Plant Species Evaluation Form

Calamagrostis crassiglumis Thurb.

THURBER'S REED GRASS

Family: Poaceae (CNPS 2018) | **PLANTS Symbol:** CASTI3 (USDA 2018) | **Calif. Endemic:** No (CNPS 2018)

Synonyms/Other Names: *Calamagrostis crassiglumis* was originally described by G. Thurber, and published in Watson (1880). The species was re-evaluated by two authors in 1951 within a single publication as *Calamagrostis neglecta* var. *crassiglumis* (Thurb.) Beal, and as *Deyeuxia crassiglumis* (Thurb.) Vasey. Both names are considered invalid synonyms. There are two additional names accepted in recent works, however: *Calamagrostis neglecta* subsp. *inexpansa* (A. Gray) Tzvelev, and *Calamagrostis stricta* subsp. *inexpansa* (A. Gray) C.W. Greene (Tropicos 2018). *The Jepson Manual, Second Edition* (*TJM2*) (Peterson et al. 2012) uses the latter name.

Identification Issues: Among the species of *Calamagrostis* with awns included (i.e. not exserted beyond glume tips) and wide leaf blades (2-10 mm), *C. crassiglumis* is one of two taxa with dense panicles, appressed lower branches, and glumes less than 3 times longer than wide. Of these two, *C. crassiglumis* is distinguished by longer glumes (3-6 mm), which are relatively thick and possess an opaque margin (Peterson et al. 2012). As recognized by CNPS (Slakey et al. 2013; CNPS 2018) and later recognized by the primary treatment author of *Calamagrostis* in *TJM2* (Peterson, P. pers. comm. 2013), *C. crassiglumis* differs from *C. stricta* subsp. *inexpansa* in having thickened glumes that are rounded toward the base rather than keeled, as well as shorter ligules and shorter panicles. Provided that specimens are flowering, and assuming some facility with grass morphology, identification of *C. crassiglumis* should not pose any special difficulty. See Taxonomy section below for comparison of characters that distinguish *C. crassiglumis* from *C. stricta* subsp. *inexpansa*.

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: +- 265 species (including *Deyeuxia*): cool temperate (especially moist montane); some forage value. Etymology: (Greek: reed grass). Note: Hybridization, polyploidy (diploids unknown), and asexual seed set contribute to taxonomic difficulty.

Species Description of *Calamagrostis stricta* subsp. *inexpansa*:
Stem: 4--12 dm. Leaf: ligule 2--5.5 mm; blade flat, strongly scabrous, upper surface generally glaucous. Inflorescence: 6--20 cm; longest branches 1.5--9.5 cm. Spikelet: glumes 3--6 mm, generally thick, margin opaque; axis 1--1.5 mm; callus hairs 2--4.5 mm; lemma 2.5--5 mm; awn occasionally twisted, bent, stiff; anthers generally sterile. eFlora Treatment Author: Paul M. Peterson, Jeffery M. Saarela & Craig W. Greene.

Calamagrostis crassiglumis is primarily distinguished from *C. stricta* subsp. *inexpansa* in glume texture and shape: *C. crassiglumis* has thickened glumes that are rounded towards the base (vs. membranous, not thickened glumes that are keeled towards the base), generally shorter ligules (1-3 mm long vs. 2-5.5(6) mm long), and generally shorter panicles (3-8 cm long vs. (5)8-15 cm long in *C. stricta* subsp. *inexpansa*) (Peterson, P. pers. comm. 2013; Slakey et al. 2013; CNPS 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	G3Q	CA: S2 NV: Not listed OR: Not listed	2B.1	Not listed	Not listed	Not listed

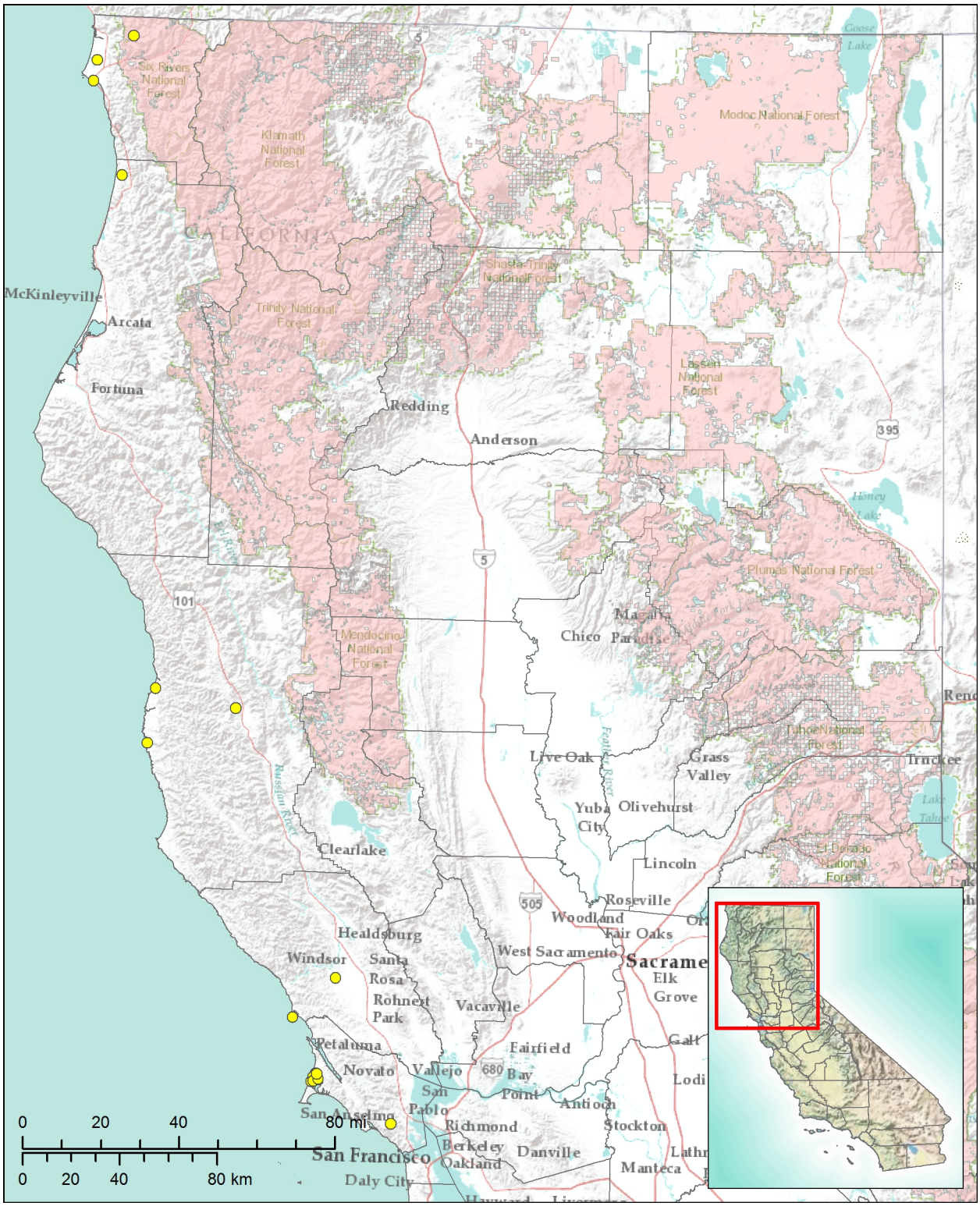
SWAP:	NNHP:	NNPS:	ORBIC:	OCS:	IUCN:
Not listed	Not listed	Not listed	Not listed	Not listed	Not listed

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).

Calamagrostis crassiglumis has been included in the *CNPS Inventory of Rare and Endangered Plants* since 1980 (Smith et al. 1980). In August of 2013, *C. crassiglumis* underwent a CNPS status review proposal to change its rank from California Rare Plant Rank (CRPR) 2B.1 to CRPR 3.1 based primarily on its treatment as a synonym of *C. stricta subsp. inexpansa* in *TJM2* (Peterson et al. 2012). However, during the review process, Paul Peterson (the primary treatment author of *Calamagrostis* in *TJM2*) further studied the types of *C. crassiglumis* and *C. inexpansa*, and additional collections of *C. crassiglumis* from California, Washington, Alaska, and British Columbia, and was able to consistently distinguish *C. crassiglumis* from *C. stricta* subsp. *inexpansa* (Peterson, P. pers. comm. 2013; Slakey et al. 2013), elucidating that *C. crassiglumis* is a unique taxanomic entity worthy of recognition. Based on Paul Peterson's comments, the status review was updated and its CRPR was not changed from 2B.1 (Slakey et al. 2013).

Distribution: *Calamagrostis crassiglumis* occurs across much of the northern hemisphere, ranging from northeastern Asia to Alaska, western Canada and much of the western United States, as well as northeastern North America. *Calamagrostis crassiglumis* occurs in the following ten western states: Arizona, California, Colorado, Idaho, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming (CNPS 2018). Within California, it is found in Del Norte, Humboldt, Mendocino, Marin, and Sonoma counties—representing the Klamath Region (KR), North Coast (NCo), and Outer North Coast Ranges (NCoRo) bioregions (Peterson et al.

2012; CNPS 2018). USDA Forest Service lands on which *C. crassiglumis* has been documented include only Six Rivers National Forest (CNDDB 2017).



Sources: *Distribution*: Calflora 2017, 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.

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
1	LAKE EARLE.	Del Norte	Crescent City (4112472)	CNDDB, May 2017 (EO 1)	1-Jun-1902	ONLY SOURCE OF INFORMATION FOR THIS SITE IS A 1902 DAVY COLLECTION, CURRENTLY DETERMINED AS CALAMAGROSTIS STRICTA SSP. INEXPANSA. NEEDS FIELDWORK AND ID CONFIRMATION.		California Depart. of Fish and Wildlife	
2	CRESCENT CITY.	Del Norte | Pacific Ocean	Crescent City (4112472)	CNDDB, May 2017 (EO 2)	01-Jan-1899	ONLY SOURCE OF INFORMATION FOR THIS SITE IS AN 1899 COLLECTION BY DUDLEY; SPECIMENS HERE DETERMINED AS C. STRICTA SSP. INEXPANSA AND C. NUTKAENSIS, NEEDS ID CONFIRMATION.		Unknown	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
3	UPPER PITKIN MARSH, NEAR THE END OF TEMPLEMAN ROAD, NORTHWEST OF SEBASTOPOL.	Sonoma	Sebastopol (3812247)	CNDDB, May 2017 (EO 3)	1-Jan-1974	SEEN IN 1966 AND 1974.		PVT	150
3	Pitkin Marsh, near Forestville	Sonoma	Sebastopol (3812247)	CCH, Jan 2017 (UCR254900)	29-May-1966			Lower Pitkin Marsh	125
4	JUST SOUTH OF ABBOTTS LAGOON ON LUNNY RANCH, ABOUT 1.5 MILES SOUTHWEST OF H RANCH, POINT REYES NATIONAL SEASHORE.	Marin	Drakes Bay (3812218)	CNDDB, May 2017 (EO 4)	18-Jul-1989	58 PLANTS SEEN IN 1987, ABOUT 15 PLANTS SEEN IN 1989. THE RARE CAMPANULA CALIFORNICA ALSO OCCURS AT THIS SITE.	MAJOR DISTURB-ANCE IS CATTLE GRAZING & TRAMPLING.	NPS-Point Reyes NS	40

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
5	NORTH BEACH ACCESS ROAD, ABOUT 0.2 MILE WEST OF SIR FRANCIS DRAKE BLVD, POINT REYES NATIONAL SEASHORE.	Marin	Drakes Bay (3812218)	CNDDB, May 2017 (EO 5)	22-May-1998	30-50 PLANTS AT N COLONY IN 1987; ~30 PLANTS IN 1989 & 1992 AT N COLONY. 3 PLANTS IN 1995 AT SOUTHERN COLONY. SPECIES NOT FOUND IN 1997. UNK # SEEN IN 1998. OTHER RARE SPP: AGROSTIS BLASDALEI, CAMPANULA CALIFORNICA, ETC.	PLANTS LESS VIGOROUS NORTH OF FENCE DUE TO GRAZING. SWALE AREA OVERGROWN WITH HOLCUS LANATUS AND BLACK-BERRIES IN 1997.	NPS-Point Reyes NS	100
6	AT&T RADIO STATION ON SIR FRANCIS DRAKE BLVD, ABOUT 2.5 AIR MILES SOUTHWEST OF H RANCH, POINT REYES NATIONAL SEASHORE.	Marin	Drakes Bay (3812218)	CNDDB, May 2017 (EO 6)	5-Jun-1998	NOT FOUND IN VICINITY IN 1983 AND 1987. N POLYGON: 5 PLANTS SEEN IN 1989. S POLYGON: 83 PLANTS IN 1995, 14 PLANTS IN 1998. INCLUDES 1947 AND 1949 COLLECTIONS FROM "SWALE NEAR RADIO STATION." INCLUDES FORMER OCCURRENCE #10.	CATTLE GRAZING; IMPACTS UNKNOWN. VEHICLE TRAFFIC FROM ANTENNA MAINTEN-ANCE.	NPS-Point Reyes NS	50
6	Point Reyes Peninsula; swale near radio station.	Marin	Drakes Bay (3812218)	CCH, Jan 2017 (SEINET2 37852)	4-Jun-1947			Point Reyes Nat. Seashore	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
6	California: Point Reyes Peninsula, Marin County. Swale near radio station.	Marin	Drakes Bay (3812218)	CCH, Jan 2017 (GH341560)	4-Jun-1947			Point Reyes Nat. Seashore	
7	EAST END OF INGLENOOK FEN, ABOUT 5.5 MILES NORTH OF FORT BRAGG, MACKERRICHER STATE PARK.	Mendocino	Inglenook (3912357)	CNDDB, May 2017 (EO 8)	27-Aug-1983	FEWER THAN 50 PLANTS OBSERVED AT EAST END OF FEN IN 1983. PLANTS SEEN AT WEST END OF FEN HAVE UNCERTAIN ID; COLLECTION MADE AT SITE MATCHED ANOTHER SPECIMEN OF C. CRASSIGLUMIS, BUT ANDERSON THOUGHT THAT BOTH SPECIMENS WERE C. NUTKAENSIS.		DPR-Macker-richer SP	80
8	NW OF HEAD OF CREAMERY BAY, ABOUT 3.2 MILES SOUTHWEST OF H RANCH, POINT REYES NATIONAL SEASHORE.	Marin	Drakes Bay (3812218)	CNDDB, May 2017 (EO 9)	10-Jun-2000	1000-1500 PLANTS ESTIMATED IN 1989; ALMOST NONE FOUND IN BRIEF SEARCH IN 1990; 733 PLANTS OBSERVED IN 1992. ALSO SEEN IN 1999 AND 2000.	CATTLE GRAZING IN IMMEDIATE AREA; GRAZING EFFECTS NOT KNOWN.	NPS-Point Reyes NS	25
8	Point Reyes - Bull Point	Marin	Drakes Bay (3812218)	Calflora, May 2017 (jgr12881)	5-Jun-1999	1+ individuals		Point Reyes Nat. Seashore	10

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
9	WEST SIDE OF SCHOONER BAY, APPROXIMATE-LY 0.4 AIR MILE NORTH OF SCHOONER LODGE SITE.	Marin | Pacific Ocean	Drakes Bay (3812218)	CNDDB, May 2017 (EO 11)	22-May-2002	UNKNOWN NUMBER OF PLANTS OBSERVED IN 2002.		NPS-Point Reyes NS	40
10	SOUTH OF ABBOTTS LAGOON, ABOUT 1.3 AIR MILES SOUTHWEST OF H RANCH, POINT REYES NATIONAL SEASHORE.	Marin	Drakes Bay (3812218)	CNDDB, May 2017 (EO 12)	26-May-2000	12 PLANTS SEEN IN 2000; PLANTS ARE ONLY ABOUT 12 INCHES HIGH.	CATTLE.	NPS-Point Reyes NS	60
11	MT TAMALPAIS.	Marin	San Rafael (3712285)	CNDDB, May 2017 (EO 13)	25-Apr-1910	ONLY SOURCE OF INFORMATION FOR THIS SITE IS A 1910 CHASE COLLECTION; SPECIMEN DETERMINED AS C. STRICTA SSP. INEXPANSA, ID SHOULD BE REVIEWED.		Marin Municipal Water District	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
12	BODEGA HEAD.	Sonoma	Bodega Head (3812331)	CNDDB, May 2017 (EO 14)	30-Apr-1997	ONLY SOURCE OF INFORMATION FOR THIS SITE IS A 1997 KELCH COLLECTION; SPECIMEN DETERMINED AS C. STRICTA SSP. INEXPANSA, ID SHOULD BE REVIEWED.		DPR-Sonoma Coast SP?	50
13	MENDOCINO CITY.	Mendocino | Pacific Ocean	Mendocino (3912337)	CNDDB, May 2017 (EO 15)	01-Jun-1865	ONLY SOURCE OF INFORMATION FOR THIS SITE IS AN 1865 BOLANDER COLLECTION. NEEDS FIELDWORK.		Unknown	150
13	Mendocino City Mendocino City	Mendocino	Mendocino (3912337)	CCH, Jan 2017 (GH341562)	01-Jul-1865				
13		Mendocino	Mendocino (3912337)	CCH, Jan 2017 (GH24591)	Unknown				
14	PRAIRIE CREEK REDWOODS STATE PARK.	Del Norte | Humboldt	Fern Canyon (4112441)	CNDDB, May 2017 (EO 16)	Unknown	ONLY SOURCE OF INFORMATION FOR THIS SITE IS A 1983 AREA CHECKLIST IN CALFLORA, UNKNOWN WHEN PLANTS SEEN. NEEDS FIELDWORK.		DPR-Prairie Creek Redwoods SP	

Rec. #	Locality	County	Quad	Reference (Source)	Date Last Observed	Population Info	Threats	Land Manager	Elev. (ft.)
14	Prairie Creek Redwoods SP	Humboldt	Fern Canyon (4112441)	Calflora, May 2017 (casp118)	1-Jan-1983	1+ individuals		Prairie Creek Redwoods SP	
14	Humboldt Co. California.	Humboldt	Fern Canyon (4112441)	CCH, Jan 2017 (GH341561)	01-Jan-1869				
15	L.E. HORTON RESEARCH NATURAL AREA, SIX RIVERS NATIONAL FOREST.	Del Norte	High Divide (4112481)	CNDDB, May 2017 (EO 17)	Unknown	ONLY SOURCE OF INFORMATION FOR THIS OCCURRENCE IS 2004 REPORT, UNKNOWN WHEN OR HOW MANY PLANTS SEEN. NEEDS FIELDWORK.		Six Rivers NF	
15	L. E. Horton Research Natural Area Six Rivers National Forest aka STONE CORRAL-JOSEPHINE PERIDOTITE	Del Norte	High Divide (4112481)	Calflora, May 2017 (ce407)	1-Jan-1986	1+ individuals		Six Rivers NF	1286

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:	15	1	0	0	1	1-Jan-1986	2	1
Stanislaus:	-	-	-	-	-	-	-	0
Tahoe:	-	-	-	-	-	-	-	0
Totals:	N/A	1	0	0	1	N/A	2	1

Demographic and Population Trends: *Calamagrostis crassiglumis* is known from 15 Element Occurrences (EOs) based on a total of 24 records. Only six records have information related to population size, of which four provide data for multiple years. All but one record indicates fewer than 100 individuals (ranging from 12 to 83), while a single record documents 1,500 individuals in 1989, decreasing to 733 in 1992. Of the remaining three records with year-on-year information, all show decreases: 58 to 15 across two years; 40 to zero across ten years; and 83 to 14 across three years (Calflora 2017, CCH 2017, CNDDB 2017). This apparent pattern of small populations, possibly decreasing over time, suggests that additional surveys should be conducted to evaluate the stability of *C. crassiglumis* populations.

Life History: *Calamagrostis crassiglumis* is a perennial rhizomatous herb that flowers from May through August (CNPS 2018). Other species within *Calamagrostis* exhibit a range of reproductive modes, from full self-incompatibility to apomixis; these differing strategies are correlated with both ploidy and ecological niche (Greene 1984). The reproductive strategy of *C. crassiglumis* is unknown.

Diversity: The genus *Calamagrostis* has long been recognized for its taxonomic complexity, with extensive morphological variation within and between species. Intergrading forms are common; the consequence of apomixis, polyploidy, and hybridization (Greene 1984). In addition, substantial phenotypic plasticity exists in at least some species, with morphology and biomass allocation changing markedly in response to nutrient availability (Lehmann and Rebele 2005). In general, self-incompatible, sexually reproducing taxa are confined to late-successional regimes, and persist as rhizomes; more disturbed or dynamic habitats are occupied by apomictic and asexual forms (Greene 1984). Some species are capable of inhibiting germination and establishment of tree seedlings via competition, and are treated as weeds in silvicultural systems (Lieffers and MacDonald 1993). *Calamagrostis* spp. are able to spread rapidly into contiguous disturbed sites by clonal foraging; growth via rhizomatous extension into areas of high nutrient density (MacDonald and Lieffers 1993). This foraging behavior, together with a capacity for rapid biomass accumulation, allows *Calamagrostis* spp. to buffer the ecological effects of anthropogenic acid deposition (Fiala et al. 2005). The phyogeographic history of *Calamagrostis* in western North America is characterized by repeated cycles of range expansion and contraction, in response to the advance and retreat of glaciers during the Pleistocene (Marr et al. 2011). This history may partly explain the extensive local diversification and recombination evident in this genus.

Habitat: Within California, *Calamagrostis crassiglumis* occurs in mesic coastal scrub, and swamps and freshwater marshes between sea level and approximately 60 meters in elevation (CNPS 2018). The elevation of the Six Rivers NF occurrence is approximately 462 meters (CNDDB 2017; Google Inc. 2015). *Calamagrostis crassiglumis* tolerates a variety of edaphic conditions, including open rocky areas and sandy soils in stabilized dunes (CNDDB 2017). The more broadly circumscribed synonymous taxon *C. stricta* subsp. *inexpansa* is known to grow at elevations of up to 3,400 meters *Calamagrostis crassiglumis* (Peterson et al. 2012). Species known to co-occur with *C. crassiglumis* include: *Agrostis oregonensis, Briza minor, Carex* spp., *Castilleja uliginosa, Deschampsia holciformis, Gentiana sceptrum, Hypericum anagalloides, Hypochaeris radicata, Iris douglasiana, Hosackia gracilis* [*Lotus formosissimus*]*, Juncus* spp., *Myrica californica, Platanthera leucostachys, Rhododendron* spp., *Rubus* spp., *Rumex acetosella*, *Scirpus s.l.* spp., *Sisyrinchium bellum, S. californicum*, and *Trifolium wormskioldii* (CNDDB 2017).

Habitat Status or Trend: The Klamath Ranges (KR) and immediately adjoining regions (NCo and NCoRo) have played host to a remarkable diversification in plant species, as a consequence of complex geology and a 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 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 *C. crassiglumis*. The scale and speed of anthropogenic climate change might exceed the region's ability 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: *Calamagrostis* contains strictly sexual, outcrossing taxa that persist primarily via rhizomes, as well as apomictic and asexual taxa (Greene 1984). Self-fertilization and asexuality are strongly associated with successful long-distance dispersal, while outcrossing tends to limit colonization ability (Baker 1955). However, it is remains unclear which of these strategies characterizes *C. crassiglumis*. The species' capacity for dispersal can be gauged in part by morphology: its florets are equipped with a basal tuft of bristly hairs (Peterson et al. 2012), a structure that may aid in zoochorous dispersal, via external attachment. Endozoochorous dispersal has also been demonstrated as a major mode of spread in *Calamagrostis* (Cosyns et al. 2005); in areas where grazing occurs, this may be especially important for *C. crassiglumis*.

Threats: Threats to the viability of *C. crassiglumis* populations in California include grazing and associated trampling by cattle; vehicle traffic; and overgrowth by invasive species—notably Rubus (CNDDB 2017).

Literature Cited

Baker, H. G. 1955. Self-compatibility and establishment after 'long-distance' dispersal. *Evolution* 9(3): 347-349.

[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].

Cosyns, E., S. Claerbout, I. Lamoot, and M. Hoffmann. 2005. Endozoochorous seed dispersal by cattle and horse in a spatially heterogeneous landscape. *Plant Ecology* 178(2): 149-162.

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].

Fiala, K., I. Tuma, P. Holub, and J. Jandak. 2005. The role of *Calamagrostis* communities in preventing soil acidification and base cation losses in as deforested mountain area affected by acid deposition. *Plant and Soil* 268(1/2): 35-49.

Google Inc. 2015. Google Earth (Version 7.1.5.1557) [Software]. Available at https://www.google.com/earth/ [accessed 20 June 2018].

Greene, C. W. 1984. Sexual and apomictic reproduction in *Calamagrostis* (Gramineae) from eastern North America. *American Journal of Botany* 71(3): 285-293.

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

Lehmann, C. and F. Rebele. 2005. Phenotypic plasticity in *Calamagrostis epigejos* (Poaceae): response capacities of genotypes from different populations of contrasting habitats to a range of soil fertility. *Acta Oecologica* 28: 127-140.

Lieffers, V. J. and S. E. MacDonald. 1993. Ecology of and control strategies for *Calamagrostis canadensis* in boreal forest sites. *Canadian Journal of Forestry Research* 23: 2070-2077.

MacDonald, S. E. and V. J. Lieffers. 1993. Rhizome plasticity and clonal foraging of *Calamagrostis canadensis* in response to habitat heterogeneity. *Journal of Ecology* 81(4): 769-776.

Marr, K. L., R. J. Hebda, and E. A. Zamluk. 2011. Morphological analysis and phytogeography of native *Calamagrostis* (Poaceae) from British Columbia, Canada and adjacent regions. *Madroño* 58(4): 214-233.

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].

Peterson, P. M., J. M. Saarela, and C. W. Greene. 2012. *Calamagrostis stricta* subsp. *inexpansa*. *In*: Jepson Flora Project (eds.), *Jepson eFlora*. Website http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=49506 [accessed 11 May 2018].

Slakey, D., A. E. Sims, and K. Lazar. 2013. Rare Plant Status Review: *Calamagrostis crassiglumis* – Proposed Change from California Rare Plant Rank 2B.1 to 3.1, Retention as G3Q / S2?. Rare Plant Program report, 8 August 2013 and 13 September 2013. California Native Plant Society, Sacramento, CA.

Smith, J. P., Jr., R. J. Cole, and J. O. Sawyer, Jr. 1980. *Inventory of Rare and Endangered Vascular Plants of California*. Special Publication No. 1 (2nd Edition). California Native Plant Society, Berkeley. 115 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].

Watson, S. 1880. *Botany of California, vol. 2*. Cambridge: John Wilson and Son, University Press. Page 281.

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 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 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 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 IPA Workshop, Loleta, CA. Contacted 16-18 November 2017.

Peterson, Paul M. 2013. Research Botanist and Curator, Smithsonian Museum of Natural History; *Calamagrostis* treatment author for *The Jepson Manual, Second Edition*. Email correspondence regarding CNPS status review of Calamagrostis crassiglumis. Personal communication 23 August 2013.

Taylor, D. Wm. 2017. Environmental contractor, Aptos, CA. Information submitted at Mendocino/Six Rivers FS-SCC and 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. June 20, 2018.

Reviewer(s) and Date:

David Magney, Rare Plant Program Manager, California Native Plant Society, (916) 447-2677 ext. 205, dmagney@cnps.org. June 20, 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.