Added to California Rare Plant Rank 4.3 of the CNPS Inventory on 3 March 2020

Rare Plant Status Review: *Claytonia obovata*
Proposed Addition to California Rare Plant Rank 4.3, G4 / S3

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Changes made to the original document are in blue text.

This species review is being expedited though a challenge cost share agreement between the California Native Plant Society and the USDA Forest Service, Pacific Southwest Region. Aside from being advanced as part of this agreement, the process, content, and information provided herein is not altered, modified, or developed differently in any way or form compared to other status reviews developed by CNPS.

Background and Taxonomy

Claytonia obovata Rydberg is a perennial herb in the Montiaceae that is known from the Klamath-Siskiyou region of northwestern California in the North Coast Ranges (Lake, Mendocino, Siskiyou, Tehama, and Trinity counties) to southwestern Oregon (Curry and Jackson counties). It has one occurrence in the Central Sierra Nevada (Tuolumne County) that represents a significant range extension, and could represent an undescribed taxon. "*Claytonia obovata* was synonymized with *C. lanceolata* in 1966 and remained unrecognized until now because previous treatments misinterpreted morphological variation in *C. lanceolata* s. s." (Stoughton et al. 2017). It is therefore not included in *The Jepson Manual* (Chambers 1993), *The Jepson Manual, Second Edition* (Miller and Chambers 2012), or *Flora of North America North of Mexico* (Miller 2004).

"*Claytonia obovata* is morphologically similar to the broad interpretation of *C. lanceolata* by Miller and Chambers (2006), but differs primarily in its ecological setting (*C. obovata* is primarily associated with cismontane, subalpine habitats) and by the presence of sunken, red veins on the cauline leaves that diverge near the base of the leaf blade and generally converge near the apex. It differs also by the shape of the cauline leaf pair, its smaller overall plant size, and in having a sub-umbellate inflorescence that generally lacks a peduncle and exhibits little to no internodal elongation among pedicels by the time of fruiting." (Stoughton et al. 2017). *Claytonia obovata* also resembles *C. peirsonii* subsp. *peirsonii*, but the two are allopatric, and *C. obovata* lacks raised adaxial cauline leaf veins, which are always present in *C. peirsonii* subsp. *peirsonii* (Stoughton et al. 2017). See Stoughton et al. (2017) for a taxonomic key and Table 1 in Appendix II for additional characters used to differentiate *C. obovata* from other taxa in the *Claytonia lanceolata* species complex in California.

According to Stoughton et al. (2017), natural interspecific hybridization between *C. obovata* and *C. serpenticola* appears to be happening at one sympatric location near Mount Shasta in northern California. The ~~(~~precise location was not reported by Stoughton et al.~~)~~, but Julie Kierstead (pers. comm. 2020) believes this is on Mt. Eddy where the two grow together, and where T. Stoughton had found both species and intermediates on May 28, 2014. ~~and~~ There also appears to be hybridization between *C. obovata* and *C. lanceolata* at Abbott Butte in southern Oregon. However, Stoughton et al. (2017) do not believe that a low frequency of hybridization with close relatives is grounds for not recognizing *C. obovata*, which maintains genetic and morphological coherence across a broad range.

Ecology

Claytonia obovata occurs on stony and talus, generally north-facing slopes comprised of siliciclastic or carbonate-dominated (meta)sedimentary rocks (e.g. greywacke, limestone, shale), or mafic substrates (e.g. gabbro, peridotite, serpentinite). It is most often in openings of subalpine coniferous forest. Stoughton et al. report *C. obovata* as occurring at an elevation of approximately 1,200 to 2,200 meters, which may include records from Oregon. According to georeferenced herbarium records and observations, *C. obovata* is known from approximately 1,385 to 2,835 meters in California (Calflora 2019; CalPhotos 2019; CCH1 2019; CCH2 2019; Google LLC 2019). Based on herbarium collection records, *C. obovata* is known to mostly flower in California from May to June ~~July~~. It has an uncommon early blooming period of April based on a single historical collection from 1972 (*Toren s.n.* CAS:BOT-BC:292670) and an even earlier blooming month of March based on the single range extension from Tuolumne County in 1978 (*Heckard et al. 4741* JEPS76794) (CCH1 2019, CCH2 2019). There are seldom collections and photos of this species blooming as late as July, and a collection (*Janeway and Castro 10451*) and photos (by John Doyen; CalPhotos 2019) of flowers of *C. obovata* from July 2011 were during an exceptionally late snow year so represent an outlier in flowering time. Later photos from July 2019 (by Matt Berger; Calflora 2019) are of plants past flowering. *Claytonia obovata* blooms while the rocky soil is still damp from snowmelt, and quickly disappears when the soil dries out (J. Kierstead pers. comm. 2020).

Distribution and Abundance

Claytonia obovata is currently known from 18 occurrences in California and from an unknown number of occurrences in Curry and Jackson counties of southern Oregon. It shares a similar geographic range with *C. serpenticola* in the Klamath-Siskiyou region of northern California and southwestern Oregon, and these two occur in close sympatry through much of their respective distributions. Five occurrences of *C. obovata* are considered historical (occurrences not seen in 20 years are considered historical by CNDDB). Although known from only a handful of occurrences in California, its occurrences range across an area of approximately 240 air km. There is also a gap of approximately 120 air km between its northern range (northern Trinity Co. and southern Siskiyou Co.) and southern range (eastern Mendocino Co.) in California. (These approximated range distances do not include the putative record from Tuolumne County.) Additional occurrences are expected to be found among and between collection records. *Claytonia obovata* has a type locality in Oregon, but Californian populations in Mendocino County are specifically mentioned in the protologue by Rydberg (1932).

The limited number of occurrences of *C. obovata* does not reflect upon its actual abundance and distribution in California: according to Thomas Stoughton (pers. comm. 2019), "While [*Claytonia*] *obovata* and *serpenticola* are edaphic endemics, *C. obovata* seems to be pretty happy across its distribution and there are plenty of serpentine locations for *C. serpenticola*." Furthermore, Dana York (pers. comm. 2019) reports that *C. obovata* is locally common but flowers so early that most botanists are not able to document it. York also states that within the Klamath Mountains there are thousands of plants from the Mt. Eddy parking lot past upper Deadfall Lakes and the Scott Mountains are also covered with it.

A record initially identified as *Claytonia umbellata* from Siskiyou County (*Taylor 9974*, JEPS100601) has been annotated by T. Stoughton as *C. obovata*, but has remained uncorrected in CCH1 (2019). *Claytonia umbellata*, a California Rare Plant Rank 2B.3 species, continues to

only be known from Alpine, Lassen, and Mono counties in California, also occurring in Nevada and eastern Oregon. The CNPS Online Inventory record for *C. umbellata* continues to incorrectly display three USGS 7.5" quadrangles for this species in Siskiyou County (Mount Eddy 4112234, Scott Mountain 4112236, and South China Mtn. 4112235); Siskiyou County and these three associated quads will be removed from its record once a new Inventory database is developed.

Stoughton et al. (2017) found a small amount of collections in herbaria from the same general area in the central Sierra Nevada (Bald Mountain, Tuolumne Co., *L.R. Heckard 4741*) that approach both *C. obovata* and *C. peirsonii* in their leaf morphology. They considered these plants to represent a range extension for *C. obovata*, but suspect they represent a new, pedunculate subspecies of either *C. obovata* or *C. peirsonii* that may be worthy of later taxonomic recognition, pending additional field and molecular research. Because of the uncertainty surrounding this record, it will be included in the CNPS Inventory with a '?' after the quad and county (a '?' after locations in the CNPS Inventory indicates uncertain about distribution or identity).

All but two occurrences of *C. obovata* are within National Forest Service lands: six occurrences are within Shasta-Trinity NF, five are within Mendocino NF, three are within Klamath NF, one is within Six Rivers NF, and the odd range extension from the central Sierra Nevada is within Stanislaus NF. The remaining two occurrences have an unknown land ownership.

Status and Threats
There are no known direct threats to *C. obovata*. The majority of its occurrences in National Forest Service lands should offer some protection from development and other threats in California. The three occurrences observed by John Doyen (records 2, 13, and 17) are remote, on National Forest, and in areas that are unlikely to be logged. The only area significantly frequented by people that Doyen observed was at Kangaroo Lake, but *C. obovata* was located some distance away on a fairly steep slope and all the fisherman were around the lake (J. Doyen pers. comm. 2019). *Claytonia obovata* is reported to be "happy across its distribution" by T. Stoughton, who subsequently recommends it to be added to California Rare Plant Rank (CRPR) 4, and it is also recommended to be added to CRPR 4 by Dana York (pers. comm. 2019).

Summary
Based on the available information, CNPS and CNDDB recommend adding *C. obovata* to 4.3 of the CNPS Inventory. If knowledge on the distribution, threats, and rarity status of *C. obovata* changes in the future, we will re-evaluate its status at that time.

Recommended Actions
CNPS: Add *Claytonia obovata* to 4.3
CNDDB: Add *Claytonia obovata* to G4 / S3

Draft CNPS Inventory Record
Claytonia obovata Rydberg
Rydberg's spring beauty
Montiaceae
CRPR 4.3
Oregon

Lake, Mendocino, Siskiyou, Tehama, Trinity, Tuolumne?
Strawberry (474A?) 3812021, Hull Mountain (581C) 3912258, Mendocino Pass (597C) 3912278, Leech Lake Mtn. (598A) 3912381, Mumbo Basin (683A) 4112225, Tangle Blue Lake (683B) 4112226, Cecil Lake (685C) 4112312, Salmon Mtn. (686B) 4112324, Weed (699B) 4112244, Mount Eddy (699C) 4112234, Scott Mountain (700C) 4112236, South China Mtn. (700D) 4112235, Yreka (717B) 4112266
Subalpine coniferous forest / rocky talus slopes, usually openings; elevation 1,385 to 2,835 meters.
Perennial herb. Blooms (March to April) May to June (July)
See *North American Flora* 21(4):299 (1932) for original description, and *Systematic Botany* 42(2):283-300 (2017) for taxonomic treatment.

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Miller, J. M. and K. L. Chambers. 2006. Systematics of *Claytonia* (Portulacaceae). *Systematic Botany Monographs* 78: 1–236. (Not seen.)

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Rydberg, P. A. 1932. Portulacaceae: *Claytonia obovata* Rydberg, sp. nov. *North American Flora* 21(4): 299. (Original description.)

Stoughton, T. R., D. D. Jolles, and R. L. O'Quinn. 2017. The western spring beauties, *Claytonia lanceolata* (Montiaceae): A review and revised taxonomy for California. *Systematic Botany* 42(2): 283-300. (Taxonomic treatment.)

APPENDIX I – BACKGROUND

The following is a general summary of the revised taxonomic treatment of the *Claytonia lanceolata* species complex in California published by Stoughton et al. (2017), with emphasis on taxa that are being reviewed for addition to the *CNPS Inventory of Rare and Endangered Plants of California*.

Recent field, taxonomic, and molecular work by Stoughton and Jolles (2013) and Stoughton et al. (2017) has led to a recircumscription of *C. lanceolata* var. *peirsonii* to *C. peirsonii* subsp. *peirsonii*, along with the description of three additional subspecies, *C. peirsonii* subsp. *bernardinus*, subsp. *californacis*, and subsp. *yorkii*, which are all rare and concurrently under review for addition to the CNPS Inventory. As a result of their work, the taxonomic recognition of *Claytonia obovata* (formerly treated as a synonym of *C. lanceolata*) was also resurrected by Stoughton et al. (2017), and a new taxon, *C. serpenticola* was described; both occurring in the Klamath-Siskiyou region of northern California and southwestern Oregon. Lastly, Stoughton et al. (2017) also newly described *C. panamintensis*, a species known in California only from the Panamint Mountains of Death Valley National Park, but ranging more widely across southern Nevada. All three of these latter *Claytonia* species (*C. obovata*, *C. panamintensis*, and *C. serpenticola*) are undergoing status reviews for addition to the CNPS Inventory.

In 2013, Stoughton and Jolles reported on the discovery of new populations of *C. lanceolata* in southern California, and discussed the taxonomic uncertainties associated with the *C. lanceolata* species complex and the southern California var. *peirsonii*. Up to ten subspecific taxa have been described in the *C. lanceolata* complex (Davis 1966), with var. *peirsonii* being the only one known from southern California. Taxonomic uncertainty of var. *peirsonii* remained present for at least 25 years, evidenced in part by Chambers (1993), who considered variation in the group to be environmentally induced, and did not formerly recognize infraspecific taxa in his treatment of *Claytonia* in *The Jepson Manual*. As originally described, *C. lanceolata* var. *peirsonii* was considered to be restricted to the higher ridges of the eastern San Gabriel Mountains, distinguished by both its relative geographic isolation (at least 450 km away from other known conspecific populations) and by a primary inflorescence axis that is shortened as to make the inflorescence appear umbellate (Munz and Johnson 1923) (Stoughton and Jolles 2013). However, var. *peirsonii* was described from only two voucher specimens, indicating that variation within var. *peirsonii* was not well captured. After reviewing the entire collection of *C. lanceolata* specimens at RSA (including the holotype of var. *peirsonii*) and additional specimens at CAS/DS, HSC, UC/JEPS, and UNLV, Stoughton and Jolles (2013) found reason to believe that the southern California populations of *C. lanceolata*, including those in Kern and Inyo counties and in the Spring Mountains of Nevada, were unique and distinct from other alleged conspecific populations in northern California and adjacent northern Nevada. Their claim was also substantiated by detailed field observations of new populations discovered in the San Bernardino Mountains and all but two of the known locations in the San Gabriel Mountains, Panamint Range, and southern Sierra Nevada.

Stoughton and Jolles (2013) also noted that preliminary molecular evidence indicated that the morphological variation of *C. lanceolata* found in differing regions in California and Nevada also had a genetic basis. Four years later, Stoughton et al. (2017) conducted a Bayesian phylogenetic inference using gene sequences available on GenBank, along with new sequences generated from collections within and outside of California. Their phylogenetic comparison included more than half of the tuberous, perennial *Claytonia* species, which encompasses *C.*

lanceolata. Stoughton et al. (2017) isolated genomic DNA from leaf material of 12 *C. lanceolata* samples. "Two or more individuals per taxon were used to sample multiple examples in the *C. lanceolata* species complex (15 total samples). Nine samples of other tuberous, perennial *Claytonia* were included as outgroups with respect to *C. lanceolata* s. l. Thirty-one total samples were used for the phylogenetic analysis, including more distant outgroups from *Claytonia* and *Lewisia*" (Stoughton et al. 2017).

In order to identify substrate affinity, Stoughton et al. (2017) collected parent rock material from selected field sites of *Claytonia* in California and southern Oregon. Slope aspect, geomorphic landform, associated species, elevation, and other local site information were also recorded at field sites. Lastly, five morphological characters (stem length, cauline leaf width, cauline leaf length/width ration, and peduncle length) were measured and used in a morphometric analysis. Results of their phylogenetic analysis were inconclusive with regards to monophyly of *C. lanceolata*, mostly due to an unresolved backbone separating major lineages within a clade that included all tuberous, perennial *Claytonia* sampled in their study. Furthermore, the use of nrITS in their study may have been problematic considering the possibilities of concerted evolution and multiple copies. However, although the results of their preliminary analysis did not permit new inferences regarding relationships among tuberous *Claytonia*, this was not a specified goal of their study, and instead their phylogenetic results fully complemented their morphological analysis of Californian taxa. Ultimately, the taxonomic and molecular work by Stoughton et al. (2017), coupled with that of Stoughton and Jolles (2013), elucidated some of the complex taxonomy and relationships surrounding *C. lanceolata* s. l. in California, and distinguished new taxa from each other by habitat (with many appearing to be edaphic-endemics), betalain pigmentation, inflorescence architecture, and morphology of cauline leaves, subterranean stems, and flowers.

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APPENDIX II – TABLES AND FIGURES

Table 1: Selected characters used to differentiate taxa in the *Claytonia lanceolata* species complex in California. Taxa are listed in same order of appearance as the taxonomic key provided in Stoughton et al. (2017), with the exception of the more recently described *C. crawfordii*. Light gray cells indicate duplicate entries to assist with making comparisons. (Table developed using characters from Stoughton et al. 2017 and 2018.)

Scientific name	Cauline leaves	Adaxial leaf surface	Inflorescence	Geology	Range
C. panamintensis	2-4, opposite at least proximally, 1-nerved elliptic to oblanceolate, distinctly petiolate	dark green (often at least weakly beet-red abaxially)	1-3, terminal and often also axillary, pedunculate, unibracteate, bracts 1-3 mm long	marble, sandstone, shale/slate	Panamint Mountains east to Spring Mountains of southern Nevada
C. serpenticola	2–4, alternate to subopposite, 1-nerved gen. > 5 x longer than wide, blades narrowly elliptic to lance linear	gen. greenish 1° veins at base, blades gen. similar in color on ab/adaxial surfaces	1-3, terminal and often also axillary, pedunculate, unibracteate, bract 1-2 mm long	gabbro, peridotite, serpentinite or shale	Klamath-Siskiyou, North Coast Ranges
C. lanceolata	2, opposite, 3-nerved gen. < 5 x as long as wide, ovate to lance ovate to lance linear	gen. greenish 1° veins at base, blades gen. similar in color on ab/adaxial surfaces	1(2), terminal (rarely also axillary), pedunculate, unibracteate, bracts 1-5 mm long	granite, rhyolite	Klamath-Siskiyou, central and northern Sierra Nevada
C. obovata	2(3), opposite, gen. 3-nerved with parallel veins equal in length, lateral veins converging with midrib at apex	gen. reddish 1° veins, not raised	1(2), terminal (rarely also axillary), sessile to short-pedunculate, unibracteate, bracts 1–3 mm long	graywacke, limestone, shale or gabbro, peridotite, serpentinite	Klamath-Siskiyou, North Coast Ranges

Scientific name	Cauline leaves	Adaxial leaf surface	Inflorescence	Geology	Range
C. peirsonii ssp. *bernardinus*	2-4, opposite at least proximally, 1-nerved often ≥ 6 x longer than wide, linear to lanceolate, sessile	gen reddish, sunken 1° veins; 2° veins of cauline leaves weakly if at all raised	1-3, terminal and often also axillary, sessile to short-pedunculate, unibracteate, bracts 1-3 mm long	limestone, marble	San Bernardino Mountains
C. peirsonii ssp. *yorkii*	2-4, opposite at least proximally, 1-nerved < 6 x longer than wide, gen. weakly pigmented on abaxial surfaces (reddish to purplish pigmentation often absent in stem and pedicels)	gen reddish, sunken 1° veins; 2° veins gen. noticeably raised	1-3, terminal and often also axillary, sessile to short-pedunculate, unibracteate, bract 1-3 mm long	rhyolite	southern Sierra Nevada
C. peirsonii ssp. *peirsonii*	2-4, opposite at least proximally, 1-nerved < 6 x longer than wide (gen. < 3.5 x as long as wide), variously shaped but gen. not oblanceolate, sessile	gen. reddish, sunken 1° veins (sometimes branched); 2° veins gen. noticeably raised	1-3, terminal and often also axillary, sessile to short-pedunculate, unibracteate, bracts 1-3 mm long	gneiss, granite, schist	San Gabriel Mountains
C. peirsonii ssp. *californacis*	2-4, opposite at least proximally, 1-nerved < 6 x longer than wide (gen. > 3.5 x as long as wide), gen. oblanceolate to elliptic, sessile	gen. reddish, sunken 1° veins; 2° veins gen. noticeably raised	1-3, terminal and often also axillary, sessile to short-pedunculate, unibracteate, bracts 1-3 mm long	limestone, marble	San Bernardino Mountains
C. crawfordii	narrower than *C. obovata*	2° veins gen. noticeably raised	1-3, terminal (rarely also axillary), elongate peduncle	volcanic	central Sierra Nevada

Sources:

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