Species: *Cypripedium californicum* Gray, California lady's-slipper

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Status

Table 1 summarizes the current status of this species or subspecies/variety by various ranking entities and defines the meaning of the status.

Table 1. Current status of California lady's-slipper

Entity	Status	Status Definition
NatureServe CA[a]	G4 S4	G4: Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors. S4: Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors.
California Rare Plant Rank[b]	4.2	4: Watch List: Plants of limited distribution 0.2: Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat) Added to CNPS Inventory in 1980; no recent change in status.
California State Listing[c]	Not listed	

USDA Forest Service[d]	Not listed	
USDI FWS[e]	Not listed	
USDI BLM[f]	Not listed	
NatureServe OR[g]	S3 4	S3: Rare, uncommon or threatened in Oregon, but not immediately imperiled, typically with 21-100 occurrences. List 4: contains taxa that are of conservation concern but currently do not meet the criteria for being considered threatened or endangered. This includes taxa that are very rare but are currently secure, as well as taxa that are declining in numbers or habitat but are still too abundant to be proposed as threatened or endangered. While these taxa currently may not need the same active management attention as threatened or endangered taxa, they do require continued monitoring.
Oregon State Listing[h]	Not listed	
NatureServe NV[i]	Not present	
Nevada State Listing[j]	Not present	

[a] California Natural Diversity Database, California Dept. of Fish & Wildlife [CNDDB 2020, 2020a]
[b] California Native Plant Society [CNPS 2020]
[c] California Department of Fish and Wildlife [CDFW 2020]
[d] US Forest Service Region 5 Forester's List [USDA 2013] and Pacific NW Survey and Manage [USDA & BLM 2014]
[e] US Department of Interior Fish and Wildlife Service [USFWS 2020]
[f] US Department of Interior Bureau of Land Management [BLM 2020]
[g] Oregon Biodiversity Information Center [ORBIC 2019]
[h] Oregon Department of Agriculture [ODA 2018]
[i] Nevada Natural Heritage Program [NNHP 2020]
[j] Nevada Division of Forestry [NDF 2012]
Note: Individual State Heritage Programs (CNDDB, ORBIC, NNHP) represent NatureServe and contain more up-to-date ranks for their state than NatureServe Explorer.

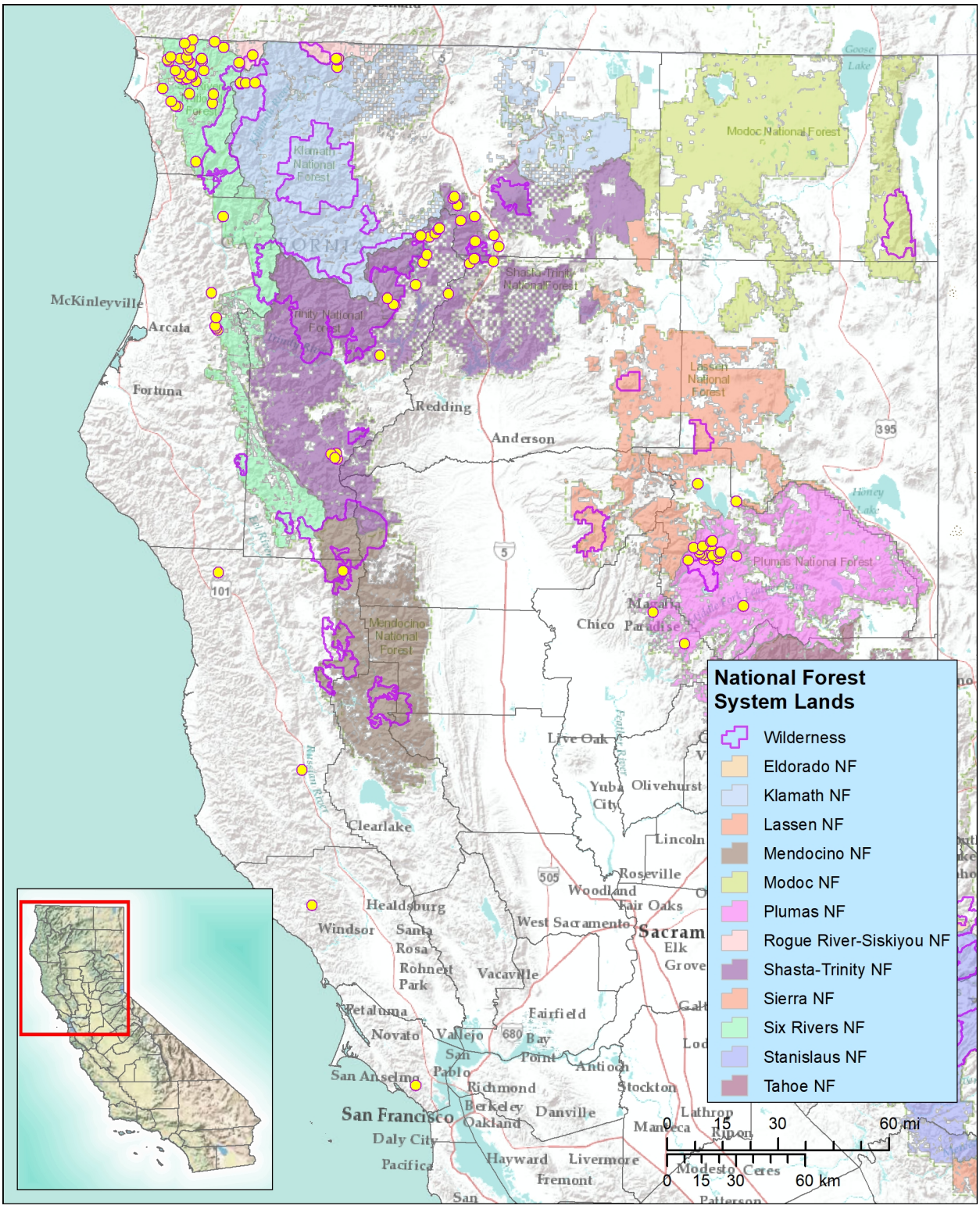
Distribution, abundance, and population trend on the planning unit[1]

Table 2 summarizes the distribution and frequency of this species or subspecies/variety within National Forest System Lands in California. Table 4 in Appendix 1 lists all known occurrences of this species or subspecies/variety within California. Individual occurrences are defined as sites that contain an individual, population, or groups of populations of the plant that are located more than 1/4 (0.25) of a mile apart from each other as defined by the CNDDB.

[1] 1909.12 Chapter 10, Section 12.53, components 2, 3, and 4.

Table 2. Known occurrence frequency of California lady's-slipper within the Planning Area (NRIS, CNDDB, Calflora/CCH databases).

National Forest System (NFS) lands in California	Record #s (from Table 4)	CNDDB Eos	Non-CNDDB Records	Recent (seen in past 20 years)	Historical (not seen in past 20 years)	Most Recent Obs. Date	Total Records on NFS lands
Klamath:	64, 65, 73, 74, 85, 94	-	6	1	5	13-Aug-2011	6
Plumas:	4, 5, 6, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25	-	19	6	13	17-Jun-2020	19
Shasta-Trinity:	28, 29, 30, 31, 36, 37, 38, 40, 44, 45, 48, 53, 58, 59, 60, 106	-	16	12	4	14-Jun-2020	16
Six Rivers:	32, 33, 34, 55, 61, 62, 63, 66, 67, 68, 69, 70, 71, 72, 75, 77, 78, 79, 80, 82, 83, 86, 87, 88, 89, 90, 91, 92, 93, 98, 99, 101, 102, 103, 104	-	35	6	29	5-Jun-2020	35
Rogue River-Siskiyou:	95, 96, 97, 100	-	4	-	4	17-Jun-1982	4
Totals:	N/A	0	80	25	55	N/A	80



Sources: *Distribution*: Sikes et al. (2010), Calflora (2020), CCH1 (2020), CCH2 (2021), NRIS (2019), T. Boomer (2021, personal communication). *Baselayers*: 2013 National Geographic Society, i-cubed, Esri, Garmin, NOAA, NPS, USGS.

California lady's-slipper is not currently tracked by the CNDDB (2020), hence the occurrences for this species were estimated using GIS tools and methods described by Green and Sims (2018).

California lady's-slipper is native to northern California and southwestern Oregon. In California, it is found in the Klamath Ranges (KR), western Cascade Ranges (CaR), northern Sierra Nevada (SN), and Outer North Coast Ranges (NCoRO) bioregions (JEPS 2020) in Butte, Del Norte, Humboldt, Lassen, Mendocino, Plumas, Shasta, Siskiyou, Sonoma, and Trinity counties. Its southern limit is in the San Francisco Bay (SnFrB) region where it is reportedly extirpated in Marin County (Coleman 1989). In Oregon, the species occurs in Curry, Josephine, Jackson and Coos counties (CPNWH 2021). The overall extent of occurrence (EOO) has been estimated as greater than 43,000 mi^2, and its area of occupancy (AOO) as 74 to 174 mi^2 (Rankou 2014).

Of the estimated 106 occurrences of California lady's-slipper in California, 80 (75 %) are located on National Forest lands (Table 2). For the Klamath NF, an internal memorandum (Barker 1984) indicated there were 19 populations of *C. californicum* known at that time (versus five occurrences for the same Forest in the present data). Also noteworthy is the fact that the current NRIS data for this species are limited to two Forests (Plumas and Rogue River-Siskiyou) while other Forests with numerous occurrences have no NRIS data at all (e.g., Six Rivers). It thus seems that our present data may underestimate the number of occurrences on USFS lands (i.e., there may be additional locality records on file for this species that are not yet reflected by NRIS). One occurrence (record # 8) is on a small, private inholding within the Mendocino NF (according to the latitude / longitude coordinates given in CCH1 [2020]). Another historical record (# 26) from Dyer Mountain (Lassen Co.) is possibly on the Lassen NF. Three occurrences (record #s 2, 7, 39) are on BLM lands. Of the remaining occurrences, 14 are on private property and seven with unknown land ownership (e.g., old records with vague locality data).

Six occurrences of California lady's-slipper are located within federally designated Wilderness Areas, including three in the Siskiyou Wilderness (record #s 64, 65, 73) and another three in the Trinity Alps Wilderness (record #s 36, 37, 38). Two of the latter (#s 36 and 37) also lie within the established Preacher Meadows Research Natural Area (Cheng 2004). Other occurrences receive protection within the Horse Mountain Botanical Area, Six Rivers NF (record # 32); a BLM designated Area of Critical Environmental Concern at The Cedars (record # 2; see Raiche 2009, Sonoma Land Trust 2021); and Castle Crags State Park in Shasta County (record # 42). In addition, the Siskiyou Land Trust has recently purchased 80 acres of conservation land in the Stony Creek Bog area of Del Norte County (record # 81; see Smith and Sawyer 2019).

More than two-thirds of the occurrences of California lady's-slipper on National Forest lands are historical (i.e., evidently not visited within the last 20 years). The vast majority of sites are lacking any population data, but 18 have been censused with numbers ranging from 2 to 10 plants (four sites), 11 to 50 plants (nine sites), 51 to 100 plants (four sites), and one site with 300 plants. It thus appears that populations of this species are usually quite small, yet there is a June 1937 collection from Del Norte County (*H. E. Parks 24008*, POM) in which it was noted: "[a]s far as we could see above our heads the *Cypripedium* [*californicum*] was in flower, and we could have taken a thousand without diminishing the supply in a noticeable manner." The population at

The Cedars (Sonoma Co.) has also been described as consisting of "huge colonies" (Raiche 1989). Ten occurrences have had repeated observations over time; most of these are on the Plumas NF and seem to indicate numbers that are fluctuating from year to year but without any clear increasing or decreasing trends. This interannual variation is perhaps to be expected given that *Cypripedium* species are known to undergo vegetative dormancy (failure to emerge above-ground) when growing conditions are unfavorable (Shefferson et al. 2018, and references cited therein).

Brief description of natural history and key ecological functions[2]

California lady's-slipper belongs to the Orchidaceae (orchid family) and is a perennial herb from a short rhizome. The stems measure 25–130 cm in height and bear 1–14 (–22) showy flowers; the blooming season starts in early May near the coast and lasts until June or July in the Cascades and northern Sierra Nevada (Coleman 1989, Sheviak 2002, JEPS 2020). Its habitat is generally along streambanks and in perennial seeps, bogs or fens in lower montane coniferous forest, usually on serpentinite; the elevational range is from near sea level up to 2,200 m in the mountains (CCH1 2020, CNPS 2020, CNDDB 2020, JEPS 2020). Soils are not only wet but also high in organic matter and heavy metals (Ni, Mg, Fe, Cu), low in essential nutrients for plant growth (P, Ca), and with a low Ca/Mg ratio (Woolhouse 2012). The most often noted associate of California lady's-slipper is the carnivorous *Darlingtonia californica* (California pitcher-plant); other frequent associates include *Rhododendron occidentale* (western azalea), *R. columbianum* (marsh tea), *Carex* spp. (sedges, especially *C. echinata*), *Hastingsia alba* (white rushlily), *Epipactis gigantea* (stream orchid), *Platanthera* spp. (bog orchid, especially *P. sparsiflora*), *Lilium* spp. (especially the leopard lily, *L. pardalinum*), *Parnassia palustris* (bog star), *Adiantum aleuticum* (five-finger fern), *Aquilegia formosa* (crimson columbine), *Bryum pseudotriquetrum* (marsh bryum), *Calliscirpus criniger* (cottongrass), *Cirsium douglasii* (swamp thistle), *Deschampsia cespitosa* (tufted hairgrass), *Juncus ensifolius* (sword-leaved rush), *Muhlenbergia andina* (foxtail muhly), *Pinguicula macroceras* (butterwort), and *Triantha occidentalis* (western false-asphodel) (Coleman 1989; Sikes et al. 2010, 2013; Woolhouse 2012; CCH2 2021). For additional information on habitat and ecological relationships, see Fowlie (1982, not seen for this assessment).

The genus *Cypripedium* holds about 50 species with an overall distribution in the subtropical to temperate latitudes of the Northern Hemisphere and centers of diversity in eastern Asia and North America (Cribb and Sandison 1998, Sheviak 2002, Li et al. 2011). California lady's slipper is one of three *Cypripedium* species native to western North America, but it is evidently not very closely related to the other two (*C. fasciculatum*, *C. montanum*). DNA analyses provide ample justification for placing it in its own separate section *Californica* (Fatihah et al. 2011, Li et al. 2011, Liu et al. 2012, Szlachetko et al. 2020). It is the tallest of our native lady's-slippers, has the most restricted geographic range and also favors the moistest soil conditions (Coleman 1989). The population genetics of this species have not been studied.

[2] Basis for other 1909.12 Chapter 10, Section 12.53 components.

The major life-history stages of the California lady's-slipper are (1) seedling-protocorm, (2) vegetative (green shoots above ground but no flowering stalk), (3) reproductive (flowering), and (4) dormancy (in need of study). Orchids in general have very small seeds that contain almost no energy resources; they thus require mycorrhizal fungi for germination and seedling nutrition. Most members of genus *Cypripedium* associate almost exclusively with the fungal species *Tulasnella cystidiophora* of the family Tulasnellaceae, but *C. californicum* was found to be far less specialized, associating with tulasnelloid, ceratobasidioid, sebacinoid and possibly other fungi (Shefferson et al. 2005, 2007, 2019). The presence of mycorrhizal fungi may determine where and in which specific habitats this orchid can grow and how it responds to habitat disturbance (McCormick et al. 2004, McCormick and Jacquemyn 2014).

Reproduction of the California lady's-slipper may take place both sexually (by insect pollination) and asexually (by clonal propagation from buds on rhizomes). The flowers offer no nectar or pollen reward to visiting insects; the lower lip is instead modified into a pouch that traps the visitor and guides it to an exit (small opening) where the pollinium (sticky pollen packet) is deposited or transferred to the stigma. The only known pollinator is *Ceratina acantha* (small carpenter bee), although *Lasioglossum nigrescens* (halictid bee) and *Sphegina occidentalis* (small syrphid fly) were also noted as floral visitors (Argue 2012). Low rates of reproductive success are an important concern in orchid conservation, particularly for *Cypripedium* and other genera lacking pollinator rewards (Tremblay et al. 2005, Bernhardt and Edens-Meier 2010). In the California lady's-slipper, a high rate of fruit set has been reported, but the breeding system has not been studied, and autogamy (self-pollination) or agamospermy (asexual reproduction by production of seeds from unfertilized ovules) cannot be ruled out (Argue 2012). The unpublished thesis of Kipping (1971) may contain additional data but was unavailable for review.

Orchid seeds are dust-like and often very numerous, a property that may compensate for the often low levels of fruit production. The seeds also have large internal air spaces that may facilitate long-distance dispersal by wind (Arditti et al. 1979, Arditti and Ghani 2000). The internal air spaces and difficult-to-wet surface of the testa (outer seed coat) also enable orchid seeds to float on water for prolonged periods (Arditti and Ghani 2000), suggesting that seeds of California lady's-slipper might be dispersed by surface water flow.

Overview of ecological conditions for recovery, conservation, and viability[3] including Threats and Risk Factors

Of the three endemic *Cypripedium* species in western North America, California lady's-slipper has the most restricted range (being native to northern California and southwestern Oregon). We estimate there are 108 occurrences of this orchid in California, roughly three-quarters of them on National Forest lands and six in protected Wilderness Areas. However, our data reflect only what was available in NRIS, and we might have missed some additional, unpublished locality records existing in Forest Service files. The species was placed on the USFS Region 5 Sensitive list in 1979–1980 but was removed in 1982.

[3] 1909.12 Chapter 10, Section 12.53, components 7, 9, 10, 11 and 12, as appropriate.

California lady's-slipper has been considered "not particularly rare in California" (Coleman 1989), but its populations are generally small, and there is uncertainty about its current status on National Forest lands since more than two-thirds of known occurrences have not been revisited in recent years. The IUCN has assessed this species as Endangered (EN) based on its limited distribution, an AOO of less than 200 mi^2, and "numerous threats" (IUCN 2012, Rankou 2014).

The species is mainly found in forested areas that are (or were) under intensive management for timber harvest. However, because of its narrow requirement for wet habitats (along streambanks and in seeps, bogs or fens), impacts tend to be minimized or avoided under existing Forest Service riparian and wetland management guidelines (Barker 1984; J. Kierstead 2020, personal communication). Overcollecting by horticulturists and orchid fanciers is possibly of concern. Global trade in wild orchid species is significant, and lady's-slippers are actively exported but generally do not survive for long in cultivation (Coleman 1989, Kaye and Cramer 2005). California lady's-slipper is listed in Appendix II of the Convention on International Trade in Endangered Species (CITES), the aim of which is to control and monitor trade in orchids and other threatened or potentially threatened taxa (Cribb and Sandison 1998). Factors increasing extinction risk at the population level include the generally small numbers of individuals, low rates of reproductive output and recruitment, and associations with mycorrhizal fungi and insect pollinators. In order for its populations to remain viable over time, the water sources that feed the habitats where it occurs will need to remain stable; therefore, extended drought due to climate change would likely be detrimental.

Taxonomy[4]

Table 3 summarizes this species or subspecies/variety's name status in key literature.

Table 3. Name status of California lady's-slipper

Entity	Name Status
CNDDB and CNPS	*Cypripedium californicum* Gray
Jepson eFlora	*Cypripedium californicum* A. Gray
Jepson Manual (1993)	*Cypripedium californicum* A. Gray
Flora of North America	*Cypripedium californicum* A. Gray
USDA NRCS[a] PLANTS	*Cypripedium californicum* A. Gray

[a] Natural Resources Conservation Service [NRCS 2020]

Synonymy: There are no taxonomic or nomenclatural synonyms for this species (Sheviak 2002, TROPICOS 2020, POWO 2020).

Jepson eFlora link (JEPS 2020): https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=21979

Type locality: "Swamps on Red Mountains [= Red Mountain], Mendocino Co., Bolander" (Gray 1868). No Bolander collections of *C. californicum* could be located in the Gray Herbarium's online collections database (https://kiki.huh.harvard.edu/databases/specimen_index.html), but there are three isotype specimens in NY (JSTOR 2020), another isotype in UC (UC13516), and another possible isotype in DS (DS52167) (CCH1 2020).

[4] 1909.12, Chapter 10, Section 12.53, component 1.

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Author(s) and Date:

R. Douglas Stone, California Native Plant Society, Assistant Rare Plant Botanist, 05 February 2021; finalized 05 October 2021

Reviewer(s) and Date:

Aaron E. Sims, California Native Plant Society, Rare Plant Program Director, 31 March 2021;
Julie Ann Kierstead, USDA Forest Service Region 5, Ecosystem Planning, 02 April 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.

Appendix 1: Known Occurrences

Table 4. Known occurrences of California lady's-slipper within California (NRIS, CNDDB, Calflora/CCH databases).

REDACTED FOR CONSERVATION PURPOSES

Appendix 2: Additional Considerations at the Forest Level

<This section, including the next 5 subheadings, would be filled out by **Forest Service botanists**.>

<Forest Name>

Geographic distribution within the Forest

A. Scarce or isolated
B. Patchy or gaps
C. Contiguous

<Select a geographic distribution rank and provide references or cite 'specialist expertise, <name>' where appropriate.>

Abundance of the species on the Forest

A. Rare – current abundance is low enough that stochastic and other factors could lead to potential imperilment.
B. Uncommon – current abundance is large enough that demographic stochasticity is not likely to lead to rapid local extinction, but, in combination with highly variable environmental factors, could pose a threat.
C. Common – current abundance is large enough that species persistence is not threatened by demographic stochasticity in combination with environmental variation.
D. Insufficient information to draw inferences about criterion.

<Select a species abundance rank and provide references or cite 'specialist expertise, <name>' where appropriate.>

Population trend on the Forest

A. Significant downward or suspected downward population trend.
B. Stable population.
C. Upward population trend.
D. Insufficient information to draw inferences about criterion.

<Select a population trend rank and provide references or cite 'specialist expertise, <name>' where appropriate.>

Habitat trend on the Forest

A. Decline in habitat quality or quantity.
B. Stable amounts of suitable or potential habitat, relatively unchanged habitat quality.
C. Improving habitat quality or increasing amounts of suitable or potential habitat.
D. Insufficient information to draw inferences about criterion.

<Select a habitat trend rank and provide references or cite 'specialist expertise, <name>'where appropriate.>

Vulnerability of habitat on the Forest

A. Substantial modification of habitat has occurred or is anticipated with conditions departing from expectations based on NRV, and/or habitat is impacted by modern stressors such as drought, climate change, high intensity wildfire and wildfire suppression disturbances, loss of natural openings due to historical wildfire suppression, nonnative invasive species, water impoundments and diversions, and recreation, etc.
B. Habitat modification is likely to result in ecological patterns similar to the range of historical conditions, but is being impacted by modern stressors.
C. Habitat resilient, changes are similar in frequency and intensity to those expected from NRV, and modern stressors not significant.
D. Insufficient information to draw inferences about criterion.

<Select a habitat vulnerability rank and provide references or cite 'specialist expertise, <name>'where appropriate.>

Additional Forest specific information related to the SCC determination

<This section is provided for Forest botanists to add additional Forest specific information that is not captured in the section above, if necessary. Provide a narrative description here of the additional relevant information. State "No additional information" if this section is not used.>