Plant Species Evaluation Form

Lilium pardalinum Kell. **subsp.** *wigginsii* (Beane & Vollmer) M. Skinner

WIGGINS'S LILY

Family: Liliaceae (CNPS 2018)

PLANTS Symbol: LIPAW2 (USDA 2018)

Calif. Endemic: No (CNPS 2018)

Synonyms/Other Names: This taxon was originally noted by Purdy (1919), as a variant of *Lilium roezlii*. This variant was subsequently described as *L. wigginsii* by Beane and Vollmer (1955). *Lilium roezlii* is now regarded as a synonym of *L. pardalinum* subsp. *pardalinum*, and *L. wigginsii* was recombined as *L. pardalinum* subsp. *wigginsii* by Skinner (2002) (Tropicos 2018).

Identification Issues: Differentiation of taxa within *Lilium* depends heavily upon floral characters. Within the *L. pardalinum* complex, *L. pardalinum* subsp. *wigginsii* is distinguished by its uniformly orange or yellow-orange flowers and yellow anthers. While the geographic range of *L. pardalinum* subsp. *wigginsii* does not overlap with congeners of very similar appearance, there is evidence of introgression with other *L. pardalinum* subspecies, a potential source of confusion (Skinner 2002, 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 < 1.7 m, weakly clonal; bulb scales 2--4-segmented. Leaf: whorled (or alternate especially in small plants). Flower: perianth parts 3.4--7.1 cm, not 2-toned (generally uniformly orange or yellow-orange); stamens often malformed or shrunken, anthers 5--13 mm, pale yellow, pollen yellow or orange; pistil 3--4.3 cm. Fruit: 2.3--4.2 cm. eFlora Treatment Author: Mark W. Skinner.

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).

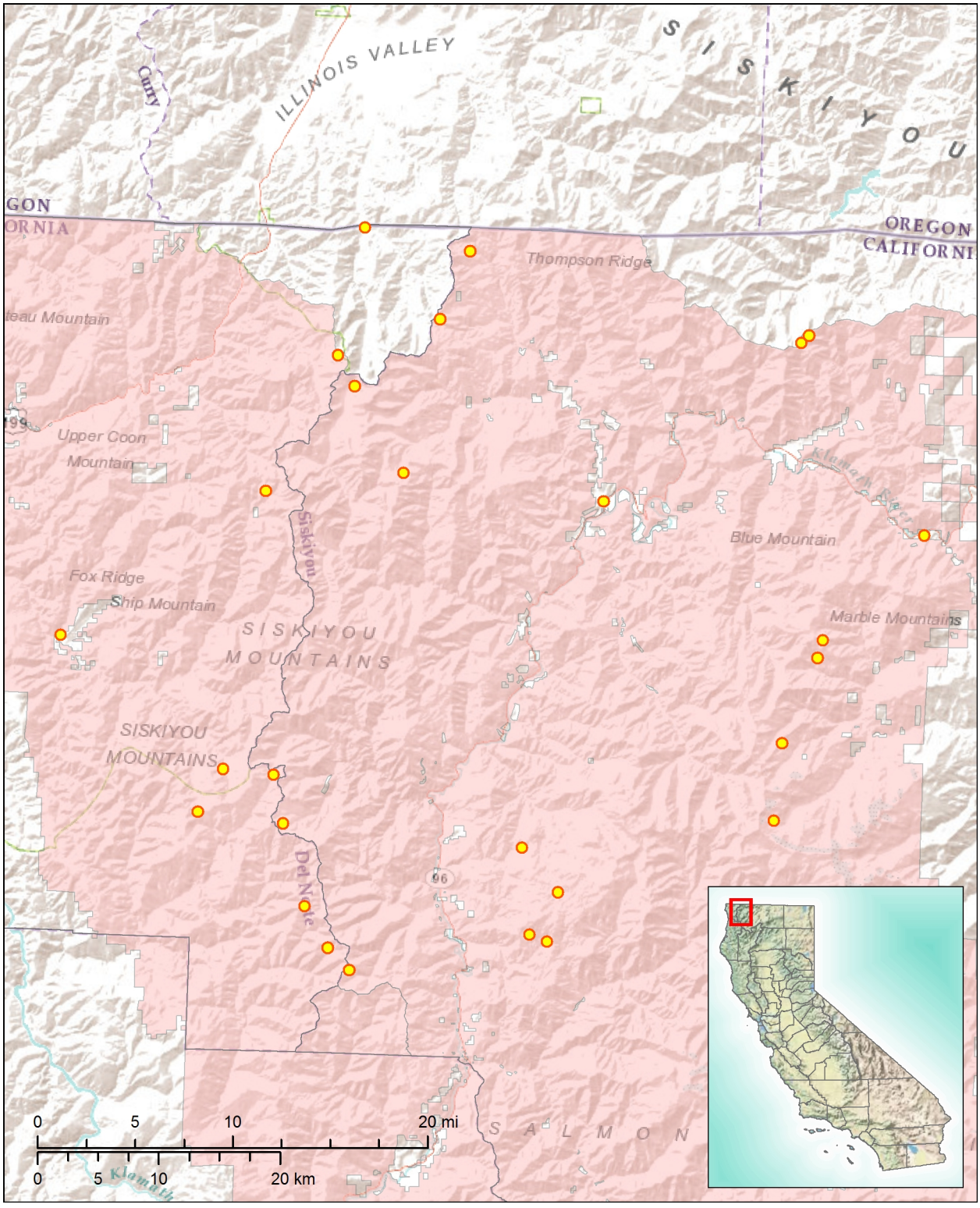
State Listing	G-rank	S-rank	CRPR	R5 FSS	NFP SM	CA BLM
CA: Not listed NV: Not listed OR: Not listed	G5T3	CA: S3 NV: Not listed OR: Not listed	4.3	Not listed	Not listed	Not listed

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).

Distribution: This subspecies occurs in southern Oregon and northwestern California. Within California, it is found in the eastern Klamath Ranges (e KR) bioregion, in Del Norte and Siskiyou counties (CNPS 2018, Skinner 2012). National Forest System lands from which *L. pardalinum* subsp. *wigginsii* has been recorded include Klamath NF and Six Rivers NF (Calflora 2017, CCH 2017).



Sources: *Distribution*: Calflora 2017, CCH 2017. *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.

Redacted for conservation purposes.

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:	1, 3, 4, 6, 7, 8, 10, 13, 15, 16, 20, 21, 23, 24, 25, 26	0	16	4	12	20-Jul-12	8	16
Lake Tahoe Basin MU:	-	-	-	-	-	-	-	0
Lassen:	-	-	-	-	-	-	-	0
Los Padres:	-	-	-	-	-	-	-	0
Mendocino:	-	-	-	-	-	-	-	0
Modoc:	-	-	-	-	-	-	-	0
Plumas:	-	-	-	-	-	-	-	0
San Bernardino:	-	-	-	-	-	-	-	0
Sequoia:	-	-	-	-	-	-	-	0
Shasta-Trinity:	-	-	-	-	-	-	-	0
Sierra:	-	-	-	-	-	-	-	0
Six Rivers:	2, 5, 9, 11, 12, 14, 18, 22	0	8	0	8	21-Jul-88	5	8
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	0	24	4	20	N/A	13	24

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). Of 27 records in the combined dataset, none provide explicit information related to population size, viability or demography. Only four records (14.8%) are associated with observations within the last 20 years (Calflora 2017, CCH 2017).

Life History: *Lilium pardalinum* subsp. *wigginsii* is a perennial bulbiferous herb, which blooms from June through August (CNPS 2018). All five recognized subspecies of *L. pardalinum* are pollinated by hummingbirds of several species, and by large swallowtail butterflies (*Papilio* spp.) (Skinner 2002).

Diversity: The genus *Lilium* consists of about 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 pardalinum* subsp. *wigginsii* is closely allied with *L. bolanderi* and *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 10Mya (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).

Habitat: This taxon is found in a range of moist, mesic habitats, including broadleaf upland forest, lower montane coniferous forest, riparian scrub, wet meadows, and fens. It has been recorded at elevations ranging from 485 to 2,000 meters (CNPS 2018). Co-occurring taxa noted in collection information include: *Abies concolor, Castilleja miniata, Heracleum maximum, Lupinus latifolius, Pinus monticola*, and *Senecio triangularis* (CCH 2017).

Habitat Status or Trend: The Klamath Ranges (KR) bioregion has played host to a remarkable diversification in plant species, as a consequence of complex geology and long history of isolation (Whittaker 1960). The area 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 original old-growth forest remains within the Klamath Ranges bioregion, and ongoing human impacts continue to degrade wild communities, especially in mesic lowland and mid-elevation areas, partly encompassing the elevation range of *L. pardalinum* subsp. *wigginsii*. 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. pardalinum* subsp. *wigginsii* 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: No specific anthropogenic threats to this taxon are documented in the literature. Allied species in the Klamath Ranges bioregion are threatened by the direct and indirect effects of urbanization, as well as by disturbance associated with timber extraction, road construction, and grazing. In some areas, competition from invasive plant taxa may reduce *Lilium* population viability, and overzealous collection for the horticultural trade is also likely to have a significant effect. *Lilium pardalinum* subsp. *wigginsii* is known to form hybrid swarms with *L. pardalinum* subsp. *vollmeri* where their ranges overlap in western Siskiyou County, posing a risk of genetic dilution (CNPS 2018). Ex situ conservation is unlikely for this species, as allied taxa do not thrive in captivity (Skinner 2012).

Literature Cited

Ascher, P. D. and S. J. Peloquin. 1966. Effect of floral aging on the growth of compatible and incompatible pollen tubes in *Lilium longiflorum. American Journal of Botany* 53(1): 99-102.

[BLM] Bureau of Land Management. 2010. Special Status Plants in California, Including BLM Designated Sensitive Species. February 8, 2010. Available at: https://www.blm.gov/ca/dir/pdfs/2010/im/CAIM2010-008ATT2B.pdf [accessed 25 May 2017].

Calflora. 2017. Information on wild California plants for conservation, education, and appreciation. Website http://www.calflora.org/ [accessed 14 June 2017].

[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.

[CDFW] California Department of Fish and Wildlife. 2015. California State Wildlife Action Plan, 2015 Update: A Conservation Legacy for Californians; Volume II, Appendix C: Species of Greatest Conservation Need. Gonzales, A. G. and J. Hoshi (eds.). Prepared with assistance from Ascent Environmental, Inc., Sacramento, CA. Available at: https://www.wildlife.ca.gov/swap/final [accessed 11 May 2017].

[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].

[CDFW] California Department of Fish and Wildlife, Natural Diversity Database. 2018a. Special Vascular Plants, Bryophytes, and Lichens List. Quarterly publication, January 2018. 127 pp. Available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109383 [accessed 22 January 2018].

____. 2018b. State and Federally Listed Endangered, Threatened, and Rare Plants of California. Last updated January 2018. 6 pp. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline [accessed 22 January 2018].

[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].

[CNPS] California Native Plant Society, Rare Plant Program. 2018. *Inventory of Rare and Endangered Plants of California* (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 22 January 2018].

[CPAD] California Protected Areas Database. 2016. Version 2016b1. GreenInfo Network. Available at: http://www.calands.org/.

[CCH] Consortium of California Herbaria. 2017. Data provided by the participants of the Consortium of California Herbaria. Regents of the University of California, Berkeley. Website http://ucjeps.berkeley.edu/consortium/ [accessed 16 May 2017].

Douglas, N. A., W. A. Wall, Q. Xiang, W. A. Hoffmann, T. R. Wentworth, J. B. Gray, and M. G. Hohmann. 2011. Recent vicariance and the origin of the rare, edaphically specialized Sandhills lily, *Lilium pyrophilum* (Liliaceae): evidence from phylogenetic and coalescent analyses. *Molecular Ecology* 20: 2901-2915.

Esri. 2012. World Reference Overlay [basemap overlay]. Scale Range: 1:591,657,528 down to 1:72,224. Esri, DeLorme, USGS, NPS. Updated 2 September 2017. Available at: http://www.arcgis.com/home/item.html?id=9763d83ba63048da8a2e0a71ccea4416 [8 December 2017].

____. 2017a. USA Topo Maps [basemap]. Scale Range: 1:591,657,528 down to 1:18,056. National Geographic Society, i-cubed, 2013. Updated 5 October 2017. Available at: http://www.arcgis.com/home/item.html?id=99cd5fbd98934028802b4f797c4b1732 [8 December 2017].

____. 2017b. World Terrain Base [basemap]. Scale Range: 1:591,657,528 down to 1:72,224. Esri, USGS, NOAA. Updated 9 February 2017. Available at: http://www.arcgis.com/home/item.html?id=c61ad8ab017d49e1a82f580ee1298931 [8 December 2017].

Gao, Y., A. J. Harris, S. Zhou, and X. He. 2013. Evolutionary events in *Lilium* (including *Nomocharis*, Liliaceae) are temporally correlated with orogenies of the Q-T plateau and the Hengduan Mountains. *Molecular Phylogenetics and Evolution* 68: 443-460.

Green, K. and A. E. Sims. 2018. Assessing rarity status of the newly described Shasta County endemic, *Adiantum shastense* (Pteridaceae), by employing innovative tools in geographic information systems. Rare Plant Program, California Native Plant Society. Presented in Scientific Poster session of CNPS 2018 Conservation Conference, Los Angeles, CA, 1-3 February 2018.

[IUCN] International Union for Conservation of Nature. 2017. The IUCN Red List of Threatened Species. Website http://www.iucnredlist.org/ [accessed 26 May 2017].

Kubitzki, K. (ed.). 1998. The Families and Genera of Vascular Plants, Volume 3: Flowering Plants, Monocotyledons, Lilianae (except Orchidaceae). Springer, Hamburg, Germany. 478pp.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Website http://explorer.natureserve.org [accessed 22 January 2018].

[NDF] Nevada Division of Forestry. 2012. NAC 527.010 List of fully protected species of native flora. April 2012. Available at: https://www.leg.state.nv.us/NAC/NAC-527.html#NAC527Sec010 [accessed 12 May 2017].

[NNHP] Nevada Natural Heritage Program. 2017. Species Lists. Department of Conservation and Natural Resources. Available at: http://heritage.nv.gov/species/lists.php [accessed 25 May 2017].

Olson, D., D. A. DellaSala, R. F. Noss, J. R. Strittholt, J. Kass, M. E. Koopman, and T. F. Allnutt. 2012. Climate change refugia for biodiversity in the Klamath-Siskiyou ecoregion. *Natural Areas Journal* 32(1): 65-74.

[ODA] Oregon Department of Agriculture. 2014. Oregon listed and candidate plants - complete list. Native Plant Conservation Program. August 13, 2014. Available at: https://data.oregon.gov/Natural-Resources/Oregon-listed-and-candidate-plants-complete-list/8s3k-ygh2 [accessed 25 May 2017].

[ODFW] Oregon Department of Fish and Wildlife. 2016. Oregon Conservation Strategy, Chapter 6: Strategy Species. Oregon Department of Fish and Wildlife, Salem, Oregon. PDF content last updated December 30, 2016. Available at: http://oregonconservationstrategy.org/ [accessed 25 May 2017].

[ORBIC] Oregon Biodiversity Information Center. 2016. Rare, Threatened and Endangered Species of Oregon. Institute for Natural Resources, Portland State University, Portland, OR. 130 pp. Available at: http://inr.oregonstate.edu/sites/inr.oregonstate.edu/files/2016-rte-book.pdf [accessed 25 May 2017].

Skinner, M. W. 2002. Nomenclatural changes in North American *Lilium* (Liliaceae). *Novon* 12: 253-261.

____. 2012. *Lilium*. *In*: Jepson Flora Project (eds.) *Jepson eFlora*. Website http://ucjeps.berkeley.edu/eflora/ [accessed 3 August 2018].

Tropicos. 2018. Missouri Botanical Garden. Website http://www.tropicos.org [accessed 22 January 2018].

[USDA] U.S. Department of Agriculture Forest Service, Pacific Southwest Region. 2013. Regional Forester Sensitive Species List. Available at: http://www.fs.usda.gov/main/r5/plants-animals/plants [accessed 9 May 2017].

[USDA] U.S. Department of Agriculture Forest Service and U.S. Department of Interior Bureau of Land Management. 2001. List of Survey and Manage Species in Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures; as amended by Annual Species Reviews 2001-2003. Available at: https://www.blm.gov/or/plans/surveyandmanage/files/sm-fs-enc3-table1-1-dec2003wrtv.pdf [accessed 12 September 2017].

[USDA] U.S. Department of Agriculture, Natural Resources Conservation Service. 2018. PLANTS Database. Website http://plants.usda.gov/ [accessed 22 January 2018].

Vinnerstein, A. and K. Bremer. 2001. Age and biogeography of major clades in Liliales. *American Journal of Botany* 88(9): 1695-1703.

Whittaker, R. H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. *Ecological Monographs* 30(3): 279-338.

Persons Contacted:

Carlberg, T. 2017. USDA Forest Service, Six-Rivers National Forest; President, California Lichen Society. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Loleta, CA. Contacted 16-18 November 2017.

Goldsworthy, E. 2017. Botanist, Green Diamond Resource Company, Arcata, CA. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Eureka, CA. Contacted 16-18 November 2017.

Hoover, L., J. McRae, and S. Carothers. 2017. Hoover and McRae: Forest Botanists, Six Rivers NF, Eureka, CA; Carothers: Botanical Contractor, Arcata, CA. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Loleta, CA. Contacted 16-18 November 2017.

O'Connell, G., G. Lester, D. York, B. Clare, G. Laural, P. Clint. 2017. California North Coast botanists. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Loleta, CA. Contacted 16-18 November 2017.

Taylor, D. Wm. 2017. Environmental contractor, Aptos, CA. Information submitted at Mendocino/Six Rivers FS-SCC and Important Plant Areas (IPA) Workshop, Eureka, CA. Contacted 16-18 November 2017.

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. October 25, 2018.

Reviewer(s) and Date:

David Magney, Rare Plant Program Manager, California Native Plant Society, (916) 447-2677 ext. 205, dmagney@cnps.org. October 25, 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.