Plant Species Evaluation Form

Sedum citrinum Zika

BLUE CREEK STONECROP

Family: Crassulaceae (CNPS 2018) | **PLANTS Symbol:** SECI6 (USDA 2018) | **Calif. Endemic:** Yes (CNPS 2018)

Synonyms/Other Names: *Sedum citrinum* was described by P. Zika in 2014, from specimens collected in the Klamath Mountains of southern Del Norte County, California. The name is accepted, and no synonyms exist (Tropicos 2018).

Identification Issues: *Sedum citrinum* is distinguished from other sedums in the section *Gormania* by a combination of open rosettes, leaves that are widest above the middle, a flat-topped inflorescence, and yellow flowers with spreading petals (Zika et al. 2018).

Taxonomy:

Species In Genus: +- 450 species: temps, tropical mountains, North America, Mexico, Central America, Europe, Asia, northern and eastern Africa, Atlantic islands, Indian Ocean islands; cultivated as ornamental, green roofs. Etymology: (Latin: to assuage, from healing properties of houseleek, to which *Sedum* was sometimes applied). Note: *Sedum roseum* moved to *Rhodiola*.

Habit: Plant 5--27.5 cm, rhizomed; rosettes open, 2--7 cm diameter, internodes generally visible. Leaf: rosette leaves 8--31 mm, 6--22 mm wide, oblanceolate to obovate, wedge-shaped, apex obtuse or notched. Inflorescence: panicle-like, generally flat-topped, 10--95-flowered; bracts opposite, 5--7 mm, 2--3 mm wide, base truncate, narrowly obovate, tip obtuse, rarely notched. Flower: petals 6--9 mm, deep yellow, lanceolate and +- mucronate. Fruit: fused at base, 5.2--6.5 mm, erect. Seed: 1.2--1.5 mm. eFlora Treatment Author: Steve Boyd & Melinda F. Denton (to be replaced in 2022 by a new eFlora treatment based on Zika et al. 2018).

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	G2	CA: S2 NV: Not listed OR: Not listed	1B.2	Not listed	Not listed	Not listed

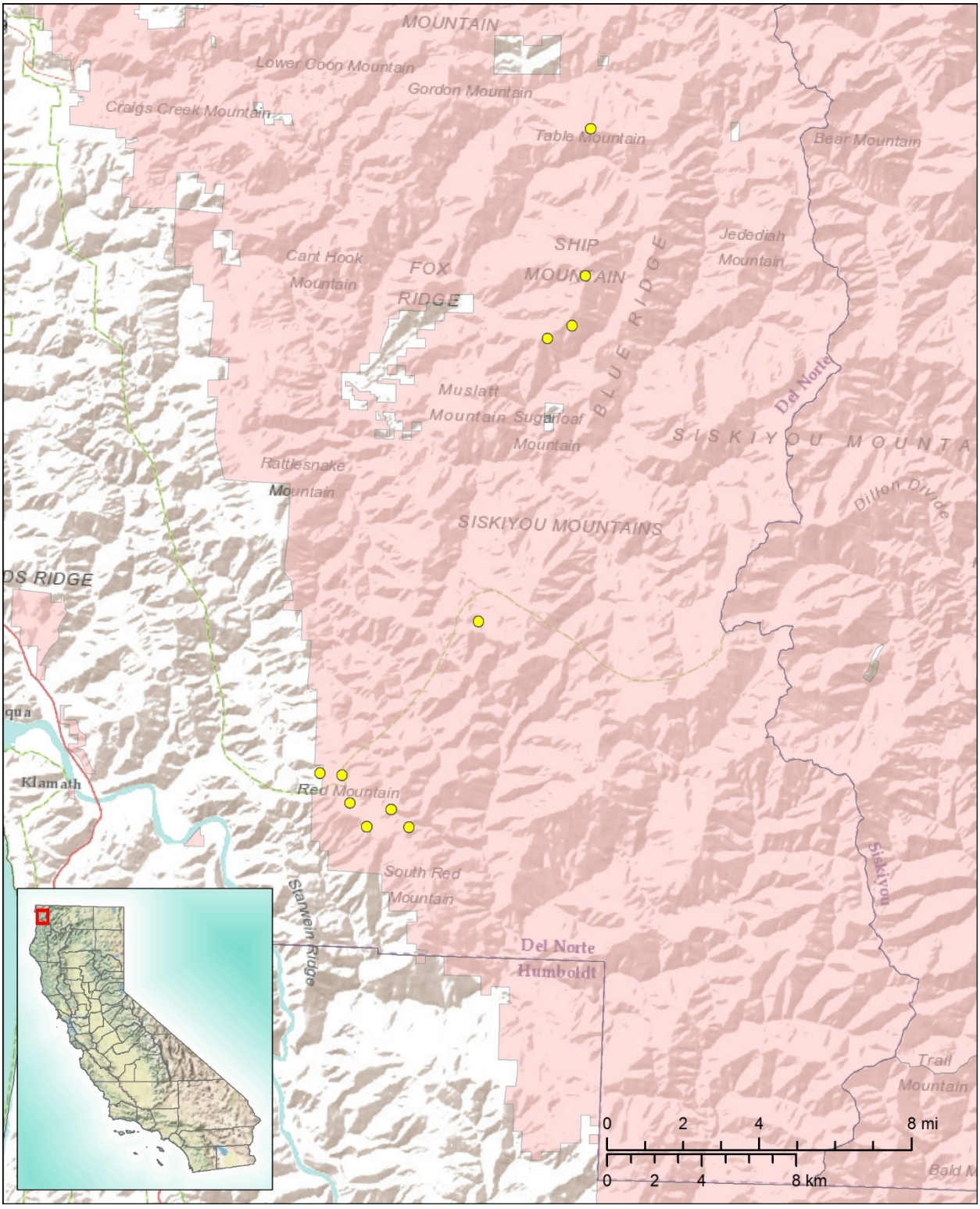
SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	Not listed	Not listed	Not listed

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).

Sedum citrinum was added to California Rare Plant Rank 1B.2 of the CNPS *Inventory* in 2015, when known from approximately six occurrences (Slakey et al. 2015; CNPS 2018).

Distribution: This species is a California endemic, known from just three populations within the North Coast Coniferous Forest bioregion of the Klamath Mountains, in Del Norte County (Zika 2014). Populations tend to be small and relatively isolated from one another. All eleven occurrences of this species occur within Six Rivers National Forest, with one occurrence (EO 6) also occurring on private property (CNDDB 2017).



Sources: *Distribution*: CCH 2017, CNDDB 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:	-	-	-	-	-	-	-	0
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:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	11	0	10	1	5-Jun-2015	1	11
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	11	0	10	1	N/A	1	11

Demographic and Population Trends: There are 11 occurrences of *Sedum citrinum*, of which five provide population size estimates. All five indicate that 300-500 ramets were present within the survey site. Only one record is more than six years old—and that record comes from an observer's recollection, offered after *S. citrinum* was described in 2014. None of the occurrences have year-on-year demographic data, so nothing can be inferred about persistence or population change within sites (CNDDB 2017). Given the recent description of this species, it is probable that undetected populations exist; additional field work is necessary for an accurate description of demography and population structure in *S. citrinum*.

Life History: *Sedum citrinum* is a succulent, perennial herb favoring rocky ultramafic sites. It has been observed to bloom in June (CNPS 2018). *Sedum* species are known to be pollinated by an array of bees, beetles, and butterflies, as well as a limited number of fly species (CPC 2018). Members of Section *Gormania* retain a generalist pollination syndrome, and are visited by the Hymentopteran families Apidae, Andrenidae, Megachilidae, Nomadidae, and Formicidae; the Dipteran families Bombylidae and Syrphidae; and the Coleopteran families Chrysomelidae and Mordellidae (Denton 1979). The principal pollinators for *S. citrinum* are unknown, but likely include some or all of these groups.

Diversity: *Sedum* is the most species-rich and taxonomically problematic genus within Crassulaceae, encompassing about 420 species showing an immense diversity of form—much of it homoplastic—that makes it impossible to characterize the genus phenotypically. Crassulaceae are also difficult to preserve in herbaria, owing to their delicate structure and succulent tissues. A recent molecular phylogenetic analysis shows that the genus is grossly polyphyletic, but that there are some coherent higher-level taxa within Crassulaceae. The majority of *Sedum* species fall within the tribe Sedeae, comprising the large Acre clade and a paraphyletic grade, the *Leucosedum* cluster. Below the genus level, some structure has been teased apart: subgenus *Sedum* has 320 species occurring mainly in Asia and the Americas, while subgenus *Gormania* contains 110 species distributed through Europe, the Mediterranean and North America. *Sedum citrinum* falls within the latter group (Nikulin et al. 2016). Section *Gormania* is restricted to western North America, with taxa occurring on rocky outcrops between 55 and 3,700 meters in elevation. Species in this group form a ploidal series, beginning with a haploid number of fifteen; however, polyploidization alone is believed to be an effect of diversification, rather than the cause. The Klamath region is especially rich in taxa of Section *Gormania*, as physical isolation, substrate specialization and divergence in reproductive morphology has promoted diversification of narrow endemics. These recently evolved species are characterized by extensive vegetative reproduction, morphological variability, polyploid genomes, and self-incompatibility; relictual species in the same area are usually diploid, morphologically homogeneous, self-compatible and restricted to a single substrate type—mostly at lower elevations (Denton 1979).

Habitat: *Sedum citrinum* occurs within rock crevices, on talus and scree slopes, and sometimes along road-cuts, from 1,050 to 1,280 meters in elevation. The species favors ultramafic substrates, often growing on serpentinite (CNPS 2018). Taxa belonging to *Sedum* section *Gormania* frequently specialize on a single substrate type (Denton 1979); it is not known to what extent *S. citrinum* is limited by edaphic conditions.

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, partly encompassing the elevation range of *S. citrinum*. 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: As a recently-evolved member of Section *Gormania*, *Sedum citrinum* is likely characterized by extensive vegetative reproduction and a low level of self-compatibility (Denton 1979). This mix of traits favors local persistence and colonization, while rendering long-distance dispersal via resistant diaspores somewhat less likely. No data exist to evaluate these hypotheses.

Threats: Several potential threats to *Sedum citrinum* have been noted by Zika (2014) and D. Brainerd (pers. comm. 2015), including road-widening, road maintenance, off-road vehicles, and mining (due to evidence of past mining at once site). However, Darington (pers. comm. 2015) suggested that these threats are over-stated, given that the deteriorating state of the access road to *S. citrinum* populations discourages use, and that the very rugged terrain and lack of water prevent use by off-road riders and campers. Darington mentioned instead that climate change and fire suppression are the only significant threats to *S. citrinum* (Slakey et al. 2015; CNPS 2018).

Horticultural collecting is also a potential threat to *Sedum citrinum* (CNPS 2018), and poaching for decorative purposes ought to be considered as a potential threat with regards to the recent poaching of *Dudleya* spp. off the north coast of California (CDFW News 2018; Krieger 2018). Lastly, as a narrow endemic with few known occurrences and relatively small population sizes, *Sedum citrinum* is vulnerable to acute disturbance at local scales, as well as more chronic regional pressures.

Literature Cited

Boyd, S. and M. Denton. 2017. *Sedum citrinum*. *In*: Jepson Flora Project (eds.), *Jepson eFlora*, *Revision 5.* Website http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=100425 [accessed 18 April 2018].

[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].

[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].

[CDFW] California Department of Fish and Wildlife News. 2018. CDFW Wildlife Officers Arrest Three for Poaching Succulents in Humboldt County [online article]. Available at https://cdfgnews.wordpress.com/2018/04/06/cdfw-wildlife-officers-arrest-three-for-poaching-succulents-in-humboldt-county/ [accessed 20 July 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/.

[CPC] Center for Plant Conservation. 2018. CPC National Collection Rare Plant Database. Website https://saveplants.org/national-collection/pollinator-search/ [accessed 9 February 2018].

[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].

Denton, M. 1979. Factors contributing to evolutionary divergence and endemism in *Sedum* Section *Gormania* (Crassulaceae). *Taxon* 28(1/3): 149-155.

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].

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

Krieger, L. 2018. How an irked Northern California postal patron helped crack a global plant smuggling scheme [online article]. The Mercury News, Bay Area News Group. Available at https://www.mercurynews.com/2018/04/20/busting-plant-smugglers-along-californias-coast/ [accessed 20 July 2018].

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].

Nikulin, V., S. Gontcharova, R. Stephenson, and A. Gontcharov. 2016. Phylogenetic relationships between *Sedum* L. and related genera (Crassulaceae) based on ITS rDNA sequence comparisons. *Flora* 224: 218-229.

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].

Slakey, D., A. E. Sims, and R. Bittman. 2015. Rare Plant Status Review: *Sedum citrinum* – Proposed Addition to California Rare Plant Rank 1B.2, G2 / S2. Rare Plant Program report, 9 March and 20 April 2015. California Native Plant Society, Sacramento, CA. 3 pp.

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].

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

Zika, P. 2014. A new species of stonecrop (*Sedum* section *Gormania*, Crassulaceae) from northern California. *Phytotaxa* 159(2): 111-121.

Zika, P. F., Wilson, B. L., Brainerd, R. E., Otting, N., Darington, S., Knaus, B. J., & Nelson, J. K. (2018). A review of *Sedum* section *Gormania* (Crassulaceae) in western North America. *Phytotaxa,* 368(1), 1-61.

Persons Contacted:

Brainerd, Dick. 2015. Carex Working Group. Email correspondence regarding distribution and conservation status of *Sedum citrinum*. Personal communication March 2015.

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.

Darington, Steven. 2015. Horticultural Council, The Jepson Manual Project, Eureka, CA. Email correspondence regarding distribution and conservation status of *Sedum citrinum*. Personal communication March 2015.

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.

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Julie Ann Kierstead, USDA Forest Service Region 5 Ecosystem Planning, 8 December 2021.

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.