

**PETITION TO LIST THE CUESTA RIDGE THISTLE
(*Cirsium occidentale* var. *lucianum*)
AS A SENSITIVE SPECIES IN THE LOS PADRES
NATIONAL FOREST**



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PREPARED BY LOS PADRES FORESTWATCH, OCTOBER 2020

PETITIONER:

Los Padres ForestWatch is a local nonprofit 501(c)(3) organization working to protect and restore wild places and wildlife in the Los Padres National Forest, the Carrizo Plain National Monument, and other public lands along California's Central Coast. LPFW.org



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EXECUTIVE SUMMARY

The U.S. Forest Service, Pacific Southwest Region last published a comprehensive update of its list of sensitive plant species for the region in July of 2013. The Cuesta Ridge thistle (*Cirsium occidentale* var. *lucianum*) is a rare thistle variety that only occurs within the Los Padres National Forest (LPNF) in San Luis Obispo County; yet, the species continues to not be afforded the protections that come with placement on the sensitive species list. As a result, the thistle's population viability continues to be threatened. Therefore, we hereby request that you add the Cuesta Ridge thistle to the LPNF sensitive species list (Forest Service Manual [FSM] 2670.5.19).

C. occidentale var. *lucianum* is a very specialized species, endemic to and only found along a narrow ridgeline in the southern Santa Lucia mountains. The designation of the Cuesta Ridge thistle as a sensitive species is imperative because populations within the LPNF are not secure. Ongoing stressors to the population include climate change, stochastic events such as wildfire and drought, livestock grazing, unregulated outdoor recreation, land-use change, and invasive species. Concomitantly, the continued existence of the Cuesta Ridge thistle is also in jeopardy due to the dearth of data available concerning the taxa and lack of protection from reduction of viable habitat. Thereby, Los Padres ForestWatch requests that the U.S. Forest Service add the Cuesta Ridge thistle to the list of sensitive species that occur in the LPNF. The addition of the *C. occidentale* var. *lucianum* to the LPNF sensitive species list will confirm that any potential impacts to the thistles or their habitat are evaluated and mitigated. It will also ensure the utilization of the best and most current information to inform land management decisions throughout the region.

The Forest Service Manual states that sensitive species are defined as: "Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

1. Significant current or predicted downward trends in population numbers or density.
2. Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution" (Forest Service Manual [FSM] 2670.5.19).

Evidence for the aforementioned includes:

1. Low population numbers with restricted range and ecological conditions (variety known from fewer than 15 occurrences prior to 2019, all of which are on Cuesta Ridge in SLO County and the majority existing within the Los Padres National Forest).
2. Significant future stressors predicted due to climate change and other anthropogenic activities
3. California Rare Plant Rank 1B.2 – Plants with a California Rare Plant Rank of 1B are rare, threatened, or endangered in California and elsewhere. A 0.2 threat rank is determined as threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat). All plants constituting California Rare Plant Rank 1B meet the

definitions of the California Endangered Species Act of the California Department of Fish and Game Code and are eligible for state listing. (CNPS, 2020).

4. NatureServe Global/Intraspecific Taxon Status: G3T2 (Imperiled Variety) – at high risk of extinction or collapse due to restricted range, few populations or occurrences (often 20 or fewer), steep declines, severe threats, or other factors (NatureServe, 2020).
 - a. NatureServe Subnational Status: S2 Imperiled (California) – Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state (NatureServe, 2020).

2012 PLANNING RULE UPDATES – SPECIES OF CONSERVATION CONCERN

When the Los Padres National Forest revises its 2005 Land Management Plan it will be pursuant to the new planning regulations adopted in the 2012 Planning Rule put into effect May of 2012. The 2012 Planning Rule established Species of Conservation Concern (SCC) (36 CFR 219.9), which will supplant the Regional Forester’s Sensitive Species list required in the 1982 Planning Rule. For plan revisions being prepared pursuant to the 2012 Planning Rule the Regional Forester must identify SCC specific to the planning unit during the planning process (Witt, 2020). The SCC list has more comprehensive and defined criteria for inclusion than the Regional Forester’s list of sensitive species, making it less likely that a species in need of help will be overlooked.

Forest Service Handbook (FSH) section 12.52c addresses “Criteria for Identifying a Species of Conservation Concern” and states that there are two main criteria for identifying potential Species of Conservation Concern:

1. The species is native to, and known to occur in, the plan area.
2. The best available scientific information about the species indicates substantial concern about the species’ capability to persist over the long term in the plan area.

FSH Section 12.52d states that species that have status ranks of G1/T1 or G1/T2 on the NatureServe Ranking system “must be considered” for SCC designation. In addition, categories of species that “should be considered” for SCC designation also include species with status ranks of G3/T3 or S1-S2 on the NatureServe ranking system, species for which the best available scientific information indicates there is local conservation concern about the species’ capability to persist over the long-term in the plan area due to:

1. Significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat). These threats include climate change.
2. Declining trends in populations or habitat in the plan area.

3. Restricted ranges (with corresponding narrow endemics, disjunct populations, or species at the edge of their range).
4. Low population numbers or restricted ecological conditions (habitat) within the plan area.

Due to its documented occurrence within the plan area (as recent as 2020) along with its T2 NatureServe status, the Cuesta Ridge thistle must be considered as a candidate for the SCC list in the Los Padres National Forest during the subsequent Forest Plan update. Further support for the variety's inclusion includes its S2 NatureServe rank, significant current and future threats/stressors, low population numbers, and its restricted range/ecological conditions within the plan area as explained in the following petition. Given the trajectory for the Cuesta Ridge thistle to likely be included as a SCC in the LPNF in the future, we believe it is prudent that until such time as the Forest Plan addresses 2012 Planning Rule regulations, *C. occidentale* var. *lucianum* currently deserves all the protection warranted by the regional listing of a sensitive species and should be classified as a sensitive species under the Regional Forester's Sensitive Species list within the Los Padres National Forest.

OCCURENCE WITHIN THE LOS PADRES NATIONAL FOREST

Prior to 2019, Cuesta Ridge thistle was known from fewer than 15 occurrences, all of which are on Cuesta Ridge within or on the border of the Los Padres National Forest (GBIF, 2020). In 2019, specimens were observed in the field in several California Native Plant Society surveys within the Los Padres National Forest:

1. Cuesta Ridge West – from Highway 101 to Tassajara Peak
[CNPS-SLO \(West Cuesta Vascular Flora Checklist, 2019\)](#)
2. Cuesta Ridge East – from Highway 101 to Upper Lopez Canyon
[CNPS-SLO \(East Cuesta Vascular Flora Checklist, 2019\)](#)
3. Stenner Springs Natural Reserve
[CNPS-SLO \(Stenner Springs Vascular Flora Checklist, 2019\)](#)

These surveys were headed by Dr. David Keil, professor emeritus of biology at California Polytechnic State University, Curator of the Robert F. Hoover Herbarium, and major contributor to the Jepson Manual and the Flora of North America. Dr. Keil is a leading expert on the *Cirsium* genus in California and his 2004 paper “New Taxa and new Combinations in North American *Cirsium*” was responsible for *C. occidentale* var. *lucianum* D.J. Keil to be accepted as a recognized variety of the cobwebby thistle. Most recently, several research-grade observations were made in 2020 within the Los Padres. Two specimens were found along East Cuesta Ridge by a biology graduate student researcher at Cal Poly. An additional specimen was identified near the TV/Radio towers on TV Tower Rd. by a professional botanist and co-chair of the Rare Plant Committee for the Marin Chapter of the California Native Plant Society. Again in 2020, Morgan Stickrod, a graduate student at San Francisco State University's Parker Lab and *Cirsium* researcher, found more specimens around the same location of the first communication towers (GBIF, 2020). An overview of recorded Cuesta Ridge thistle occurrences can be seen in Table 1.

Table 1. Recorded occurrences of Cuesta Ridge thistle.(Source: GBIF.org (31 July 2020) GBIF Occurrence Download <https://doi.org/10.15468/dl.hq2exc>)

Date	Scientific Name	State	County	Locality	Record Type	Source	Recorded By:
6/24/2020	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF; slope near TV/radio towers, E of W Cuesta Ridge Rd, 3 mi W of HWY 101	Human Observation	iNaturalist	Morgan Stickrod
6/24/2020	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF; slope near TV/radio towers, E of W Cuesta Ridge Rd, 3 mi W of HWY 101	Human Observation	iNaturalist	Morgan Stickrod
5/22/2020	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF; along Mount Lowe Rd., approximately 7 miles from Highway 101 junction	Human Observation	iNaturalist	Paul Excoffier
6/9/2019	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Cuesta Ridge East from Highway 101 to Upper Lopez Canyon San Luis Obispo County, California	Human Observation	CNPS-SLO	David Keil
6/9/2019	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Stenner Springs Natural Reserve, San Luis Obispo County, California	Human Observation	CNPS-SLO	David Keil
6/2/2019	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Cuesta Ridge West from Highway 101 to Tassajera Peak San Luis Obispo County, California	Human Observation	CNPS-SLO	David Keil
5/15/2019	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF; along Mount Lowe Rd., approximately 7 miles from Highway 101 junction	Human Observation	iNaturalist	Paul Excoffier
5/13/2019	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF; slope near TV/radio towers, E of W Cuesta Ridge Rd, 3 mi W of HWY 101	Human Observation	iNaturalist	David Greenberger
6/2/2011	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	In roadcut along roadside. 0.3-0.6 miles west of Highway 101 along Cuesta Ridge Road (USFS 29S11), West of Cuesta Pass (Several plants observed)	Preserved Specimen	CNDDDB	Bushakra, J.
5/21/2009	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Upper Reaches of Stenner Creek	Human Observation	CNDDDB	Zachary Green
6/4/2000	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	0.3 mi from Hwy 101 along W Cuesta Ridge Rd	Preserved Specimen	OBI	Jill M. Bushakra; John Bushakra
5/28/1995	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	San Luis Obispo County: Steep rocky opening at edge of <i>Quercus agrifolia</i> woodland at margin of unburned area; SE base of Peak 3.	Preserved Specimen	DAV	G. F. Hrusa
5/2/1995	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Black Butte Research Natural Area.	Preserved Specimen	OBI	G.F. Hrusa
6/22/1989	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF; W facing cleared slope below TV towers just E of W Cuesta Ridge Rd at eastern botanical area boundary sign, 3 mi W of hwy 101	Preserved Specimen	OBI	T.J. Ayers; S. Junak
6/22/1989	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Cuesta Ridge; along main road (USFS Road #29S11.3) 1.3 mi W of E boundary sign for the Cuesta Ridge Botanical Area, about 4.3 mi W of Highway 101	Preserved Specimen	OBI	Steven A. Junak; Tina J. Ayers
5/17/1987	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Los Padres NF, Cuesta East past end of rd along fire trl in area burned by both the Gay Mtn fire and the Las Pilitas fire	Preserved Specimen	OBI	David J. Keil; Rhonda Riggins, Richard Pimentel, Michael Stiles and Joanna Tomassacci
6/7/1971	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Along main rd by S entrance to Cuesta Ridge Botanical Area. 2 mi NW of Cuesta Pass	Preserved Specimen	OBI	Patricia Wiese
6/17/1965	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Santa Lucia Range. Ridge NW of Cuesta Pass	Preserved Specimen	OBI	Robert F. Hoover
7/9/1964	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	5 mi W of Pozo (Salsipuedes Creek)	Preserved Specimen	OBI	Robert F. Hoover
6/5/1964	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Near summit of ridge W of upper Lopez Canyon	Preserved Specimen	OBI	Robert F. Hoover
6/1/1964	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Near summit of ridge west of upper Lopez Canyon	Preserved Specimen	CAS	Hoover, R. F.
5/13/1958	<i>Cirsium occidentale lucianum</i> (D.J. Keil)	CA	San Luis Obispo	Cerro Alto	Preserved Specimen	CNDDDB	Hardham, C.

TAXONOMY

The following is the biological classification for Cuesta Ridge thistle:

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Subclass: Asteridae

Order: Asterales

Family: Asteraceae

Tribe: Cynareae

Genus: *Cirsium*

Species: *C. occidentale*

Variety: *C. occidentale* var. *lucianum*

There are approximately 62 native species within the *Cirsium* genus, several of which include multiple varieties, that only occur in the Northern Hemisphere. Seven of these species are only found in California (Keil, 2006).

DESCRIPTION

Cuesta Ridge thistle (*Cirsium occidentale* var. *lucianum*) is a California native thistle and recognized variety of the native thistle species *C. occidentale*. It is a California Rare Plant 1B.2 ranked plant and is endemic to a small narrow corridor within and directly adjacent to the Los Padres National Forest in San Luis Obispo County. *C. occidentale*, with the common name cobweb thistle or cobwebby thistle, is a North American species of thistle in the sunflower family. The plant is widespread and fairly common across most of California in its mountain ranges, valleys, and the Mojave Desert. It is also found in the western Great Basin region in western Nevada, southern Oregon, and southwestern Idaho (Baldwin et al., 2012). *C. occidentale* is morphologically distinguished from other *Cirsium* species by its plant heads that are covered in large phyllaries with very long, spreading spines which are laced, often quite heavily, in fibers resembling cobwebs (Baldwin et al., 2012). There are seven recognized varieties within the *C. occidentale* complex, including the Cuesta Ridge thistle, which differ from one another in range and form. Other varieties include compact cobwebby thistle, California thistle, snowy thistle, cobwebby thistle, Coulter's thistle, and Venus thistle (Keil, 2006).

Cuesta Ridge thistle grows erect to 3–20 decimeters tall. Its capitula are long-peduncled and elevated well above its lower leaves (Fig. 4). Involucres are 2–4 cm in diameter, dark purple, and floccose to arachnoid in appearance. Middle phyllary tips are generally 5–8 mm long, 1–3 mm wide, straight or upwardly curved, ascending to spreading (Fig. 1). Corollas are 20–24 mm long and dark purplish red in color (Fig. 5). The plant shares traits with Venus thistle and California thistle; it has less fuzzy flowerheads like var. *venustum* (Fig. 3) but has smaller-headed plants like that of var. *californicum*. *C. occidentale* var. *lucianum* is differentiated from var. *californicum* by its dark, reddish purple corollas and darkly pigmented involucres (Fig. 2). It approaches the ranges of var. *californicum* and var. *venustum* but are not known to grow with

either of these varieties. *C. occidentale* var. *lucianum* may represent a stabilized emergent form derived by prehistoric hybridization between var. *californicum* and var. *venustum* (Keil, 2004).



Figure 1. Involucre of Cuesta Ridge thistle (2020).

Involucres are 2-4 cm in diameter, dark purple, and floccose to arachnoid in appearance. Middle phyllary tips generally 5–8 mm long, 1–3 mm wide, straight or upwardly curved, ascending to spreading.

Photo Credit: [Morgan Stickrod](#), licensed under [CC BY-NC 4.0](#)



Figure 2. Capitulum of Cuesta Ridge thistle (2020). *C. occidentale* var.

lucianum resembles the small-headed plants of var. *californicum* but differ in their dark, reddish purple corollas and darkly pigmented involucres.

Photo Credit: [Morgan Stickrod](#), licensed under [CC BY-NC 4.0](#)



Figure 3. Involucre hairs of Cuesta Ridge thistle (2020). The Cuesta Ridge thistle is one of two Cobweb thistle varieties (the other being the Venus thistle) that have less fuzzy flowerheads than other Cobweb thistle varieties.

Photo Credit: [Morgan Stickrod](#), licensed under [CC BY-NC 4.0](#)



Figure 4. Cuesta Ridge thistle growing on West Cuesta Ridge (2020). *C. occidentale* var. *lucianum* plants grow erect, 3–20 decimeters tall. Their capitula are long-peduncled and elevated well above the lower leaves.

Photo Credit: [Morgan Stickrod](#), licensed under [CC BY-NC 4.0](#)

LIFE HISTORY

Like other native thistles *C. occidentale* var. *lucianum* is monocarpic, flowering only once in its lifetime before dying. It is a biennial plant — during the first year it forms a taproot and basal rosette of gray woolly and spiny leaves (Fig. 6) while flowering occurs in the second year of its life cycle. Flowering occurs between April and July. The thistle's reproduction is based entirely on seed production – making seeds critical to the persistence of the species. The brownish seed is about ¼" (0.6 cm) long, attached at one end to a white, plumose pappus that carries it away in wind currents. Dormancy rates in California native thistles has not been well established, the amount of live thistle seeds that do not germinate for one to several years. Monocarpic species employ intermediate life history strategies, relying more on current seed for regeneration and are often fugitives with patchy distributions. Fugitive species, especially those with transient seed banks, depend on current seed for recruitment (Silvertown et al. 1993; Louda & Potvin, 1995) and therefore dormancy mechanisms are likely limited. Seed dormancy is a common adaptation for native plants, but even if present its efficacy may be attenuated in the future due to climate change and increasing drought durations (Eckberg et al., 2017).

Moths and butterflies that *C. occidentale* var. *lucianum* likely host include: Painted Lady (*Vanessa cardui*), Mylitta Crescent (*Phyciodes mylitta*), Bilobed Looper Moth (*Megalographa biloba*), Sweetclover Root Borer Moth (*Walshia miscecolorella*), Garden Webworm Moth (*Achyra rantalis*), and Artichoke Plume Moth (*Platyptilia carduidactyla*) (Jepson Flora Project, 2015).

HABITAT

Cuesta Ridge thistle is endemic to a narrow corridor of the southern Santa Lucia Mountains in San Luis Obispo County between 450-750 meters above sea level. It occurs within pure coast chaparral stands and/or on the edges of woodland-chaparral or grassland-chaparral communities (Fig. 7). The thistle can also be found in Sargent cypress conifer forest openings within the Cuesta Ridge Botanical Special Interest Area. The variety is adapted to abundant sunlight and therefore found in clearings where it has direct access to sunlight. Associated species that have been noted growing nearby thistle specimens include: *Gnaphalium californicum*, *Salvia mellifera*, *Eriophyllum confertiflorum*, *Diplacus aurantiacus*, *Lupinus spp.*, *Arctostaphylos obispoensis*, *Salvia mellifera*, *Calystegia macrostegia ssp. Cyclosegia*, *Centaurea solstitialis*, *Melica torreyana*, *Eriophyllum*, *Stachys*, *Stipa*, *Avena*, and non-native grasses.

Cuesta Ridge thistle most often occurs on ultramafic serpentine soils, with much of the population growing in the Cuesta-Henneke Families soil complex (Fig. 8). These soils formed in material weathered from serpentinite and peridotite rocks. Cuesta soils are on mountainsides and ridge tops, with elevations ranging from 600 to 3,000 feet and slopes from 15 to 70 percent. The climate is dry, sub humid mesothermal with warm, dry summers and cool, wet winters. These soils are well-drained with moderate to rapid runoff and slow permeability (Soil Survey). Henneke soils are on hillslopes with elevations from 500 to 4,000 feet and slopes from 5 to 75 percent. Rock outcrops, stones, and cobbles are common and occupy 5 to 60 percent of the surface. Much of the parent material is in the form of a "mélange", that is, a mix of crushed and broken rocks with limited bedrock exposures (Soil Survey).

Figure 5. Corollas of Cuesta Ridge thistle. Corollas 20–24 mm long, dark purplish red. *Photo Credit: [Chris Winchell](#)*



Figure 6. Basal leaves of Cuesta Ridge thistle (2020). *C. occidentale* var. *lucianum* forms a rosette of gray-green woolly and spiny leaves during the first year of its life cycle. *Photo Credit: [Morgan Stickrod](#), licensed under [CC BY-NC 4.0](#)*





Figure 7. A) Cuesta Ridge thistle growing on West Cuesta Ridge in June of 2020. *Photo Credit: [Morgan Stickrod](#), licensed under [CC BY-NC 4.0](#).* B) A budding Cuesta Ridge thistle growing in a manzanita clearing on the west flank of Cuesta Ridge in May of 2019. Bishop Peak and Ferrini Ranch Open Space can be seen in the background. *Photo Credit: [David Greenberger](#), licensed*

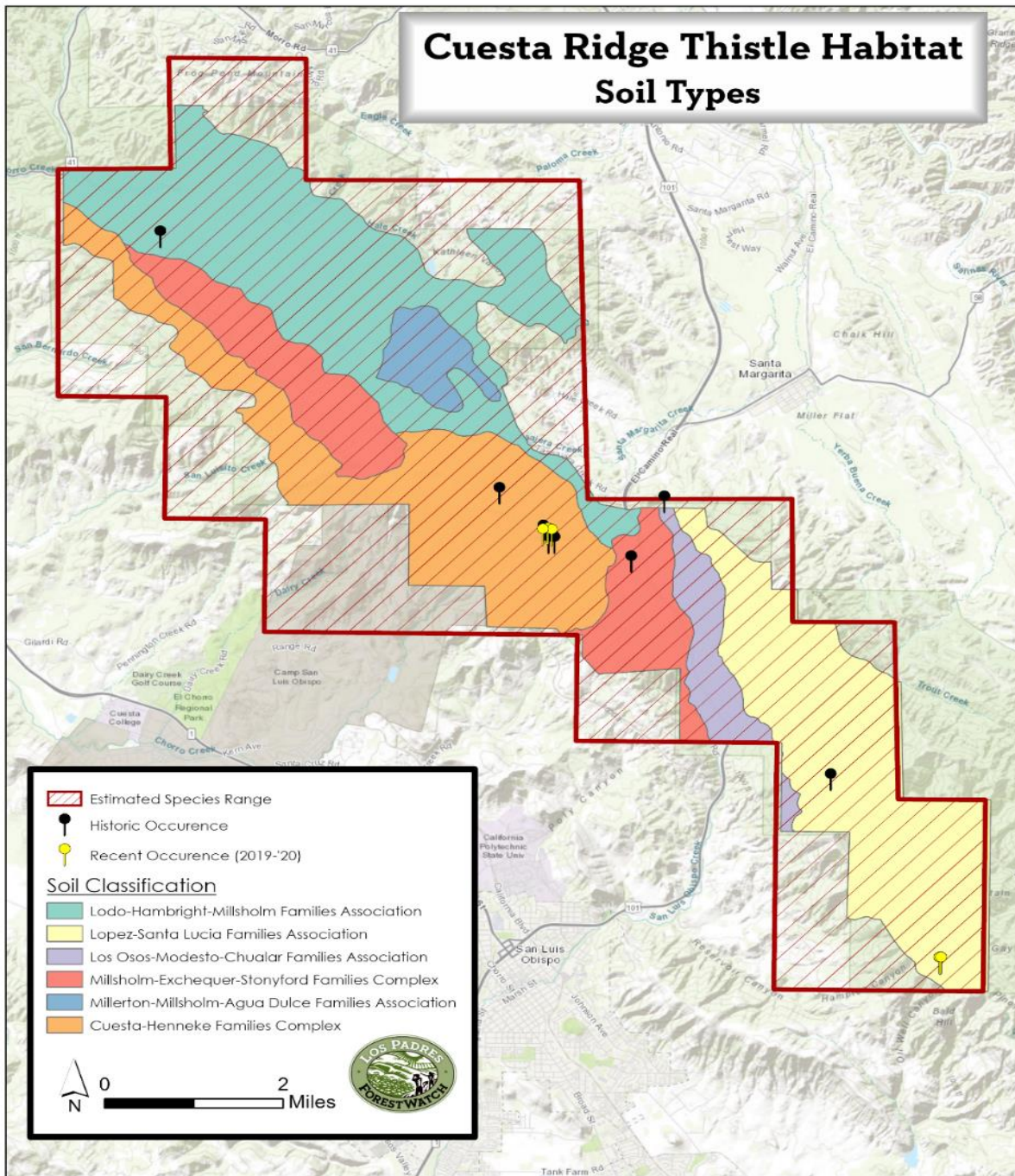


Figure 8. Soil associations along Cuesta Ridge within *C. occidentale* var. *lucianum*'s range. The Cuesta Ridge thistle is primarily found in soils formed in material weathered

Serpentine soil and rock are characterized by low calcium to magnesium ratios, and with calcium at significantly lower levels relative to surrounding areas. In addition, serpentine soil and rock frequently contain elevated levels of heavy metals (e.g. iron, nickel, chromium, cobalt), which are toxic to most other plants, and they are often deficient in essential plant nutrients (e.g. nitrogen, potassium, phosphorus) (Brady et al. 2005). Because of their ultramafic origin, which in San Luis Obispo County is associated with tectonics and subduction, serpentine substrates are often steep outcrops (Brady et al. 2005). Accordingly, it is reported that Cuesta Ridge thistle occurs mostly on rocky slopes and road cuts (Fig. 9).

DISTRIBUTION

Cuesta Ridge thistle is endemic and restricted to only a narrow corridor along and adjacent to the main ridge of the southern Santa Lucia Mountains within the Los Padres National Forest. This narrow eight-mile ridgetop strip of national forest land, known as Cuesta Ridge, is home to several rare plant species. Estimated current range of the Cuesta Ridge thistle ranges south of Highway 41 to several miles south of Highway 101 along Mount Lowe Rd. (Fig. 10). The largest extant populations are on West Cuesta Ridge and centered around the Cuesta Ridge Botanical Area and circling the TV/Radio towers broadcasting KCBX-FM, KWSP-FM, and KSBY Communications among others (Fig. 11).

CONSERVATION VALUE

Native *Cirsium* species are one of North America's evolutionary success stories. There are approximately 62 native *Cirsium* species, making this the most diverse thistle genus in North America (Keil, 2006). The diversification among *Cirsium* species has allowed members of the genus to currently occupy an incredibly wide range of habitats across North America and created many habitat specialist species throughout the West. Very few thistle species are widely distributed with many being endemic and restricted to a specific ecological region. Around 1/6 of native species only occur in a single state (Keil, 2006); furthermore, approximately 60% of thistle species are rare throughout much of their distribution (Kartesz, 2015). Globally, 10 *Cirsium* species are listed as near threatened to critically endangered by the International Union of the Conservation of Nature (IUCN, 2017), and in the U.S., five thistles are now on the Endangered Species List. In California, nearly half of recognized *Cirsium* species are considered rare, with one believed to be extinct (Keil, 2006). Thistles are likely still evolving rapidly, given the high prevalence of hybridization among geographically overlapping species (Kelch and Baldwin, 2003).

C. occidentale var. *lucianum* is restricted to San Luis Obispo County where it only occupies a narrow corridor along and adjacent to the main ridge of the southern Santa Lucia Mountains. It shares similar imperiled population numbers as that of Chorro Creek bog thistle (*Cirsium fontinales* var. *obispoense*), another *Cirsium* species variety that occurs only in San Luis Obispo County and was listed as endangered under the California Endangered Species Act in 1993 and the U.S. Endangered Species Act in 1994. At the time it was federally listed in 1994, Chorro Creek bog thistle was known from nine occurrences (Kofron, 2016). Prior to more recent occurrences in 2019, Cuesta Ridge thistle was known from less than 15 occurrences (GBIF, 2020), yet it does not possess any formal level of protection. Due to the rarity and decline of

many *Cirsium* species/varieties in California along with unique levels of evolutionary adaptation, it is prudent that Cuesta Ridge thistle be afforded sensitive species protections to reduce further declines to this unique genus.

Native thistles like *C. occidentale* var. *lucianum* provide a unique and attractive resource for insect pollinators. Like many other thistle species, Cuesta Ridge thistle is monocarpic and only flowers once before dying. Monocarpic thistle species/varieties tend to allocate significant resources toward larger flowerheads than many other members of the sunflower family (Fenner et al., 2002). As a result, research suggests that native thistles provide significant rewards to foraging insects. One study, using updated species descriptions by David Keil in 2006, found that *C. occidentale* var. *californicum* (another closely related Cobwebby thistle variety) have higher concentrations of sugar in their nectar compared to other flowering species (Gut et al., 1977). Native thistles in North America are visited and pollinated by a diverse range of insects. Over 200 invertebrate species visit native *Cirsium* species including honeybees, bumble bees, solitary bees, butterflies, beetles, and flies (Powel et al., 2011). A wide variety of birds feed on native thistle seeds; additionally, hummingbirds are frequent visitors, possibly preferring native thistles for the high sugar content of their nectar. Additional protections for the Cuesta Ridge thistle will help bolster higher biodiversity in the southern Santa Lucia Mountain's chaparral-woodland habitat within the Los Padres National Forest.

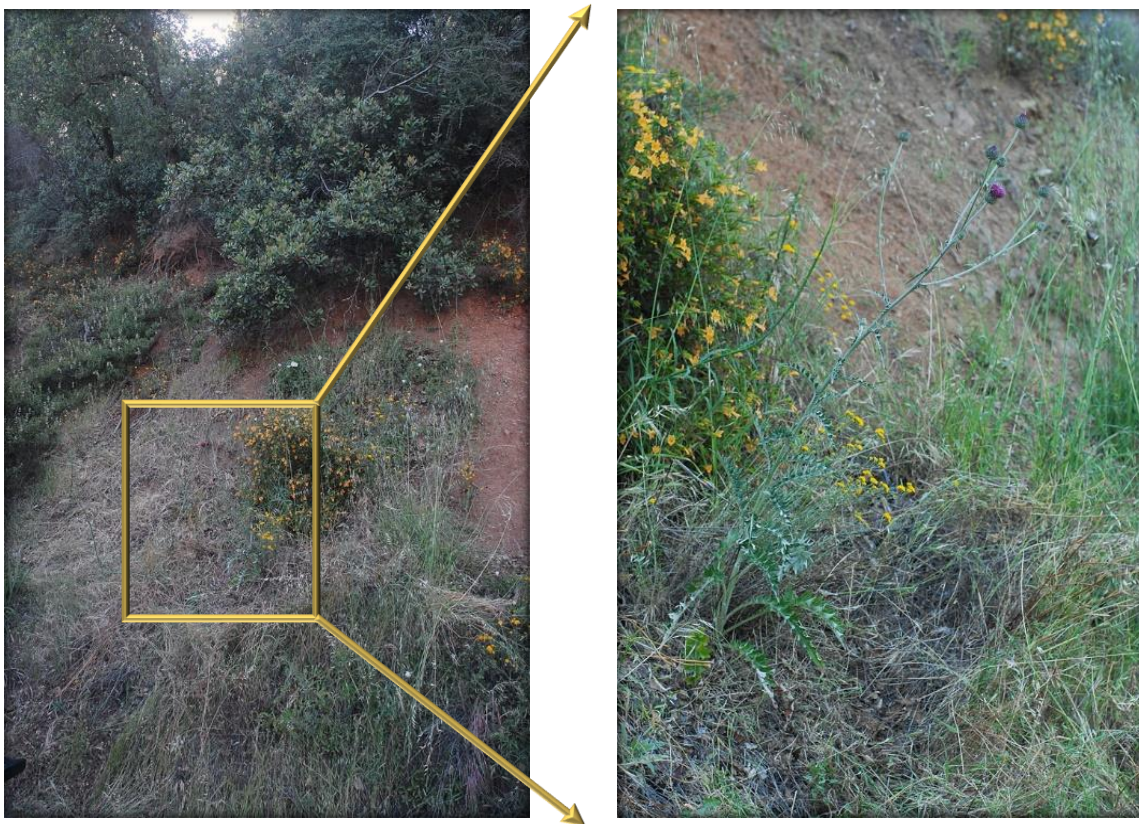


Figure 9. A Cuesta Ridge thistle in a chaparral-oak clearing. The variety is most often found in open sites on steep rocky slopes and along disturbed roadsides in ultramafic (serpentinite) soils. *Photo Credits: Chris Winchell*

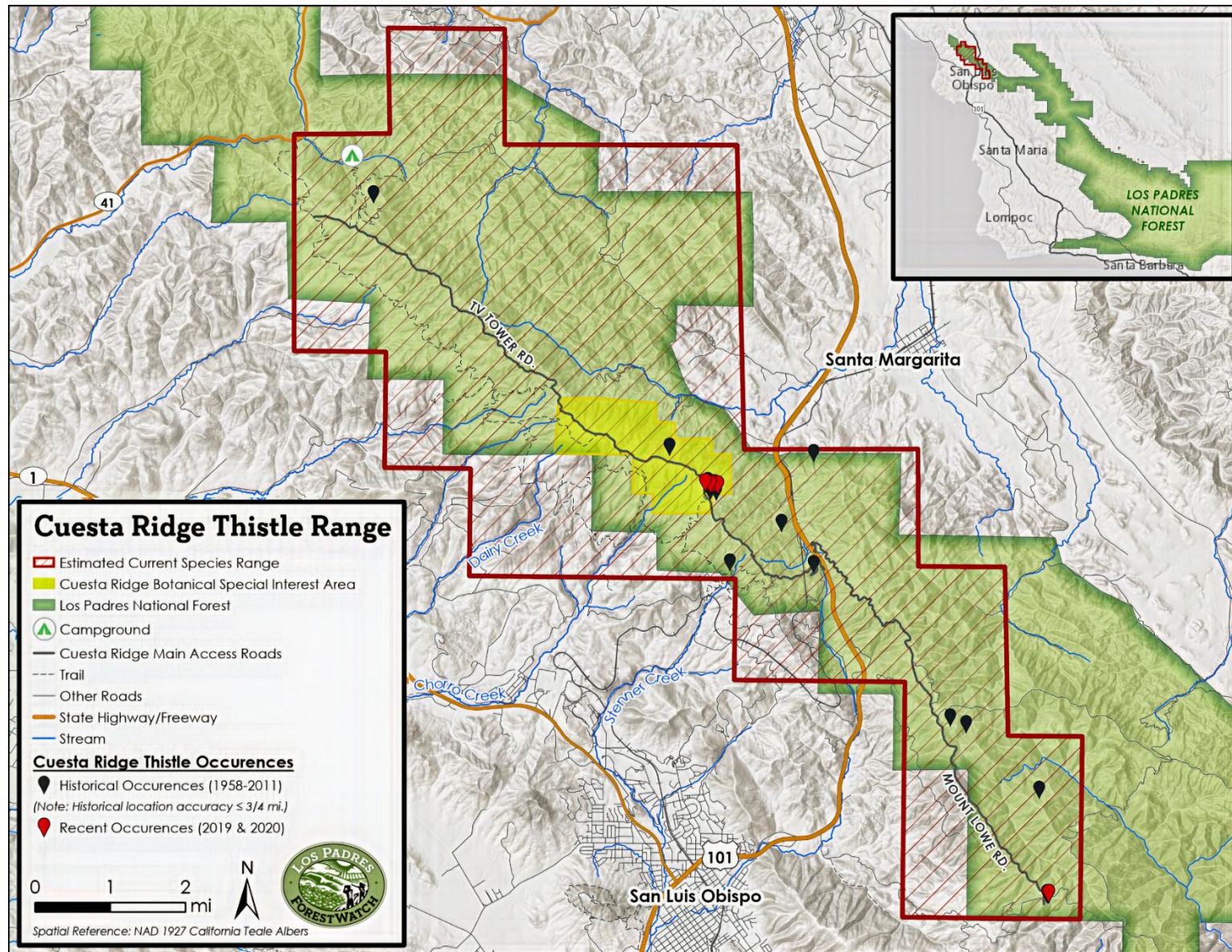


Figure 10. Estimated current range of *C. occidentale* var. *lucianum* with documented occurrence locations (1958-2020). Species range is estimated by including areas within 10 miles of a verified specimen that are also within the elevation and precipitation/temperature average ranges in which the plant grows.

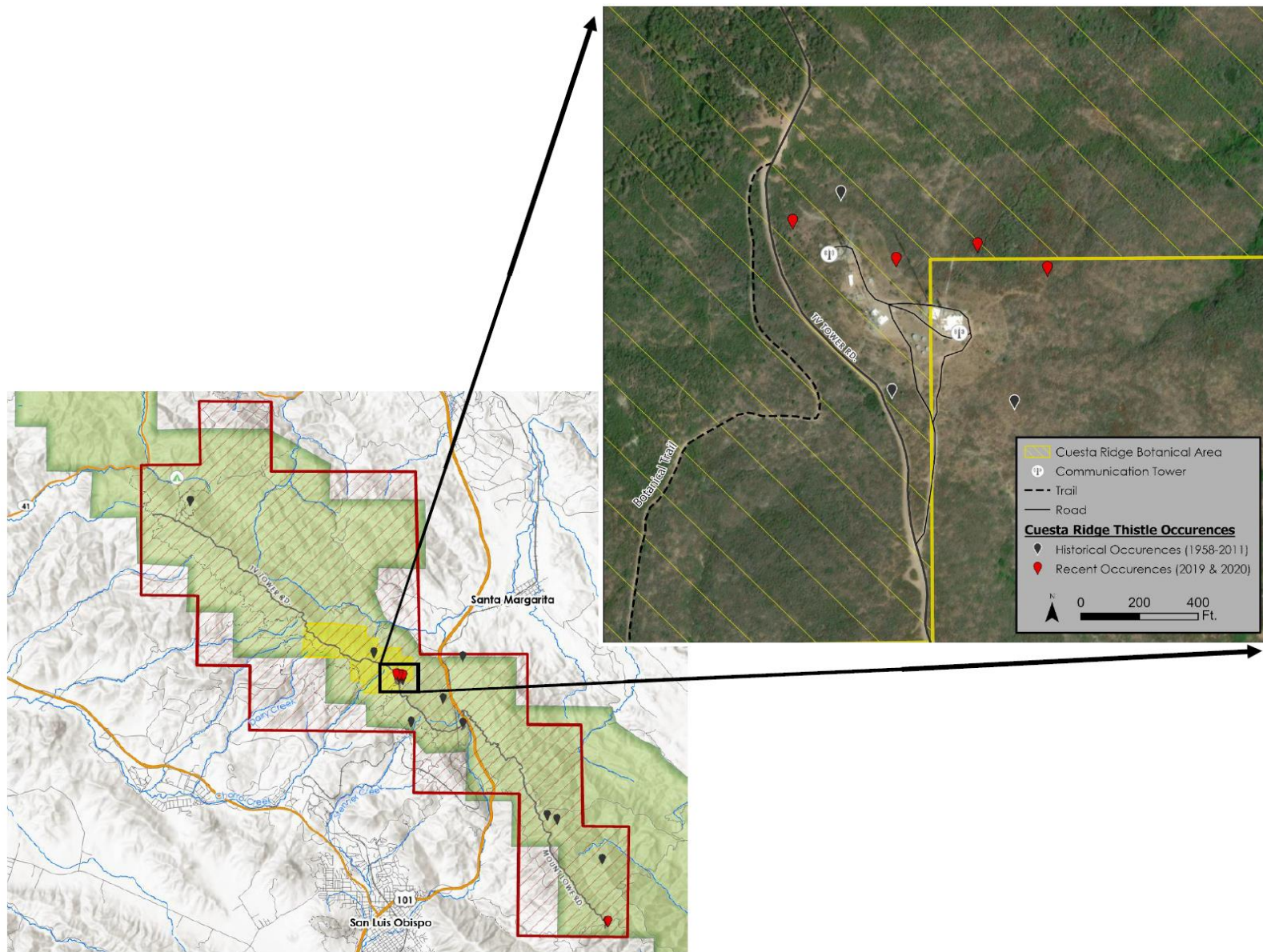


Figure 11. Historic and recent confirmed occurrences of Cuesta Ridge thistle around the current population center. The majority of *C. occidentale* var. *lucianum* are fairly concentrated on West Cuesta Ridge. A few botanists in the San Luis Obispo area have reported scattered individuals on the east side of the ridge, but the most reliable population can be found centered around the first radio/TV tower on TV Tower Rd. (West Cuesta Ridge Rd.)

Bumble bees are highly attracted to thistle flowers. In a long-term review of flower visitation records by bumble bees in California, the *Cirsium* genus was found to be the most commonly visited flower, with 23 of California's 24 bumble bee species on *Cirsium* and twice as many individuals as on the next most visited genus *Chrysothamnus* (Thorp et al., 1983). Bumble bees are an integral part of California's ecosystems, but populations of many species in the state are in rapid decline due to land use changes, pesticide overuse, diseases spread by commercial bees, and climate change. Recently, the populations of four bee species — the Crotch, Franklin's, Suckley cuckoo and Western bumble bees have been listed as endangered species candidates by the California Fish and Game Commission (Romero, 2020). Including the Cuesta Ridge thistle on the Regional Forester's Sensitive Species list would not only help its populations continued persistence but subsequently aid the persistence of other imperiled invertebrates as well.

THREATS

Climate Change

Climate change is a relatively novel threat to the thistle, but it brings about several different stressors. California is becoming hotter and drier with prolonged periods of drought. Annual average temperatures across SLO County are expected to increase between 2.1 to 3.9 degrees Fahrenheit by 2045 and between 4.1 to 7.6 degrees Fahrenheit by 2085 (Koopman et al., 2010). Annual average precipitation projections in the county are variable, with an expected decrease up to 4.2 inches or increase up to 1.5 inches by 2045; however, even if levels of precipitation were to increase, soil moisture is expected to decline due to higher temperatures and evaporation (Koopman et al., 2010). Species with small geographic ranges are more vulnerable to climate change (Foden et al. 2013), with particular concern regarding extreme weather events. Cuesta Ridge thistle is moderately to highly vulnerable to climate change because of its relatively small geographic range and its soil and habitat specificity. The thistle's seeds are critical to the persistence of the species, however, dormancy rates in native thistles has not been well established. Increased temperatures and prolonged droughts may render seed dormancy, a common native plant adaptation, less effective in the future.

Bumble bees are a critical pollinator for *Cirsium* species. Yet, bumble bee populations in North America have plummeted as a result of extreme temperatures. The number of areas populated by bumble bees has fallen 46 percent in North America, and the new research found that regions with sharp bee declines also experienced strong variations in climate — and especially higher temperatures and worse heat waves (Mooney, 2020). A decline in bumble bee pollination due to climate change can be detrimental to native thistles, including var. *lucianum*, which are highly reliant on insect pollination. A study of *C. fontinales* var. *obispoense*, a next-door neighbor to Cuesta Ridge thistle and an endangered variety of the fountain thistle, found that without pollinators less than 10% of seeds develop (Powell et al. 2011).

Stochastic Events

Species with small populations are vulnerable to extinction by randomly determined processes known as stochastic events (Ricklefs, 2008). Stochastic events are important and unpredicted factors that contribute to shaping population spatial distribution and encompass both environmental and demographic stochasticity. Demographic stochasticity results from chance independent events of individual mortality and reproduction, causing random fluctuations in population growth rate, primarily in small populations (Lande et al., 2003). Environmental stochasticity refers to events such as wildfires, droughts, and other catastrophes that may affect population spatial distribution.

Larger and more severe wildfires are significant stochastic events that threaten the long-term survival of *C. occidentale* var. *lucianum*. The restricted range and low population numbers of the Cuesta Ridge thistle make it very vulnerable to large destructive wildfires that may consume teetering populations in one conflagration; the landscape of the Cuesta Ridge is at substantial risk for large wildfires (Fig. 12, Appendix Fig. 14, Fig. 15).

A substantial increase in area burned by wildfire is projected for San Luis Obispo County, with an expected 200-350% increase in acreage burned by 2085 as compared to the historic (1961-1990) amount (Westerling et al., 2009). This will largely be attributed to an increase in human caused fires exacerbated by climate change conditions.

Most wildfires in the LPNF are human caused. As more people pack into the region, the chance for wildfires to ignite increases, and they are occurring far more frequently than they did centuries ago. Over 56% of the Los Padres National Forest has burned just in the last 20 years and many of those areas have burned two or three times in the last 50 years (Appendix, Fig. 16). The Los Padres has one of the most negative fire interval return departure (FRID) values of any national forest in California. Fire is occurring too frequently for many of the native chaparral species, of which the thistle coexists with, to keep up. Areas that burn too frequently for too long will undergo “type conversion” — the permanent conversion of native chaparral to nonnative weeds and grasses. Type conversion would affect the habitat of which the Cuesta Ridge thistle has evolved in.

Both environmental and demographic chance or randomness can cause the population size of Cuesta Ridge thistle to fluctuate; given its dispersed small population sizes these fluctuations are more likely to include zero and lead to extinction. In its 2014 ESA review of the nearby Chorro Creek bog thistle, U.S. Fish and Wildlife identified stochastic events as an ongoing threat to the thistle due to its low population numbers that exist as a metapopulation in a relatively small geographic area (271 km²) (USFWS, 2014). Cuesta Ridge thistle’s range has a similarly small area (estimated around 120 km²) with low estimated population numbers. Therefore, we consider stochastic events an ongoing threat to the thistle.

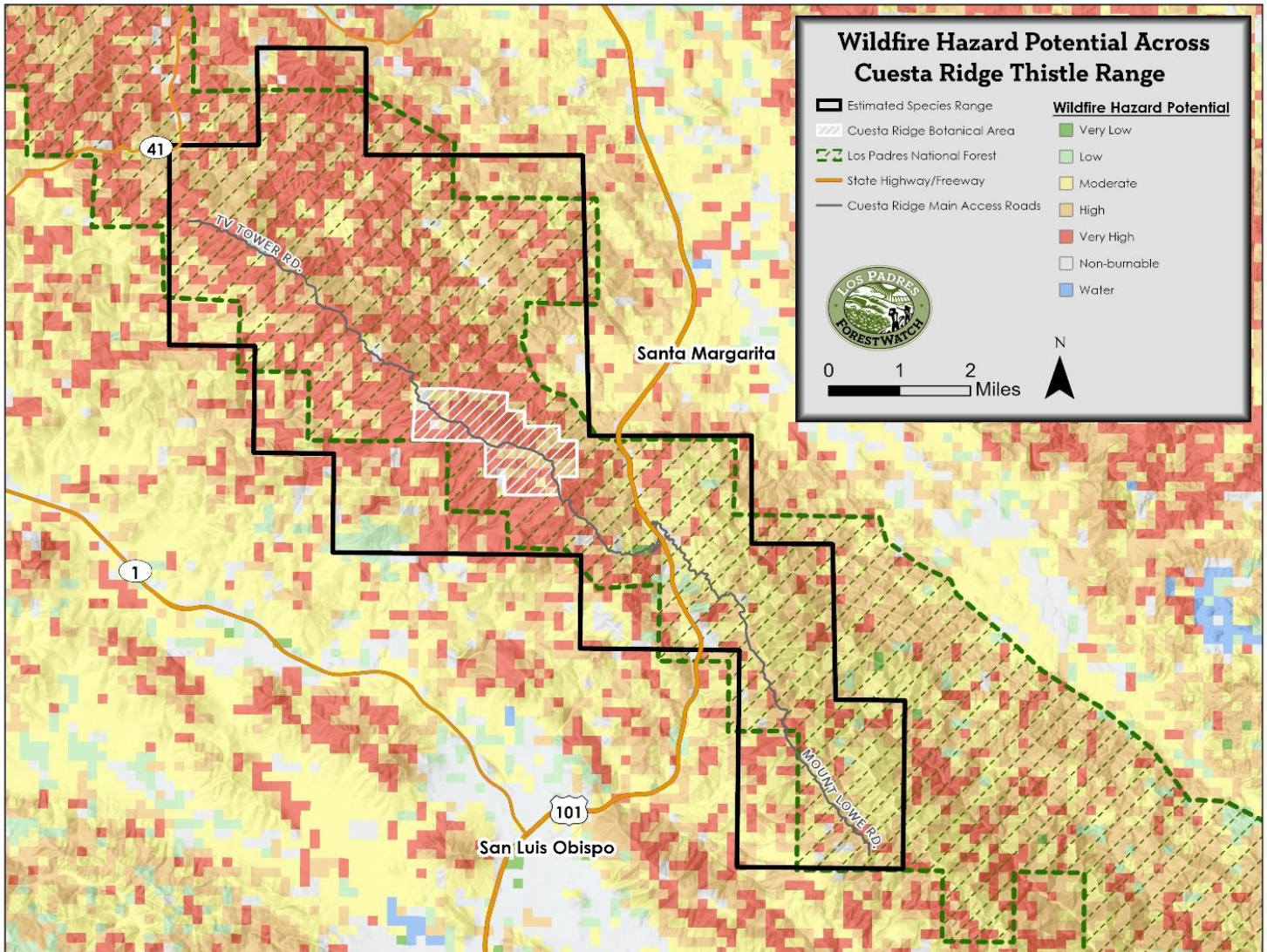


Figure 12. Wildfire hazard potential (WHP) for the area within *C. occidentale* var. *lucianum*'s range along Cuesta Ridge. The WHP layer, produced in 2018 by the USDA Forest Service's Fire Modeling Institute, is meant to depict the relative potential for wildfire that would be difficult for suppression resources to contain. Most of the Cuesta Ridge thistle's restricted range is classified as 'High' or 'Very High' wildfire hazard

Livestock Grazing & Other Herbivory

Currently, there are a couple of grazing allotments on national forest land within the thistle's core habitat area (Fig. 13). Herbivory effects on mature bolting plants and rosettes due to browsing ungulates are minor and not a significant threat because spiny thistle plants are generally unpalatable (USFWS, 1998). However, these foliar defenses likely do not become effectively deterrent in developing plants until reaching a considerable point of maturation; therefore, it is likely that herbivory can serve as a threat to young developing var. *lucianum* plants. Regardless of development stage, trampling from ungulates can severely damage established plants. In a 2019 botanical survey of the Stenner Springs Natural Reserve (SSNR) headed by Dr. David Keil of the Robert F. Hoover Herbarium, Cuesta Ridge thistle was observed during field surveys within the reserve boundary. SSNR lies partially within and partially adjacent to the Los Padres National Forest. Livestock grazing is currently permitted in the reserve since SSNR is not separately fenced from the adjacent Cal Poly lands to the south. The current lease on the property, inherited by the City from Union Pacific Railroad, will be cancelled and replaced with a new agreement changing livestock grazing to an as-necessary program, and allowing the continued availability of water for use by Cal Poly's agriculture program. This agreement will remain in effect unless cancelled or modified by the parties or by a superior agency (Havlik & Oat, 2009).

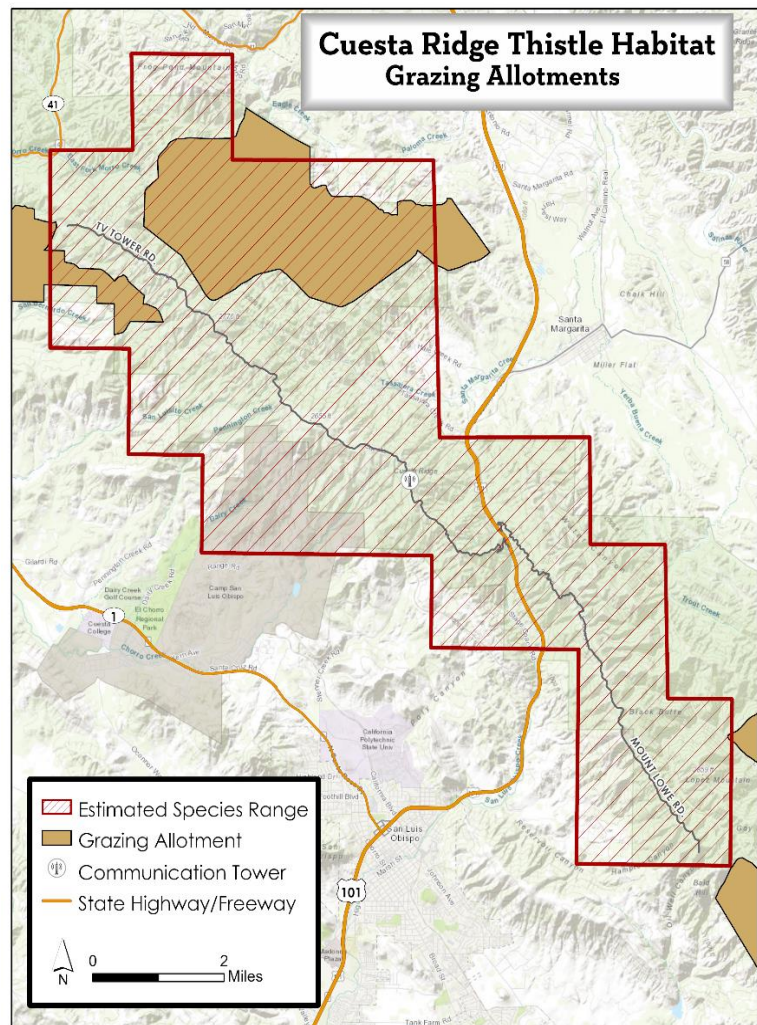


Figure 13. USFS grazing allotments within the estimated current range of *C. occidentale* var. *lucianum*.

Fugitive species like *C. occidentale* var. *lucianum* are characteristic of variable environments and often have relatively large inflorescences or seeds; this adaptation presumably enhances pollination or germination in variable environments but also tends to attract inflorescence and seed feeders (Louda & Potvin, 1995). Damage by inflorescence-feeding insects is typically high on plants with larger, concentrated inflorescences like Cuesta Ridge thistle heads. Fugitive species' traits such as transient seed banks and seed-limited recruitment can increase the risk of

significant impact by inflorescence-feeding insects on plant fitness and population dynamics (Louda & Potvin, 1995). A study on the effects of mammal herbivory on population dynamics of *C. occidentale* in the central California coast found the largest loss of individuals came from mammals that removed 60% of the dispersed seeds (Palmisano & Fox, 1997). Rabbit herbivory from common local species such as the brush rabbit (*Sylvilagus bachmani*) also significantly modified other key aspects of *Cirsium* demography, such as growth rate and the timing of reproduction. Small plants sustaining typical grazing damage took at least 1 year longer to mature than did caged plants. For plants with relatively short (2 year) life spans such as *C. occidentale*, delays of 1±2 years can have significant population effects (Palmisano & Fox, 1997). In sum, livestock grazing and other herbivory remains a potential threat to the continued successful recruitment of the thistle.

Land Cover Change & Human Recreational Impacts

West Cuesta ridge and the Cuesta Ridge Botanical Area are the main population center for the Cuesta Ridge thistle, accounting for most known occurrences. Throughout the past decade, recreation use along West Cuesta ridge (TV Tower Rd.) on the Santa Lucia district has grown. More recently, in 2016 the road accessing the ridge was paved, improving access and increasing vehicle traffic in the area. Correspondingly, the ridge has been negatively impacted by unplanned and unmanaged recreation activities since the road has been maintained such as: unauthorized motorized and non-motorized trails development, resource damage to the Cuesta Ridge Botanical Area, accumulation of human waste from dispersed camping, illegal trash dumping, abandoned campfires, and target shooting. The Forest Service has taken efforts to address some of these activities and the resultant resource damage, particularly in the Cuesta Ridge Botanical Special Interest Area, with limited success (Elliott, 2019).

Dispersed camping along the roadsides and spurs has led to a continual and expanding encroachment within the botanical area. The dispersed camping and recreation target shooting pressure has also resulted in a lot of trash and waste throughout the area. They have also exacerbated fire risk to the surrounding forested landscape and nearby communities, particularly from abandoned campfire (Elliott, 2019). Unmanaged recreation development, including the unauthorized construction of trails that are not properly designed, results in unnecessary damage to government lands, soil loss, water quality impacts, and potential impacts to federally listed sensitive forest plant and animal species in the area, including the California red-legged frog, Cuesta Pass checkerbloom, San Luis sedge, San Luis mariposa lily, and Brewer's spineflower (Elliott, 2019). The Cuesta Ridge thistle is also among the sensitive plants that are at risk from unmanaged recreation in the area.

In 2020, Clark University modeled the predicted regional vulnerability to land cover change by the year 2050 within the United States. This analysis found that the primary population center range for *C. occidentale* var. *lucianum* is classified as the most vulnerable to modification by humans by the year 2050 (Appendix, Fig. 17). Due to predicted land cover change and continued risk for habitat degradation due to human recreation, we consider these factors to be very significant threats to the long-term persistence of *C. occidentale* var. *lucianum*.

Invasive Species

Weevil predation is a major issue among several California endemic thistles, particularly the narrow endemics with small population numbers and low connectivity among populations/subpopulations. Since 1968 the Eurasian flower-head weevil, *Rhinocyllus conicus*, has been introduced at multiple locations in North America as a biocontrol agent for invasive thistles *Carduus* and *Silybum*, including San Luis Obispo County in 1973 (Goeden et al. 1985) and in particular Camp San Luis Obispo in the early 1980's (USFWS 2014). By 2005 the weevil occurred in 26 states and Canada, with multiple reports of the weevil also feeding on native *Cirsium* thistles (Turner et al. 1987). The adult weevils congregate on young thistles in early spring to feed and mate. They lay eggs on developing flower heads into which the subsequent larvae tunnel and feed on.

This weevil was reported feeding on Chorro Creek bog thistle at Camp San Luis Obispo as recent as 2012 (USFWS 2014), roughly 5 miles from where the Cuesta Ridge thistle grows. When a native thistle is infested with *Rhinocyllus conicus* the thistle's seeds are destroyed in the infested flower head through direct predation. Population studies on the closely related and endangered Suisun thistle (*C. hydrophilum* var. *hydrophilum*) found that in addition to direct weevil predation on seeds a high number of seeds were aborted due to damage to the receptacle tissue surrounding the seeds, leading to the same fatal result (Graham-Bruno, 2019). *C. occidentale* var. *lucianum* reproduction is based solely on seed production – making seeds critical to the persistence of the species; any loss of the seed bank from weevil infestation can pose as a significant barrier to the variety's propagation. In sum, we consider the Eurasian flower-head weevil a threat because of the potential for it to seasonally destroy a substantial number of seeds at the occurrences where it has been studied.

Genetic Bottlenecks

From a conservation standpoint, genetic bottlenecks and inbreeding depression can be critical to species with scattered populations populated by low numbers of reproductive individuals (Schneider, 2013). Given the low connectivity of scattered Cuesta Ridge thistle populations coupled with low population numbers, minimal gene flow may act as a stressor to the taxon in the future. Natural seed dispersal mechanisms may not be sufficient to prevent inbreeding depressions given current populations. In *Cirsium*, the pappus detaches from mature seeds as a single unit and thus wind dispersal may be limited, especially if the achenes are heavy (Susanna & Garcia-Jacas, 2009). A study on Suisun thistle seed dispersal found a potential for inbreeding effects and loss of viability due to reduced population numbers and isolation from other subpopulations. The study found a positive correlation between plants per patch and seed germination indicating potential inbreeding depression in smaller patches (Schneider, 2013).

One potential consequence of populations undergoing bottlenecks while being separated by long distances from other populations is low viable seed production, which can turn into its own feedback loop when taken in conjunction with high seed mortality from insect predation and herbivory as described above. In cases like this, the only possibility (without active restoration and human intervention) of introducing new alleles to the population would be through dormant seeds in a persistent seed bank. However, studies on seed bank dormancy specifically for Cuesta

Ridge thistle have not been conducted and dormancy among native *Cirsium* taxa may vary significantly. Data from prior studies on *C. occidentale* along the central California coast suggests that recruitment in *C. occidentale* is seed limited with a transient seed bank exhibiting little to no dormancy mechanisms (Palmisano & Fox, 1997). Additionally, preliminary results in studies of the Suisun thistle indicate that seed dormancy is unlikely in *C. hydrophilum* (Schneider, 2013). Until seed dormancy viability in *C. occidentale* var. *lucianum* is further elucidated in the scientific literature, genetic bottlenecks and inbreeding depression should be considered a potential threat to the ongoing persistence of the taxon.

CONCLUSION

Not only does the Cuesta Ridge thistle occur in the LPNF but is also vulnerable due to climate change stressors, invasive species, and other land use activities within the forest. Measures must be taken now to protect from further declines of the taxon and its habitat. The rarity and sensitivity of this taxon makes it vulnerable to high decreases in populations within a short time period. Without the proper conservation procedure in place, we risk significant decreases that may warrant its listing as endangered.

The information presented in this petition should serve as evidence that the population viability of the Cuesta Ridge thistle is of concern due to its status and threats to its habitat. It warrants all the protection granted by the regional listing of a sensitive species and should be classified as a sensitive species in the Los Padres National Forest.

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APPENDIX

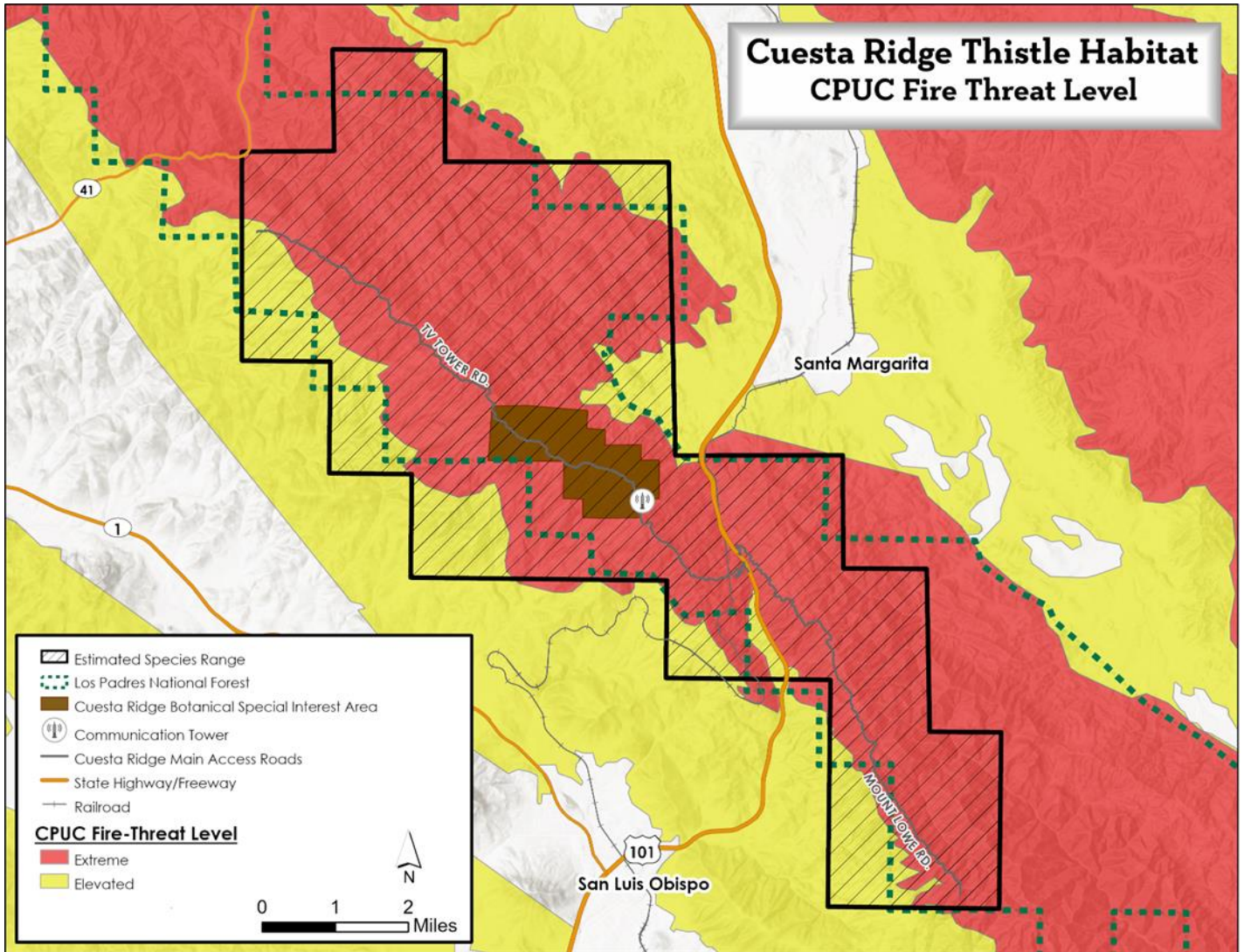


Figure 14. Risk of utility-related fires in Cuesta Ridge thistle habitat per the California Public Utilities Commission (CPUC) fire threat map (2019). Per the CPUC threat analysis, the entirety of the current range of the species is classified as ‘Extreme’ fire-threat for utility-related fires.

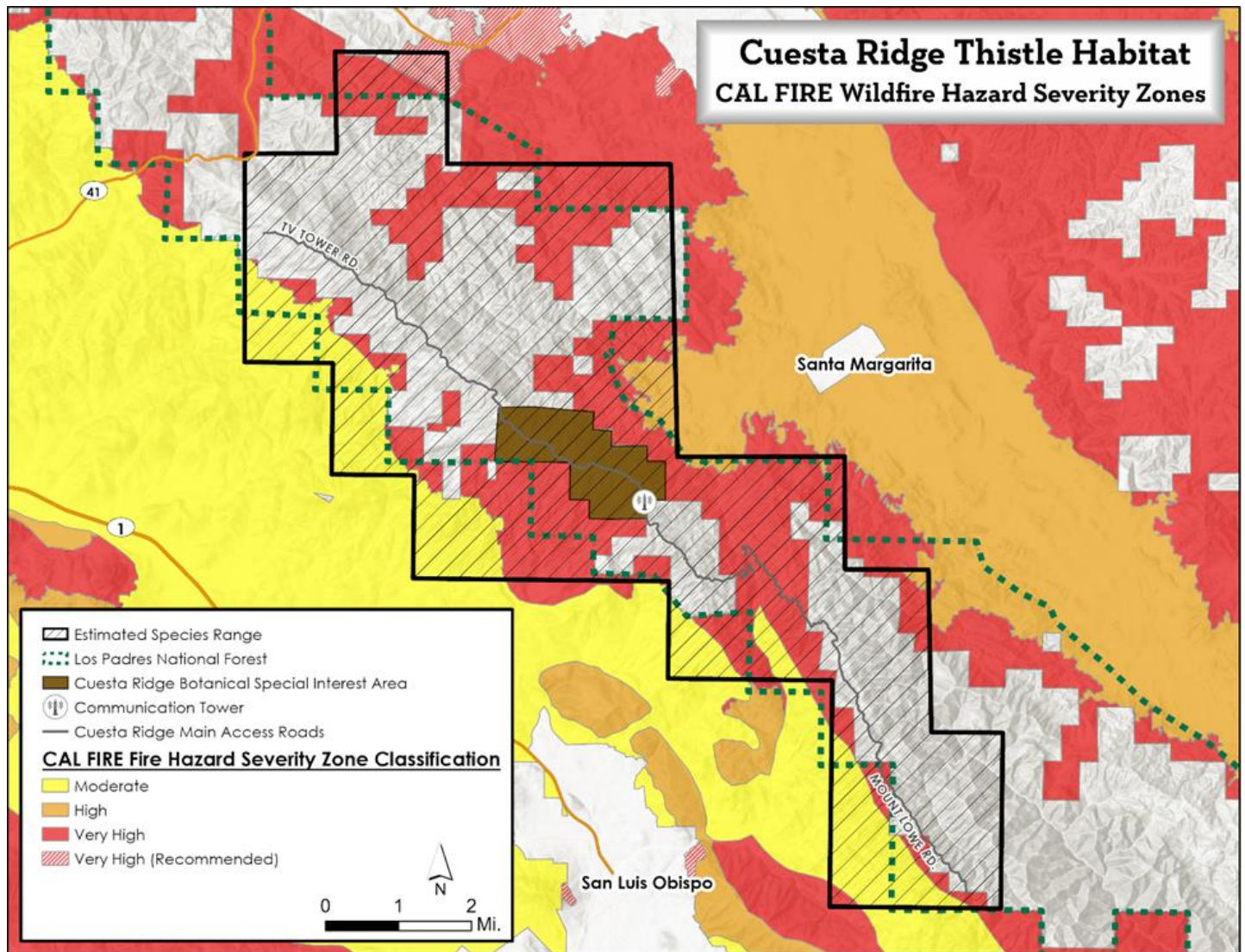


Figure 15. CAL FIRE designated Fire Hazard Severity Zones along Cuesta Ridge and the San Luis Obispo area. Cuesta Ridge thistle habitat contains or is surrounded by Fire Hazard Severity Zones classified as ‘High’ or ‘Very High.’

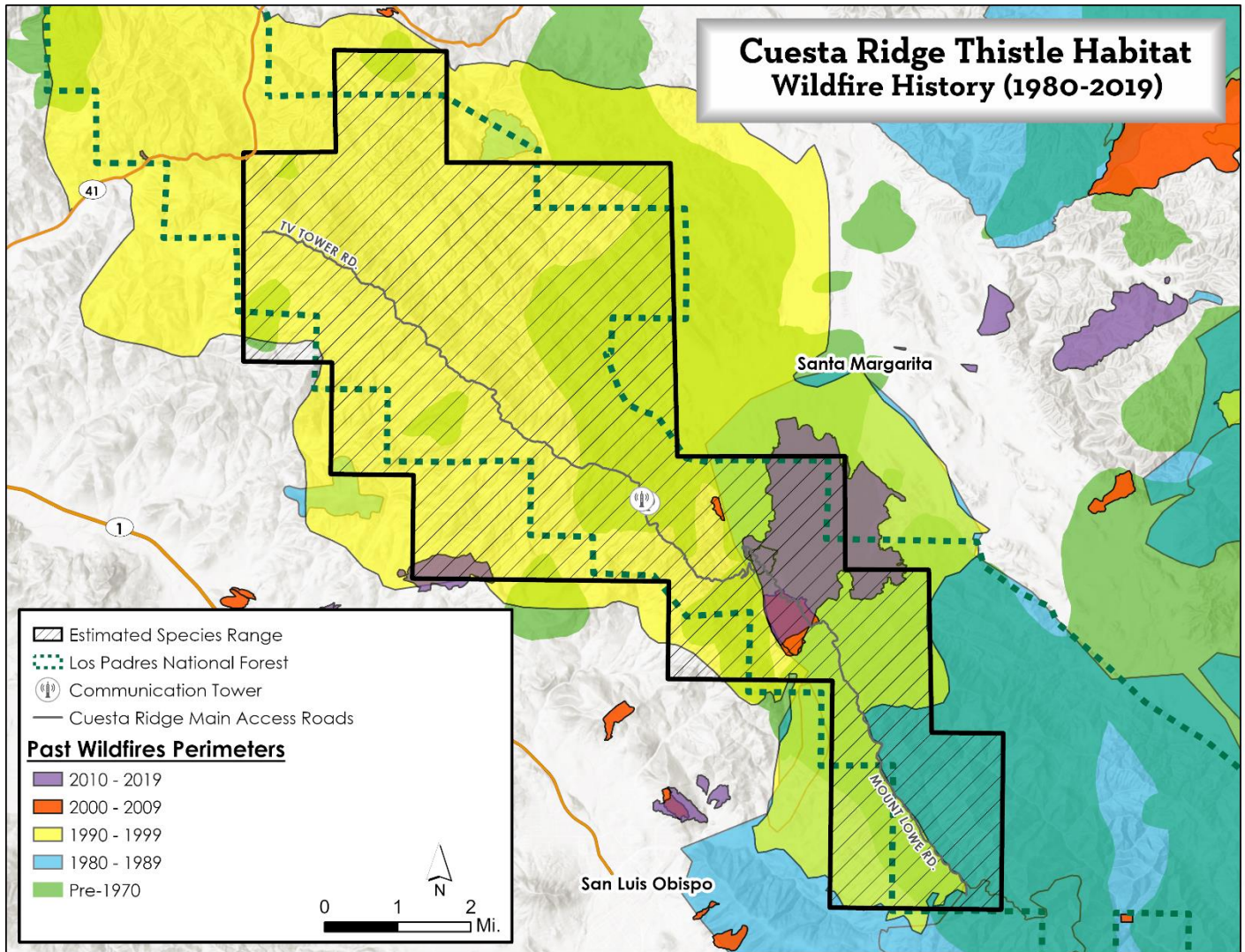


Figure 16. Previous wildfire perimeters around the San Luis Obispo Area. Before human settlement Chaparral communities in this part of California burned two to three times per century or less. Over 56% of the Los Padres National Forest has burned just in the last 20 years and many of those areas have burned two or three times in the last 50 years, accelerating type conversion in the Cuesta Ridge thistle’s habitat.

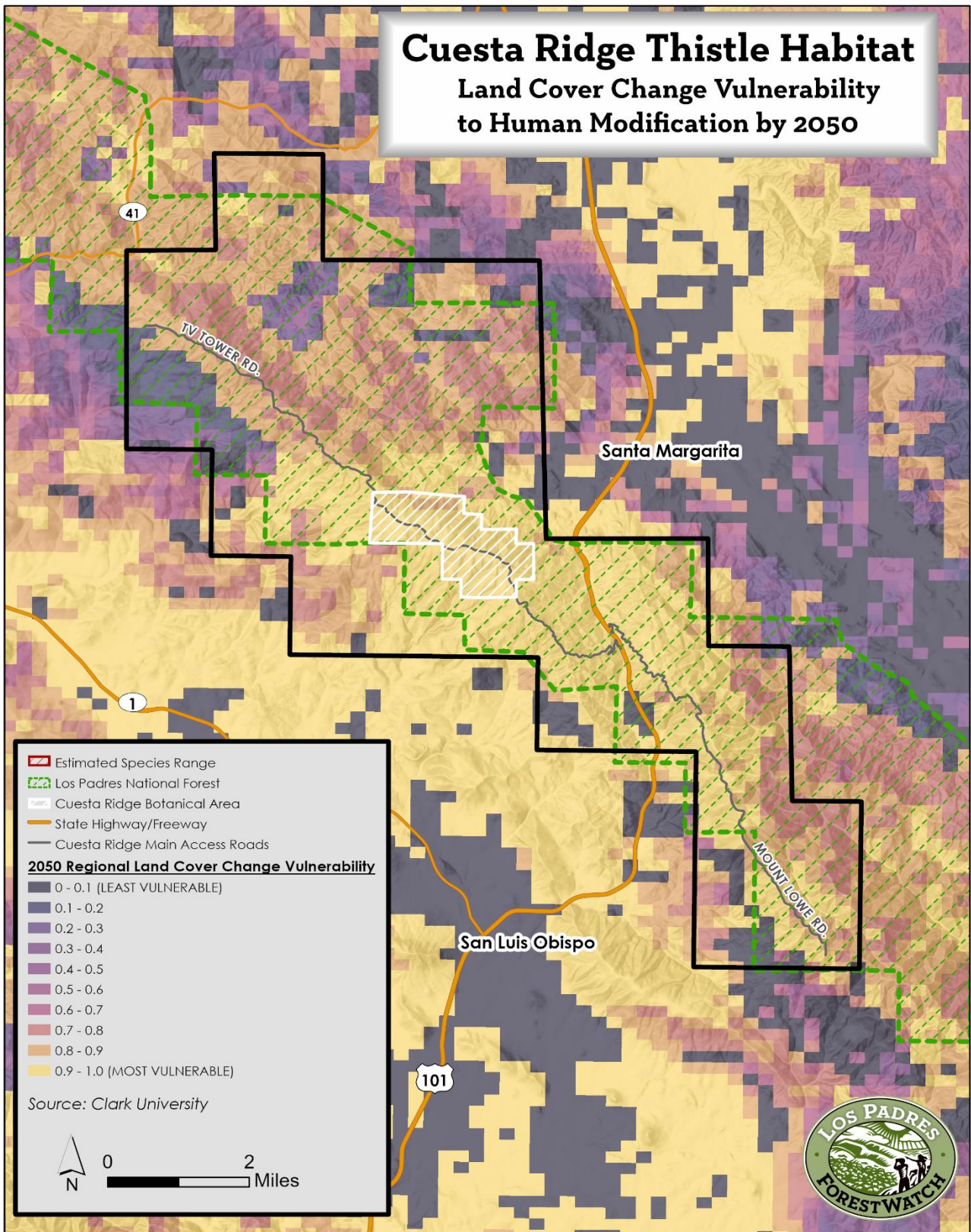


Figure 17. Predicted vulnerability to land cover change by year 2050, as modeled by Clark University (2020). Primary population center range for *Cirsium occidentale* var. *lucianum* is categorized as the most vulnerable to modification by humans by the year 2050.