Plant Species Evaluation Form

*Lilium bolanderi* Wats.

**BOLANDER'S LILY**

**Family:** Liliaceae

**PLANTS Symbol:** LIBO

**Calif. Endemic:** No

**Synonyms/Other Names:** *Lilium bolanderi* was described by S. Watson in 1885, based upon four collections spanning seventeen years of field work by three botanists. The author regarded this entity as “a well-marked species, allied to *L. parvum* and *L. maritimum*” (Watson 1885). In 1923, I.M. Johnston attempted to subsume *L. bolanderi* into the new species, *Lilium howellii*. The latter name is regarded as an invalid synonym, and will be only rarely encountered in the literature (Tropicos 2018).

**Identification Issues:** When flowers are available for observation, identification of this species is straightforward: flowers are nodding to erect, and red or magenta in color (rarely salmon, or pale yellow). Leaves are 1.8-7 cm in length, with a glaucous surface and wavy margins. In the absence of flowers, the task of distinguishing species within *Lilium* becomes problematic (Skinner 2012).

**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: +- 100 species: northern temperate, tropical mountains of eastern Asia.

Etymology: (Greek: lily). Note: Variable, hybridization common. Many species declining from habitat destruction, collecting; few thrive in gardens. Generally flowers May--Aug.

Habit: Plant < 1.1 m, glaucous; bulb erect, +- ovoid, scales unsegmented, longest 3--6 cm. Leaf: in 2--6 whorls, +- ascending, often cupping stem, 1.8--7 cm, generally +- obovate or +- oblanceolate, generally distinctly glaucous; margin generally wavy. Inflorescence: flowers 1--9, nodding to spreading. Flower: narrowly bell-shaped, not fragrant; perianth parts 3--4.7 cm, +- recurved in distal 20--40%, red or magenta (salmon, pale yellow), adaxially basal 30--50% often +- yellow; stamens exceeded by to held at same level as perianth, filaments +- parallel, anthers 3--8 mm, +- red or magenta, pollen red-brown, orange, or yellow; pistil 2--3.5 cm. Fruit: 2--4 cm.

**Status:**
**Lilium bolanderi** Wats.

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).

<table>
<thead>
<tr>
<th>State Listing</th>
<th>G-rank</th>
<th>S-rank</th>
<th>CRPR</th>
<th>R5 FSS</th>
<th>NFP SM</th>
<th>CA BLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA: Not listed</td>
<td>G4</td>
<td>CA: S3S4</td>
<td>4.2</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
<tr>
<td>NV: Not listed</td>
<td></td>
<td>NV: Not listed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR: Not listed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| SWAP: Not listed | NNHP: Not listed | NNPS: Not listed | ORBIC: Not listed | OCS: Not listed | IUCN: 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).

**Distribution:** *Lilium bolanderi* is found in southwestern Oregon, as well as the Klamath Ranges (KR) bioregion of northwestern California—encompassing parts of Del Norte, Humboldt, and Siskiyou counties (CNPS 2018). United States Forest Service administered lands on which this species occurs include Klamath NF and Six Rivers NF (Calflora 2017, CCH 2017).
Lilium bolanderi Wats.

Lilium bolanderi Wats.

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.

Redacted for conservation purposes.
**Lilium bolanderi** Wats.

### 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.)

<table>
<thead>
<tr>
<th>National Forest System (NFS) lands</th>
<th>Record #s (from Locations table above)</th>
<th>CNDDB EOs</th>
<th>Non-CNDDB Records</th>
<th>Recent (seen in past 20 yrs.)</th>
<th>Historic (not seen in past 20 yrs.)</th>
<th>Most Recent Obs.</th>
<th>EOs/Recs. (5 mile buffer)</th>
<th>Total Records on NFS lands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angeles:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Cleveland:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Eldorado:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Inyo:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Klamath:</td>
<td>22, 46</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1-Sep-1980</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lake Tahoe Basin MU:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Lassen:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Los Padres:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Mendocino:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Modoc:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Plumas:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>San Bernardino:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Sequoia:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Shasta-Trinity:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Sierra:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Six Rivers:</td>
<td>2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 19, 20, 21, 24, 25, 26, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 49</td>
<td>0</td>
<td>42</td>
<td>5</td>
<td>37</td>
<td>3-Jul-2013</td>
<td>5</td>
<td>42</td>
</tr>
<tr>
<td>Stanislaus:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Tahoe:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td>N/A</td>
<td>0</td>
<td>44</td>
<td>5</td>
<td>39</td>
<td>N/A</td>
<td>7</td>
<td>44</td>
</tr>
</tbody>
</table>
Demographic and Population Trends: The total number of occurrences for this taxon was estimated using GIS tools and methods described by Green and Sims (2018), and later refined to eliminate additional duplicate location records. *Lilium bolanderi* is known from approximately 50 occurrences based on a total of 124 records (Calflora 2017; CCH 2017). The majority (42/50; 84%) of its occurrences are on Six Rivers NF, with two occurrences (2/50; 4%) known from Klamath NF, one occurrence (1/50; 2%) on Siskiyou NF, and the remaining occurrences (5/50; 10%) being on lands with unknown ownership. A 1934 collection “2 miles from Snow Camp on road to Bald Mountain” (Wolf 5860, RSA12433; CCH 2017) is approximately 60 air km south of all other records, and should be verified for accuracy in identification.

Of the 50 total occurrences, only one contains information related to population count estimates: a 2013 Calflora observation from Six Rivers NF, which documented 11-50 individuals (Calflora 2017). Very little is known about the population biology and demography of this species.

Life History: *Lilium bolanderi* is a perennial, bulbiferous herb that blooms from June through July (CNPS 2018), and sometimes extending into August (Skinner 2012). Plants in the genus *Lilium* are pollinated by an array of insects, as well as by hummingbirds (Trochilidae). Among the insects are bees (Hymenoptera: Apidae), especially bumblebees (*Bombus* spp.), and Lepidoptera, including swallowtail butterflies (*Papilio* spp.) and sphinx moths (Sphingidae) (CPC 2018). While the specific pollinators of *L. bolanderi* are not known, they probably come from some or all of these groups.

Diversity: The genus *Lilium* consists of approximately 100 species, distributed across the temperate latitudes of the northern hemisphere, with a few representatives in the mountainous parts of tropical eastern Asia (Skinner 2012). The genus was traditionally divided into seven sections, based upon 15 morphological characters; recent molecular phylogenetic analyses largely support this arrangement, with limited reorganization. *Lilium bolanderi* is sister to *L. kelloggii*, nested within *Pseudolirium*, a monophyletic section found only in North America (Douglas et al. 2011, Gao et al. 2013). *Lilium* evolved during the Miocene, about 10 Mya (Vinnersten and Bremer 2001); much of the group’s species diversity in Asia results from orogenic events at the margins of the Tibetan Plateau, which drove speciation via allopatry and habitat disparification. Global biogeographic inference in *Lilium* remains enigmatic, as a result of poor phylogenetic resolution at basal splits between Asian, European, and North American clades (Gao et al. 2013).

*Lilium* taxa are known for rampant hybridization in cultivation, and there is some evidence for this in wild populations. Promiscuous gene flow, together with edaphic specialization, seems to play a large role in diversification within *Lilium* (Douglas et al. 2011). There are unpublished reports that *L. bolanderi* hybridizes with at least three other taxa (CNPS 2018).

Habitat: This taxon occurs in lower montane coniferous forest and chaparral, on serpentine-derived soils between 30 and 1,600 meters in elevation (CNPS 2018). Common floristic associates and other ecological parameters are not well known.
Lilium bolanderi Wats.

Habitat Status or Trend: The Klamath region has played host to a remarkable diversification in plant species, as a consequence of its complex geology and long history of isolation (Whittaker 1960). The region is one of six globally important temperate forest biodiversity hotspots, having served as a climatic refugium during the Pleistocene. More than a century of land use (including logging, mining, grazing and modification of fire regimes) has significantly altered much of the region. Only 28% of the old-growth forest remains, and ongoing human impacts continue to degrade wild communities, especially in mesic lowland and mid-elevation areas, encompassing the elevation range of L. bolanderi. The scale and speed of anthropogenic climate change might exceed the capacity of the Klamath region to provide refugia for taxa of low mobility and narrow ecological requirements, though careful management may partially mitigate this risk (Olson et al. 2012).

Capacity for the Species to Disperse: Lilium fruits are loculicidal, opening along suture lines to expose compact, flattened seeds in an arrangement reminiscent of stacked coins. Upon dehiscence, dispersal occurs principally by gravity, with some wind-scattering as a result the seeds’ small size, flattened geometry and the presence of a marginal wing. Lilium endosperm contains aleurone and fatty oils, but no starch. This chemical makeup suggests the possibility of ant-mediated dispersal (a phenomenon observed in allied genera), though the absence of a true elaiosome means this mode is at best secondary (Kubitzki 1998). While studies of dispersal distance in L. bolanderi are lacking, its seed morphology and inferred dispersal mode(s) suggest a preponderance of short-distance dispersal events, perhaps favoring persistence over colonization. Recruitment can also occur asexually, by means of underground bulbs; this too is a mechanism of persistence, more than of dispersal. Self-incompatibility is the norm in Lilium, but it attenuates around floral senescence, allowing self-fertilization to occur if outcrossing has failed (Ascher and Peloquin 1966). Accordingly, isolated jump-dispersal events may produce viable populations, albeit of low genetic diversity.

Threats: This species may be threatened by disturbance associated with timber extraction (CNPS 2018), as well as by habitat loss and overzealous collecting (Skinner 2012). Lilium bolanderi hybridizes with L. pardalinum, L. rubescens, and L. washingtonianum subsp. purpurascens, posing a risk of genetic dilution where range overlap occurs (CNPS 2018). Ex situ conservation is unlikely for this species, as it doesn’t thrive in cultivation (Skinner 2012).

Literature Cited


Lilium bolanderi Wats.

[CDFG] California Department of Fish and Game. 2013. 24K Quads, SDE Feature Class. Index for 1:24,000-scale (24K), 7.5-minute by 7.5-minute, paper U.S. Geological Survey maps in California.


[CNDDB] California Department of Fish and Wildlife, Natural Diversity Database. 2017. RareFind 5 [Internet application] and CNDDB Maps and Data. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data [Government Version, May 2017].


[CDF] California Department of Forestry and Fire Protection. 2009. 1:24,000 County Boundaries (cnty24k09_1_poly) [shapefile]. California Department of Forestry and Fire Protection, California Department of Fish and Game. Berkeley Library Geodata. Available at: https://geodata.lib.berkeley.edu/catalog/ark28722-s73w23 [10 December 2017].


Lilium bolanderi Wats.

http://www.arcgis.com/home/item.html?id=9763d83ba63048da8a2e0a71ccea4416 [8 December 2017].


Lilium bolanderi Wats.


Persons Contacted:


Lilium bolanderi Wats.


**Author(s) and Date:**
Seth Kauppinen, Assistant Rare Plant Botanist, California Native Plant Society, (916) 447-2677 x212, skauppinen@cnps.org;

Aaron E. Sims, Rare Plant Botanist, California Native Plant Society, (916) 324-3816, asims@cnps.org. July 11, 2018.

**Reviewer(s) and Date:**
David Magney, Rare Plant Program Manager, California Native Plant Society, (916) 447-2677 ext. 205, dmagney@cnps.org. July 11, 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.