

**5-YEAR REVIEW**  
**Springville Clarkia (*Clarkia springvillensis*)**

**GENERAL INFORMATION:**

**Species:** Springville Clarkia (*Clarkia springvillensis*)

**Date listed:** September 14, 1998

**Federal Register (FR) citation:** 63 FR 49022 (Service 1998)

**Classification:** Threatened

**State Listing:** Springville clarkia was listed by the State of California as endangered in 1979.

**BACKGROUND:**

**Most recent status review:**

U.S. Fish and Wildlife Service. 2009. *Clarkia springvillensis* (Springville Clarkia) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California. 19 pp.

We did not recommend a status change in the 2009 status review.

**FR notice citation announcing this status review:**

U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 76 Species in California and Nevada. Federal Register 86:27462–27464.

We did not receive information from the public regarding Springville clarkia in response to the notice.

**ASSESSMENT:**

**Information acquired since the last status review:**

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Sacramento Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on May 20, 2021 (Service 2021). We also contacted species experts, the California Department of Fish and Wildlife (Wildlife Department), the U.S. Forest Service (Forest Service), the California Department of Transportation (Caltrans), and the California Native Plant Society to request any data or information we should consider in our review. Additionally, we conducted a literature search, reviewed information in our files, and obtained data from an occurrence search of the California Natural Diversity Database (Diversity Database) maintained by the Wildlife Department. Personal communication with species experts and partners was our primary source of information; however, new information is limited due to lack of consistent monitoring.

## Species overview:

Springville clarkia is a narrowly distributed annual herb in the evening primrose family (Onagraceae) (Service 2009, p. 2). The species grows mostly on the slope of road banks, on small decomposing granitic domes, and in sunny openings from elevations between 330 and 1,220 meters (1,080 and 4,000 feet) within chaparral and blue oak (*Quercus douglasii*) woodland community (Colgate, pers. comm. 2021; Service 2009, p. 2). The 1 meter (3 feet) tall plant has simple or branched stems (Service 1998, p. 49023). The bright green leaves are 2–9 centimeters (0.8–3.5 inches) long and 5–20 millimeters (0.2–0.8 inches) wide. Lavender-pink flowers appear in May to July and usually have a dark purple basal spot. Springville clarkia can be distinguished from the sympatric elegant clarkia (*Clarkia unguiculata*) by the absence of long hairs on the calyx and ovary, the purple sepals, and the dark purple spot at the base of the petals. Seed germination occurs in late November to early December, continuing into January (McCue and Holtsford 1998, p. 31; Forest Service 2012, p. 11). Plants usually begin flowering in May through June and are pollinated primarily by bees through cross- and self-pollination (Forest Service 2012, p. 11). Springville clarkia is believed to begin blooming earlier than elegant clarkia, although the flowering periods overlap and results in the potential for hybridization (Forest Service 2012, p. 11; Diversity Database 2021). The seeds can remain dormant for at least two years, and they form a soil seed bank that helps maintain genetic diversity (Forest Service 2012, p. 11; McCue and Holtsford 1998, p. 34).

## Distribution:

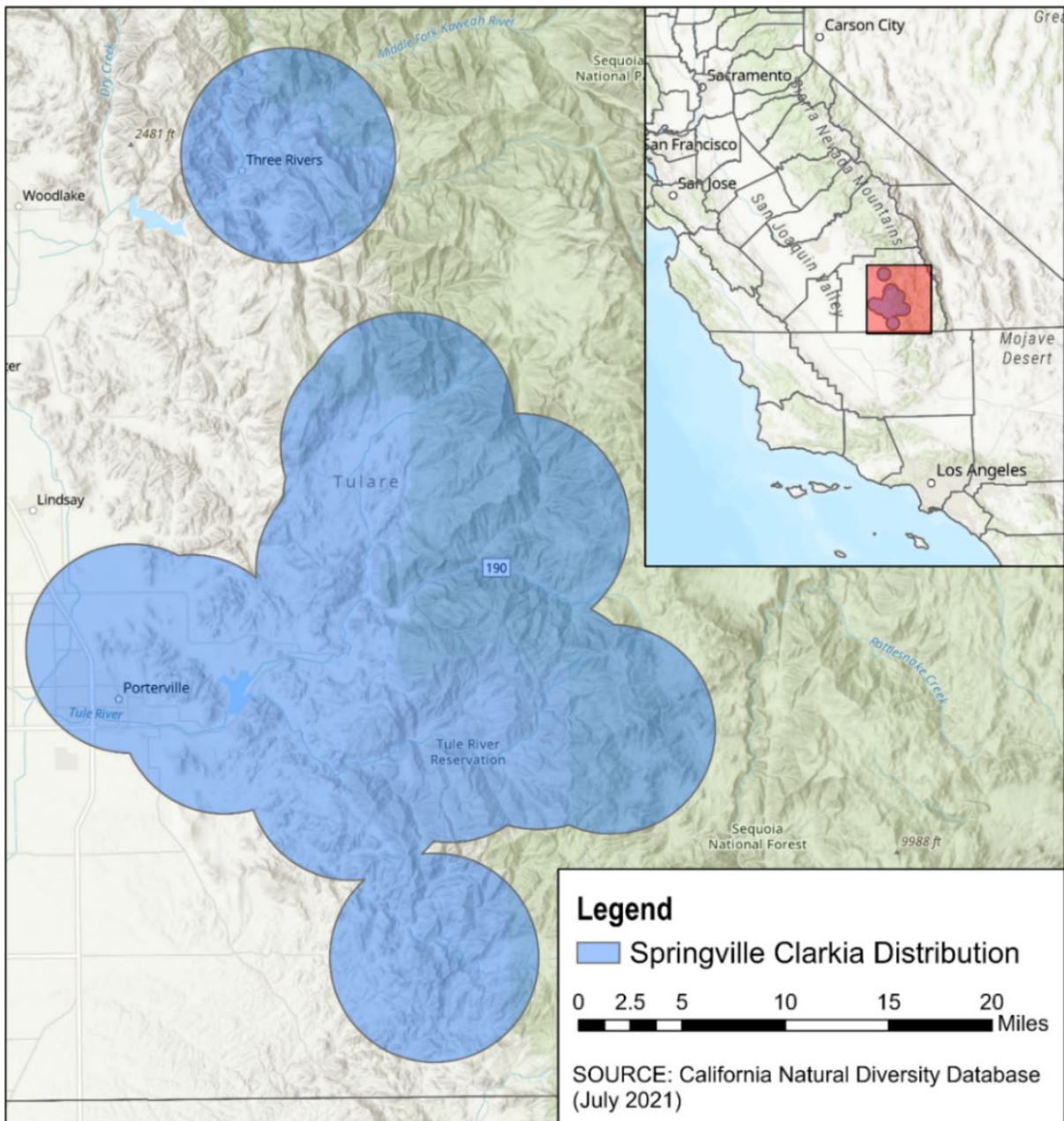
The range of Springville clarkia lies entirely within the Tule River watershed in the western Sierra foothills within Tulare County, California. See **Figure 1** for a map of distribution. One area is the Rancheria/Bear Creek drainage in the North Fork of the Tule River watershed, including Diversity Database occurrences #5, 7, 8, 10, 12, 13, 14, 15, and 20 (Service 2009, p. 5; Diversity Database 2021). A second area is the Siphon Canyon–Coffee Canyon area in the Middle Fork of the Tule River watershed, including Diversity Database occurrences #3, 4, 6, 18, 23, and 28 (Service 2009, p. 5; Diversity Database 2021). An “occurrence” refers to Springville clarkia records in the Diversity Database, where an occurrence consists of individuals separated by ¼ mile or less. Other surveys group individuals as “populations” or “localities”. For the purpose of this 5-year review, we will use “colonies” to describe groups of Springville clarkia individuals and reference various parts of a population, although it does not necessarily describe a biological population.

At the time of listing, there were 15 occurrences of Springville clarkia occupying 61 hectares (150 acres), which are now considered historical occurrences (Service 1998, p. 49023; Forest Service 2012, p. 10). At the time of our 2009 5-year review, there were 17 presumed extant occurrences (Service 2009, p. 3). New occurrences of Springville clarkia have been added to the Diversity Database since the previous status review (Diversity Database 2021). These occurrences are likely due to increased survey efforts and do not change the overall distribution of the species. According to the Diversity Database (2021), there are currently 28 occurrences. The type locality is possibly extirpated, while the other 27 occurrences are presumed extant (Diversity Database 2021). Of the extant occurrences, nine occurrences have not been surveyed since before 2000 (Diversity Database 2021). Collected specimen from Diversity Database occurrences #29 and #30 are thought to be an atypical outcrossing form of Kern River clarkia

(*Clarkia exilis*) (U.S. Army Corps of Engineers 2021, p. 45). However, further field work is needed to confirm (Diversity Database 2021). See **Appendix Table 1** for further details on Diversity Database occurrences (note: table includes all occurrences recorded as Springville clarkia in the Diversity Database, including occurrences that need further expert verification on species identity).

**Figure 1.** Springville clarkia occurrence map (Diversity Database 2021).

## Distribution of Springville Clarkia (*Clarkia springvillensis*)



As a caveat to the presented occurrence data, several colonies have been discovered during pre-construction surveys and during other activities but have not yet been catalogued in the Diversity Database (Colgate, pers. comm. 2021; Service 2005, p. 6). Additionally, as mentioned above, several occurrences may be misidentified and require further fieldwork and genetic studies to confirm as Springville clarkia (Service 2005, p. 6; Diversity Database 2021). Occurrences that need verification display morphological variations from what is typically described for Springville clarkia and/or occur outside of the typical elevation range for Springville clarkia (Colgate, pers. comm. 2021; Diversity Database 2021). The need for genetic studies is discussed in **Recommendations**.

### **Abundance:**

Abundance of Springville clarkia varies across colonies and across years (Diversity Database 2021). Recorded abundance data includes extremes of single plants to hundreds of thousands of plants (Diversity Database 2021). As is common in annual plants, the aboveground population size of Springville clarkia drastically fluctuates from year to year (Service 2009, p. 5). The number of plants depends on interactions between the soil seed bank and weather (Forest Service 2012, p. 12). Rainfall patterns may be the most important factor for determining abundance in the following year (Forest Service 2012, p. 12).

For example, as discussed in the previous status review, a comprehensive multiyear study of Springville clarkia as part of Southern California Edison's Lower Tule River Hydroelectric Project documented this drastic change in abundance in the project area (Service 2005, p. 4). The project area overlaps with the Siphon Canyon–Coffee Canyon area in the Middle Fork of the Tule River watershed. Survey data from 2002 to 2005 revealed that the area's abundance fluctuated between 2,500, 4,880, 1,800, and 10,000 individuals, with high and low numbers corresponding to wetter and drier years, respectively (Service 2005, pp. 8–9). Surveys estimate 3,055–3,315 individuals within the area in 2016 (Cardno, Inc. & Stebbins 2016, p. 3-2–3-3).

The most recently available survey data estimates 1,016 individuals within the area in 2021, representing the low in the 2017–2021 reporting period (Cardno, Inc. & Colgate 2021, p. 3-4). The highest abundance surveyed during this period was 7,590 individuals in 2019 (Cardno, Inc. & Colgate 2021, p. 3-4). While abundance continues to fluctuate in this area, the changes do not as closely correspond with annual precipitation as previously reported (Cardno, Inc. & Colgate 2021, pp. 3-4–4-1). Botanists hypothesized that the Pier Fire in 2017 created unsuitable microhabitat conditions and/or precipitation patterns were unfavorable for the species (Cardno, Inc. & Colgate 2021, p. 3-4).

The soil seed bank greatly increases the effective population size of the species (Forest Service 2012, p. 12). Therefore, further research on Springville clarkia's reproduction parameters (e.g., seed production rate, germination rate) and their relationship to environmental conditions and stochastic events, such as fire, is necessary to describe the species' abundance in a way that is meaningful to species conservation and recovery (discussed further in **Recommendations** section). Additionally, while multiple years of survey data is available for some colonies or groups of colonies, it is difficult to reconcile the different methods of grouping individuals by the various databases and surveys.

## Threats:

At the time of listing, the primary threats to Springville clarkia were identified as urban development, inadequate regulatory mechanisms, heavy livestock grazing, roadway maintenance activities, and extirpation from random events (Service 1998, p. 49023). Threats to the species identified at the time of the 2009 5-year review include: residential development, road maintenance activities (e.g., mowing, grading, spraying herbicide, mechanically removing brush, clearing culverts), road improvements (e.g., widening and straightening roads, installing culverts), inappropriate livestock grazing, inadequate regulatory mechanisms, competition from nonnative plants, altered fire regimes, climate change, and genetic risks associated with narrow distribution and small population size (e.g., extirpation from random demographic, environmental, stochastic, and genetic events; increased genetic drift; inbreeding) (Service 2009, pp. 6–12). These threats continue to act on the species.

Currently, the primary threats to Springville clarkia throughout its range include drought, climate change, road maintenance activities, road improvements, and competition from nonnative plants. All contacted landowners and managers of Springville clarkia occurrences cited drought and climate change as significant threats to the species (Anderson, *in litt.* 2021; Brydolf, *in litt.* 2021; Kelly, *in litt.* 2021). For example, a colony of Springville clarkia occurs on private land along Balch Park Road, near the type locality, and is potentially undocumented in the Diversity Database. An informal survey noted that only two Springville clarkia plants were present at this site this year while there are typically hundreds (Brydolf, *in litt.* 2021). Additionally, another area on the property with a previously reliable colony of Springville clarkia has not contained any individuals for the past three years (Brydolf, *in litt.* 2021). The observer attributes this decrease in Springville clarkia presence to drought that is exacerbated by climate change (Brydolf, *in litt.* 2021). At another occurrence that has been consistently surveyed, blooming typically peaks during the first week of June (Colgate, pers. comm. 2021). However, in 2021, peak blooming occurred by mid-May, which the observer hypothesizes is the result of climate change and drought (Colgate, pers. comm. 2021). During additional surveys in 2021, many flowers were observed to desiccate before fruiting (Colgate, pers. comm. 2021), suggesting climate change may have the potential to disrupt seed production. Standardized and repeated monitoring of multiple occurrences is necessary to determine how Springville clarkia responds to increasing drought conditions (discussed further in **Recommendations**).

Road maintenance activities and road improvements continue to impact Springville clarkia as described in the 2009 5-year review (Service 2009, p. 7). Diversity Database occurrence #5 was at least partially bulldozed in 2018 during a Caltrans project; this occurrence has not been assessed and its status is unknown (Gunn, *in litt.* 2021). Occurrences may be further threatened by Caltrans' proposed project to replace seven culverts on State Route 190 between the City of Springville and the Town of Camp Nelson (Anderson 2020, p. 1). Based on surveys and consultation with Caltrans, the Service (2020) determined that the proposed project may affect, and is likely to adversely affect, the 100–200 Springville clarkia individuals that occur within the project's action area (p. 1). Caltrans is coordinating with the Service, through Section 7 consultation, and the Wildlife Department to off-set project impacts to Springville clarkia (Service 2020, p. 2; Kemp, *in litt.* 2021).

Competition from nonnative plants is a primary threat to Springville clarkia throughout its range but especially at the Springville Clarkia Ecological Reserve, which is part of Diversity Database occurrence #5 (O’Leary, pers. comm. 2021). The Springville Clarkia Ecological Reserve is managed by the California Department of Fish and Wildlife and excludes livestock grazing, road maintenance activities, and road improvements for the benefit of Springville clarkia. However, Italian thistle (*Carduus pycnocephalus*) is competing with Springville clarkia and is not managed for due to lack of funding and staff time (O’Leary, pers. comm. 2021).

### Disturbance-Related Effects

There is some evidence that Springville clarkia is a disturbance-adapted species and may benefit, to some extent, from activities that result in disturbance, including road maintenance and improvements, grazing, and fire. Therefore, while described here as threats, road maintenance and improvements, grazing, and fire may negatively or positively impact Springville clarkia recovery depending on intensity, magnitude, timing, and other variables. Road maintenance and improvement activities threaten Springville clarkia when the plants are run over by vehicles and trampled by workers. However, activities like mechanical brush removal may be beneficial to Springville clarkia when performed while the species is not actively growing (Forest Service 2012, p. 16). Removal of thatch creates more habitat for Springville clarkia (Forest Service 2012, p. 16). There is also evidence that road grading activities act as a seed vector and help establish new colonies (Colgate, pers. comm. 2021).

Similarly, the effects on plants from livestock grazing are highly variable and dependent on many factors, such as the type of livestock, timing, intensity, and duration (Service 2009, p. 8). McCue (*in litt.* 1997) determined that appropriate grazing regimes may benefit Springville clarkia in some situations by reducing the abundance of nonnative plants and easing competitive pressure (as cited in Service 2009, p. 8). However, inappropriate grazing activities can negatively impact Springville clarkia through excess herbivory of individuals, trampling, and soil compaction (Service 2009, p. 8).

Finally, fire may both threaten and benefit the species, depending on fire intensity, spread, duration, and timing relative to Springville clarkia life cycle. High-intensity, long-duration, and spring to early-summer fires may deplete the soil seed bank, create hydrophobic soil layers, and result in unfavorable microhabitat conditions (Anderson, *in litt.* 2021; Cardno, Inc. & Colgate, pp. 3-4-4-2). In contrast, low-intensity, short-duration, and late-summer to fall fires may remove thatch and benefit Springville clarkia (Forest Service 2012, p. 15; Cardno, Inc. & Colgate, pp. 3-4-4-2). Fire and other disturbances can also control the growth of over-mature woody and perennial species such as chamise (*Adenostoma fasciculatum*) (Cardno, Inc. & Colgate 2021, p. 3-2). Colgate, pers. comm. 2021). Chamise is a native shrub that has been observed to grow among and compete with Springville clarkia, especially in chaparral habitat (Colgate, pers. comm. 2021). Surveys determined that the 2017 Pier Fire was generally beneficial to the occurrences in Southern California Edison’s Lower Tule River Hydroelectric Project, as the cleared habitat for Springville clarkia and, as a late-summer burn, did not disrupt seed bank accumulation (Cardno, Inc. & Colgate, p. 4-2). Further research is necessary to analyze how Springville clarkia responds to disturbance and the potential impacts of road maintenance and improvement activities, livestock grazing, and fire (discussed further in **Recommendations**).

## **Recovery criteria:**

There is currently no published recovery plan for Springville clarkia.

## **Conclusion:**

After reviewing the best available scientific information, we conclude that Springville clarkia remains a threatened species. While ten new occurrences have been recorded in the Diversity Database (2021) since we last reviewed the status of the species in 2009, these new occurrences do not change the known distribution of the species. Furthermore, of the 27 presumed extant occurrences, 16 have not been surveyed in the past ten years (see **Appendix Table 1**) and species-level identification is uncertain for some occurrences (Diversity Database 2021). Additionally, we cannot rely on the available abundance data to assess the status of the species due to lack of information on surveying methods and lack of sampling standardization among land managers. Therefore, due to the uncertainty of the status of many of the occurrences throughout the species' range, we recommend no change in the species' status. Furthermore, the evaluation of threats affecting the species under the factors in 4(a)(1) of the Endangered Species Act in our 2009 status review (Service 2009, pp. 6–13) remains an accurate reflection of the species' current status.

## **RECOMMENDATIONS FOR FUTURE ACTIONS:**

Here we propose several habitat conservation and ecological research recommendations which will aid in the recovery and conservation of Springville clarkia. Some of these recommendations have already been discussed in the previous status review (Service 2009, pp. 13–14) and remain valid.

1. Verify Springville clarkia occurrences recorded in the California Natural Diversity Database, especially occurrences with a currently unknown status and/or that have not been surveyed in the previous ten years.
2. Conduct further research on Springville clarkia's reproduction parameters (e.g., seed production rate, germination rate) and their relationship to environmental conditions to better understand population dynamics and effective population size.
3. Establish reliable baseline data for monitoring Springville clarkia occurrences, including both aboveground presence and soil seed bank. Work with the U.S. Forest Service and other landowners/managers to monitor the status and trend of occurrences to (a) track any threats, (b) estimate current colony/population sizes and the number and distribution of colonies/populations, and (c) determine whether the species is stable, increasing, or declining. Annual precipitation and monitoring data should be compared to assess the impact of drought on population changes, as this may be the most significant threat to the species.
4. Conduct genetic and ecological studies to gain a better understanding of the potential for hybridization between Springville clarkia and other clarkia species, such as elegant clarkia (*Clarkia unguiculata*). Create a species identification key based on genetic and morphological relationships. This information can then be used to help determine the

status of California Natural Diversity Database occurrences with an uncertain identification.

5. Conduct further research on the effect of disturbance on Springville clarkia. Work with the U.S. Forest Service, Bureau of Land Management, and California Department of Fish and Wildlife to conduct research on (a) the value of prescribed burning and mechanical brush removal and (b) the effects of livestock grazing on Springville clarkia.
6. Provide support to the Tule River Indian Tribe of California to implement conservation actions for Springville clarkia on the Tule River Reservation. The Tribe plans to implement several conservation measures to protect occurrences on the Reservation and intends to survey for new colonies should any activities occur in suitable habitat.
7. Complete a recovery plan for Springville clarkia. The plan would establish a framework for agencies and landowners to coordinate conservation efforts. The plan would set recovery priorities and estimate costs of various tasks necessary to accomplish them. It also would describe site-specific management actions necessary to achieve conservation and survival of the Springville clarkia.

**Field Supervisor, Sacramento Fish and Wildlife Office**

**Approve** \_\_\_\_\_ **Date** \_\_\_\_\_

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**APPENDIX Table 1.** Springville clarkia occurrences in California Natural Diversity Database (2021).

<b>Occurrence #</b>	<b>Last verified</b>	<b>Verified since 2009 5-year review?</b>	<b>Most recently available abundance (year of survey)</b>	<b>Owner/manager</b>
1	1987	No	Extirpated (2002)	Private
3	2014	Yes	1,000s (2014)	U.S. Forest Service
4	2021	Yes	3 (2021)	U.S. Forest Service
5	2016	Yes	1,000+ (2014)	Private; California Department of Fish and Wildlife
6	2002	No	150 (2002)	U.S. Forest Service
7	1993	No	300 (1993)	Private; Tulare County
8	1990	No	110 (1988–1990)	U.S. Forest Service
9	1989	No	Unknown (-)	Unknown
10	1990	No	300+ (1990)	Unknown
12	1993	No	100s (1993)	U.S. Forest Service
13	1993	No	100s (1993)	U.S. Forest Service
14	1993	No	150 (1993)	U.S. Forest Service
15	1993	No	1,000s (1993)	U.S. Forest Service
16	1995	No	Unknown (-)	Bureau of Land Management
18	2003	Yes	10,000+ (2003)	U.S. Forest Service
19	2002	No	5 (2002)	U.S. Forest Service
20	2005	No	100 (2005)	Private
21	2010	New	100–200 (2010)	Unknown
22	2014	New	30+ (2014)	Bureau of Indian Affairs*
23	Unknown	New	Unknown (-)	U.S. Forest Service
24	2014	New	20 (2014)	Bureau of Indian Affairs*
25	2015	New	Unknown (-)	Bureau of Indian Affairs*
26	2013	New	Unknown (-)	Bureau of Indian Affairs*
27	2011	New	Unknown (-)	Unknown
28	2014	New	800 (2014)	U.S. Forest Service
29	2016	New	200 (2016)	U.S. Army Corps of Engineers
30	2017	New	25 (2017)	Unknown

\*These lands are held in Federal trust status by the Bureau of Indian Affairs for the Tule River Indian Tribe of the Tule River Reservation, California.