Plant Species Evaluation Form

*Gentiana plurisetosa* C. Mason

**KLAMATH GENTIAN**

**Family:** Gentianaceae  
**PLANTS Symbol:** GEPL6  
**Calif. Endemic:** No

**Synonyms/Other Names:** *Gentiana plurisetosa* was described by the late Charles Mason in 1990. There are no synonyms of this name (The Plant List 2013; Tropicos 2018).

**Identification Issues:** The Gentianaceae in California are distinctive herbs with opposite or whorled, fleshy leaves tending to a pallid green color. They have blue and/or white cup-shaped corollas, often with elaborate appendages in the sinuses between the corolla lobes (Pringle 2012). They are thus reasonably easy to identify, even in vegetative condition. However, all five of the other perennial California members of the genus *Gentiana* (*G. affinis* var. *ovata*, *G. calycosa*, *G. newberryi* var. *newberryi*, *G. setigera*, and *G. sceptrum*) occur in the wet meadows of the three county area of the range of *G. plurisetosa* (Pringle 2012). All have similarly large and distinctive blue and/or white deep cup-shaped flowers with elaborate flaps of tissue (plicae) at the junction between each petal lobe (except *G. sceptrum*). The similarity is such that, for over a century, *G. plurisetosa* was not distinguished taxonomically from *G. setigera*, which had been described by Asa Gray in 1876. Only in 1989 did Chambers and Greenleaf suggest that a new name be given for an upright-stemmed *Gentiana* occupying the same region (and the same habitats) as *G. setigera*. Mason published the description in 1990, assigning as a type a specimen from Half Moon Meadow in Siskiyou County.

Mason (1990) distinguished *G. plurisetosa* from *G. setigera* by its plicae being bilobed, each lobe with 3-5 capillary setae (*G. setigera* has 2-8 setae that are capillary their entire length); erect stems (*G. setigera* has decumbent stems), several terminal flowers (*G. setigera* has a single terminal flower per stalk), and no basal rosette leaves (*G. setigera* usually has basal rosettes). Mason distinguished *G. plurisetosa* from *G. affinis* var. *ovata* by its plicae (*G. affinis* var. *ovata* lacks capillary setae), by its glabrous stems (*G. affinis* var. *ovata* has rows of fine hairs along stems), and its larger flowers (*G. affinis* var. *ovata* has flowers 2-2.5 cm long). Mason distinguished *G. plurisetosa* from *G. calycosa* by its lower elevation (*G. calycosa* is typically high montane), by its multiple flowers per inflorescence stalk (*G. calycosa* has a single terminal flower), and its plicae with capillary setae (*G. calycosa* has erose plicate with acute or rounded apices). *Gentiana newberryi* var. *newberryi* has plicae that are triangular with jagged edges and *G. sceptrum* lacks plicae (Pringle 2012).
**Gentiana plurisetosa C. Mason**

**Taxonomy:**
Unless otherwise cited, the following description is used with permission from the Jepson Herbarium. Jepson Flora Project (eds.) 2018. *Jepson eFlora*, http://ucjeps.berkeley.edu/eflora/, accessed in 2018. Copyright © Regents of the University of California.

Species In Genus: +- 400 species: temperate to subarctic, alpine America, Eurasia. Etymology: Gentian, tribute to Genthios, the King of Illyria (ancient Greece, modern Albania) 181-168 BC, who used the roots to treat malaria; setiger, Latin for bearing bristles.

Genus Description – Habit: Annual to perennial herb, generally glabrous. Stem: generally simple below inflorescence. Leaf: cauline, opposite (also basal or not). Inflorescence: compact cyme or flowers 1. Flower: parts generally in 5s (generally in 4s in *Gentiana prostrata*, 4s or 5s in *Gentiana fremontii*); calyx tube generally > lobes; corolla tube narrow-bell-shaped, lobes spreading, < tube, base of sinus between lobes truncate or generally with a variously shaped, sometimes fringed appendage, nectary pits 0 (nectaries on ovary stalk); ovary stalked, style +- 0 or short, entire, persistent, stigmas 2.

Species Description – Habit: Perennial herb. Stem: from caudex, decumbent to erect, 2--several, 5--40 cm. Leaf: basal + 0; cauline many, +- even-spaced, generally > 0.8 × internodes, 12--60 mm, 7--38 mm wide, elliptic to round, tips obtuse to acute, base sheaths at mid-stem generally > 5 mm. Inflorescence: terminal; flowers 1--5, also 1 at 1--3 upper nodes or not. Flower: calyx 17--25(35) mm, lobes lance-elliptic, rarely +- leaf-like, not ciliate, obtuse to acute; corolla 35--50 mm, deep blue, lobes 7--14 mm, oblong-obovate to round, short-acuminate, sinus appendages divided +- to base into 2--several thread-like parts. Seed: winged. eFlora Treatment Author: James S. Pringle.

**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).

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<th>G-rank</th>
<th>S-rank</th>
<th>CRPR</th>
<th>R5 FSS</th>
<th>NFP SM</th>
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<td>IUCN: Not listed</td>
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Expanded abbreviations and citations: State Listing=California Endangered Species Act Listing (CDFW 2018b), Nevada Division of Forestry Fully Protected Plant Species (NAC 527) (NDE 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=Nebraska Natural Heritage Program Status (NNHP 2017); NNPS=Nebraska 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).

*Gentiana plurisetosa* was added to the equivalency of California Rare Plant Rank (CRPR) 4 in the CNPS Inventory, Fifth Edition (Skinner and Pavlik 1994). Its status was changed to CRPR...
1B in 2006 (McIntyre and Bittman 2006), when known from approximately 15 occurrences in California and considered rare in Oregon. Its CRPR 1B status has remained unchanged since (CNPS 2018).

**Distribution:** Within California, Pringle (2012) lists the bioregional distribution of *G. plurisetosa* as Klamath Ranges and Outer North Coast Ranges, a local endemic to the region. It occurs in Siskiyou and Humboldt counties, with one Humboldt County occurrence on the border with Trinity County (CNDDB 2018). The distribution of *G. plurisetosa* outside of California is limited to extreme southwestern Oregon (NatureServ 2018), from two locations in southern Josephine County (CPNWH 2018). This sparse and patchy distribution is likely a reflection of both the recent recognition of this species and the ruggedness and relative roadlessness of the area bounded by these occurrences; additional populations could be discovered in similar habitats within this region.
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**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.

<table>
<thead>
<tr>
<th>Rec. #</th>
<th>Locality</th>
<th>County</th>
<th>Quad</th>
<th>Reference (Source)</th>
<th>Date Last Observed</th>
<th>Population Info</th>
<th>Threats</th>
<th>Land Manager</th>
<th>Elev. (ft.)</th>
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<td>1</td>
<td>SHACKLEFORD CREEK, NORTHWESTERN N KLAMATH RANGES REGION.</td>
<td>Siskiyou</td>
<td>Boulder Peak (4112351)</td>
<td>CNDDB, May 2017 (EO 1)</td>
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<td>Siskiyou</td>
<td>Boulder Peak (4112351)</td>
<td>CNDDB, May 2017 (EO 2)</td>
<td>17-Sep-1972</td>
<td>ONLY SOURCE OF INFORMATION FOR THIS SITE ARE 1908 COLLECTION BY BUTLER AND 1972 COLLECTION BY HEMPHILL. NEEDS FIELDWORK.</td>
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<td>27-Jul-1972</td>
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<th>Land Manager</th>
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<td>ROUND MEADOW.</td>
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### Gentiana plurisetosa C. Mason

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<td>HALFMOON MEADOW, MARBLE MOUNTAIN PRIMITIVE AREA, NORTHWESTERN KLAMATH RANGES.</td>
<td>Siskiyou</td>
<td>Somes Bar</td>
<td>CNDBB, May 2017 (EO 11)</td>
<td>29-Aug-1939</td>
<td>COLLECTED HERE BY HARRIS IN 1939.</td>
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<td>12</td>
<td>ALONG TRAILS SOUTHEAST OF NORTH TRINITY MOUNTAIN.</td>
<td>Humboldt</td>
<td>Trinity Mtn.</td>
<td>CNDBB, May 2017 (EO 12)</td>
<td>3-Aug-1973</td>
<td>LOCATIONS FROM &quot;ABOUT 1/4 - 1/2 MILE ON RIGHT SIDE (S SIDE) OF OLD HORSE TRAIL TO TRINITY SUMMIT STATION..., &quot;NEAR TRINITY SUMMIT GUARD STATION,&quot; AND &quot;SE OF TRINITY MTN.&quot; ALSO ATTRIBUTED TO THIS SITE. NEEDS FIELDWORK.</td>
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**Elev. (ft.)**
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- Klamath NF: 5130
- Six Rivers NF: 5600
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<td>13</td>
<td>WATER DOG LAKES, EAST SLOPE OF NORTH TRINITY MOUNTAIN, SIX RIVERS NATIONAL FOREST.</td>
<td>Humboldt</td>
<td>Trinity Mtn. (4112314)</td>
<td>CNDDDB, May 2017 (EO 13)</td>
<td>23-Sep-2006</td>
<td>2000 RAMETS ESTIMATED IN 2006. PLANTS ABUNDANT AND EVENLY SCATTERED. COLLECTIONS FROM NORTH TRINITY MOUNTAIN, NEAR WATER DOG LAKES, AND BELOW MILL CREEK LAKES ATTRIBUTED TO THIS SITE.</td>
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**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.)

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<th>Record #s (from Locations table above)</th>
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<th>Non-CNDDB Records</th>
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<th>Historic (not seen in past 20 yrs.)</th>
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**Demographic and Population Trends:** *Gentiana plurisetosa* is known from 13 Element Occurrences (EOs) in the CNDDB (2018). Of these 13, two occur on the Six Rivers National Forest (NF) and these same two occur within a 5 mile buffer of the Shasta-Trinity NF; 10 occur on the Klamath NF, and one has insufficiently detailed location information to infer ownership, but it is located within a 5 mile buffer of the Klamath NF. A CCH (2017) specimen mapping error causes one erroneous point to appear to be in the Lassen NF 5 mile buffer.
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All EOs are listed as Presumed Extant, with a single EO visited within the past 20 years (EO 13 in 2006). There is one record from 1910 and the rest range in date from 1954 through 1973. Only EO 13 has a site quality ranking: it is listed as Excellent. It is also the only population with a size estimate: 2,000 “ramets” were observed in 2006, “evenly scattered and abundant”. No EO has repeated census from which to estimate trends.

The adults of these plants would be discrete clumps and thus easy to tell apart as individuals, but given the dense vegetation of their habitat, juveniles could be very easily overlooked.

Life History: Gentiana plurisetosa is a polycarpic (blooming annually) herbaceous perennial, overwintering as rootstock without basal rosette leaves (Pringle 2012, CNPS 2018). Its lifespan is unknown, but a similar species, G. pneumonanthe of European fens, is known to live 30 years or more (Oostermeijer et al. 1994). It flowers July to September (Pringle 2012; CNPS 2017; CCH 2017). It is not known to reproduce vegetatively, so must rely on seeds to recruit and disperse. Its seeds are winged (Pringle 2012), but their dormancy mechanism or longevity in the seedbank do not appear in published studies.

The family Gentianaceae is known to have mycorrhizal associations, and several genera are mycoheterotrophic (i.e. they depend on fungi for food at least part of their lifecycle) (Leake 1994). The relationship of California Gentiana species with mycorrhiza has not been studied, but they may be associated with common soil vesicular-arbuscular mycorrhizal species such as Gigaspora margarita or G. mossae in the fungus family Endogonaceae, as was demonstrated for Gentiana lutea in Europe (Jacquelinet-Jeannougin and Gianinazzi-Pearson 1983). The genus Gentiana does not have the tiny, “dustlike” seed of mycoheterotrophic species that require fungal infection to germinate (Olson 1980), but mycorrhizal associations could play some other important role in the G. plurisetosa lifecycle.

Wet meadow-inhabiting Gentiana species may require some disturbances for successful recruitment. Oostermeijer et al. (1994) studied the age-structure of populations of the rare wetland inhabitant G. pneumonanthe and found that in later successional habitats, or those without internal micro-disturbances, the age-structure was weighted towards older individuals. They suggest that age-class is an important indicator of population health that is missed by census alone.

Diversity: Due to the recentness of its description (1990), and to its rarity, G. plurisetosa has not yet been included in phylogenetic or population diversity studies. Its relationship to other species of Gentian remains unknown, although Chambers and Greenleaf (1989) assert that it is closely related to G. calycosa Grisebach.

Habitat: Very little has yet been written about the habitat of Gentiana plurisetosa. It appears to inhabit wet mountain meadows and seeps within upper and lower montane coniferous forest in the Siskiyou Mountain area of southwestern Oregon and northern California (CNPS 2018). It occurs at 1,200-1,900 meters in elevation (Pringle 2012). Descriptions of habitat in CNNDDB (2018) give a little more information: red fir forest and alder thicket are each mentioned twice, and wet meadows, moist thickets, or very wet marshy ground are always mentioned. Frequently the site is associated with a lake. Open ground and “open, sunny area” are both mentioned as
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well. In CalPhotos (2018), in most of the photos one can see short stature vegetation surrounding individual plants, of short forbs, grasses, and moss. Substrate is not mentioned in any source, and this species is not mentioned as being associated with serpentine.

**Habitat Status or Trend:** The natural fire regime has been suppressed over the past 100-150 years throughout this region, resulting in shrub encroachment and increased fuel loads, potentially leading to hotter fires and consequent increased erosion (Kagan et al. 2006). No specific beneficial effect of disturbance such as fire on *G. plurisetosa* is reported, although a beneficial effect is supported by census data for the related species in the region, *G. setigera* (CNDDB 2018). In addition, habitat fragmentation in the region is caused by agriculture, road building and forest harvest patterns that influence population viability in remnant plant communities (Jules et al. 1999).

**Capacity for the Species to Disperse:** Species of the genus *Gentiana* have a two-valved capsule that is held erect and opens apically to form a smooth-walled cup in which the seeds lie loosely (Pringle 2012; Nakanishi 2002). This type of structure is effective for wind dispersal if the plant is taller (e.g. greater than 10 cm), and is made more effective if the seed has elaborations for wind dispersal such as a wing (Nakanishi 2002), as is the case for *G. plurisetosa* (Pringle 2012). This type of capsule is also effective as a rain-dispersal mechanism if the seeds are small, and does not require seed elaborations for dispersal up to 1 meter distance by splashing raindrops if not in dense vegetation. *Gentiana* species that are shorter tend to have traits for rain-dispersal, for instance, *G. thunbergii* and *G. zollerii* of Japan have hygroscopic mechanisms in their capsules that allow the capsule to open only when it is wet (Nakanishi 2002). It is not reported whether the capsule of *G. plurisetosa* opens only when wet, nor what the seed size is, but the winged seed and taller stature of this plant suggests wind is the primary agent of dispersal, as is the case for the similar species *G. pneumonanthe* (Oostermeijer et al. 1994).

*Gentiana plurisetosa* is not reported to spread vegetatively (Pringle 2012), so it must be dispersed by seed. Seed measurements and number of seed per capsule have not been reported for this species, but 56 micrograms weight per seed and 134.7 ± 23.5 seeds per capsule was reported for *G. thunbergii* of Japan (Nakanishi 2002).

**Threats:** Threats specific to certain populations of this plant in California identified in CNDDB (2018) are listed for two of the thirteen Element Occurrences. Element Occurrence 12 lists grazing as a threat but specifies “area heavily grazed by cattle but this plant not touched, apparently unpalatable”. Therefore, the threat from grazing may be trampling and alteration of meadow hydrology rather than direct consumption. Element Occurrence 13 mentions foot traffic and trampling as a threat in a site that is a wet meadow adjacent to small lakes (Water Dog Lakes, Six Rivers NF).

Fire as a disturbance was not listed in CNDDB, but natural fire would have little negative impact on the species occupying this perpetually saturated habitat and may be required to maintain the open, low stature vegetation conditions this species appears to prefer (CNDDB 2018; CalPhotos 2018).
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**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.