All other information is directly from the Reference (Source) unless additional citation is given.

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
1	Rohnerville. Desiccated pool. Field notes: Plant decumbent; Leaves lanceolate, 7 lines long, low dentate; Corolla decidedly bilabiate; 5 lines wide and 5 lines deep. Lobes without dark veining; Corolla tube 2 lines long, equal to or a trifle shorter than the calyx lobes; Upper lip cut to the base, segments ascending and parallel; Lower lip 5 lines wide and 3 lines deep, lobes obtuse but with apical points.; Lower lip sky-blue, with a triangular white upper center, this white center with 2 yellow spots at the top; Anther tube hooked-shaped, not exerted.;	Humboldt	Fortuna	CCH 2018 (as D. yina)	29-Jul-1923	Desiccated pool		Unknown	197
2	1/2 mile S of Fortuna. Wet black loam, low swales, sun; Life Zone: Humid transition: grassland. Height: 3-8 in.; scattered; fls. blue.;	Humboldt	Fortuna	CCH 2018 (as D. yina)	18-Jun-1937	Wet black loam, low swales, sun; scattered		Unknown	51

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
2	1/2 mile S of Fortuna. Wet black loam, low swales, sun; Life Zone: Humid transition: grassland. Height: 8-10 in.; rare; fls. white - seems different from #8893 - i.e. fls. smaller.;	Humboldt	Fortuna	CCH 2018 (as D. yina)	18-Jun-1937	Rare		Unknown	51
2	Near Fortuna	Humboldt	Fortuna	CCH 2018 (as D. yina)	8-Jul-1923			Unknown	51
3	back of Everett Beck House (formerly George Fray) bed of former Goose Lake, Hydesville. Bed of former lake. Abundant locally.;	Humboldt	Hydesville	CCH 2018	21-Jun-1951	Abundant locally		Unknown	350
3	Hydesville. Adjacent to Hydesville School.	Humboldt	Hydseville	CCH 2018	23-May-1905			Unknown	368
3	near Hydesville; Northern Coast Region	Humboldt	Hydesville	CCH 2018	Jun 30 1911			Unknown	283
4	On northwest corner of Hiouchi Road and Jedediah Road, north of Hiouchi. Vernal pool.	Del Norte	Hiouchi	CCH 2018	1-Jul-1995	It was a long time ago, but I remember collecting this in a vacant lot in a residential area. I doubt it falls within the boundaries of the state park (Schultheis, L. pers. comm. 2018)		Unknown	125
5	Alton, Northern Coast Region in wet ground	Humboldt	Fortuna	CCH 2018	Jul 21 1912	Wet ground		Unknown	69

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
6	3 mi SW of Snow Mountain dry soil around a small dry sag pond	Lake	Potato Hill	CCH 2018	Sep 19 1936	dry soil		Mendocino NF	3647
7	3.5 miles by road east of Seigler Springs, margin of Snow's Lake. Growing at wet edges of lake. Stems succulent, swollen below, flowers bright blue. USGS quad: NULL; Other Notes: Label says: UC Davis Herbarium, The Beecher Crampton Herbarium Collection.;	Lake	Whispering Pines	CCH 2018	26-Jun-1956	wet edges of lake		Unknown	2185
7	Margin of Snow's Lake, 3.5 miles east of Seigler Springs Basalt rubble Fls. light blue-violet, 2 orange spots at the base of the lobes.;	Lake	Whispering Pines	CCH 2018		D. willamettensis (Schultheis, L. pers. comm. 2018).			655
8	Roberts Lake west of Eden Valley. Drying margins, with Eryngium and Pogogyne, on serpentine substrate surrounded by open mixed forest.	Mendocino	Jamison Ridge	CCH 2018	1-Jul-2004	Drying margins, serpentine substrate		Unknown	2584
9	Inner North Coast Range. Lower SW facing slope of Snow Mt. West above Sheep Camp. margins of drying pools with Amaranthus californicus.	Lake	Potato Hill	CCH 2018	19-Sep-1936	SW facing slope; margins of drying pools		Mendocino NF	2363

Distribution on National Forest System (NFS) Lands:

(Please see Reference column of Locations table above for references pertaining to Record Numbers indicated on NFS lands.)

National Forest System (NFS) lands	Record #s (from Locations table above)	CNDDB EOs	Non-CNDDB Records	Recent (seen in past 20 yrs.)	Historic (not seen in past 20 yrs.)	Most Recent Obs.	EOs/ Recs. (5 mile buffer)	Total Records on NFS lands
Angeles:	-	-	-	-	-	-	-	0
Cleveland:	-	-	-	-	-	-	-	0
Eldorado:	-	-	-	-	-	-	-	0
Inyo:	-	-	-	-	-	-	-	0
Klamath:	-	-	-	-	-	-	-	0
Lake Tahoe Basin MU:	-	-	-	-	-	-	-	0
Lassen:	-	-	-	-	-	-	-	0
Los Padres:	-	-	-	-	-	-	-	0
Mendocino:	-	-	2	-	2	19-Sep-1936	1	2
Modoc:	-	-	-	-	-	-	-	0
Plumas:	-	-	-	-	-	-	-	0
San Bernardino:	-	-	-	-	-	-	-	0
Sequoia:	-	-	-	-	-	-	-	0
Shasta-Trinity:	-	-	-	-	-	-	-	0
Sierra:	-	-	-	-	-	-	-	0
Six Rivers:	-	-	-	-	-	-	-	0
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	0	2	0	2	N/A	1	2

Demographic and Population Trends: Population size information for *D. willamettensis* is only documented from two occurrences; being "scattered" at one location and "locally abundant" at another (CCH 2018). Since this taxon 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. Of the nine occurrences, eight are considered historical (occurrences not seen in over 20 years are considered historical by CNDDB) (Sims et al. 2018).

Life History: Annual herb that blooms from June through July, and sometimes into September (CNPS 2018).

Diversity: *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 molecular variation and previously documented infraspecific variation for chromosome number (Foster 1972, Weiler 1962). Also, in both ITS (nrDNA) and 3' *trnK* (cpDNA) 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*.

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)."

Habitat: In California, *Downingia willamettensis* occurs along the edges of lakes and ponds and in vernal pools in valley and foothill grasslands (Schultheis 2012; CCH 2018). One occurrence indicates it was along margins of a lake "on serpentine substrate surrounded by open mixed forest" (*Ertter et al. 18401*, UC2043169; CCH 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 (CCH 2018; Google Inc. 2015). Only two California collections indicate associated species with *D. willamettensis*: *Amaranthus*

californicus (*Belshaw 2675*, UC1925881), and *Eryngium* and *Pogogyne* (*Ertter et al. 18401*, UC2043169) (CCH 2018).

Habitat Status or Trend: Unknown.

Capacity for the Species to Disperse: *Downingia* species have dehiscent fruit and seeds that lack morphological adaptations for any specialized dispersal mechanism (Bauder 1992; Schultheis 2012).

Threats: There are currently no known specific threats to *D. 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 (Sims et al. 2018).

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Persons Contacted:

Morin, Nancy. 2018. Co-Lead Editor, Taxon Editor, Southwest Regional Coordinator for *Flora of North America*. Email correspondence regarding conservation status of *Downingia willamettensis*. Personal communication 27 July 2018.

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Reviewer(s) and Date:

David Magney, Rare Plant Program Manager, California Native Plant Society, (916) 447-2677 ext. 205, dmagney@cnps.org. October 22, 2018.

Formatting: Form is set up as 508 compliant. Please use the "styles" if further formatting is necessary.

Purpose: This is to maintain the best available science on a species that could be used by the Forest Service in a variety of functions. Specifically, there would be additional steps and evaluations to determine whether or not this species would be considered a Species of Conservation Concern under the 2012 Planning Rule or a Sensitive Species under the 1982 Planning Rule.

Additional Considerations at the Forest Level: Habitat amount and juxtaposition of both the species and habitat locations.