

State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION
STATUS REVIEW OF CLARA HUNT'S MILKVETCH (*ASTRAGALUS CLARANUS*)

March 2021



Clara Hunt's milkvetch, CDFW photo by Jeb McKay Bjerke

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LIST OF ABBREVIATIONS, ACRONYMS, AND TERMS

CEQA – California Environmental Quality Act
CESA – California Endangered Species Act
CNDDDB – California Natural Diversity Database
Commission – California Fish and Game Commission
Department – California Department of Fish and Wildlife
Occurrence – CNDDDB Element Occurrence
et al. – “and others”
Id. – “the same”
NEPA – National Environmental Policy Act
ssp. – Subspecies
var. – Variety

EXECUTIVE SUMMARY

This Status Review of Clara Hunt's milkvetch (*Astragalus claranus* Jeps.) (Status Review) has been prepared by the California Department of Fish and Wildlife (Department) for the California Fish and Game Commission (Commission) pursuant to the requirements of the California Endangered Species Act (CESA; Fish & G. Code, § 2050 et seq.).

Clara Hunt's milkvetch was designated a threatened species under CESA in January of 1991. On November 18, 2019, the Commission received a five-year species review on Clara Hunt's milkvetch from the Department that recommended up-listing the species from threatened to endangered status. On February 21, 2020, the Commission considered the Department's five-year species review on Clara Hunt's milkvetch, the Department's recommendation, and comments received, and found that sufficient information existed to indicate the petitioned action may be warranted and accepted the petition for consideration. Pursuant to Fish and Game Code section 2074.6, the Department has prepared this Status Review to indicate whether the petitioned action to up-list Clara Hunt's milkvetch from threatened to endangered status is warranted. This Status Review is based on the best scientific information currently available to the Department regarding each of the components listed under section 2072.3 of the Fish and Game Code, and section 670.1 of Title 14 of the California Code of Regulations. In addition, this Status Review includes a preliminary identification of habitat that may be essential to the continued existence of the species, and the Department's recommendations for management activities and other recommendations for recovery of the species. (Fish & G. Code, § 2074.6.). This Status Review has been independently reviewed by scientific peers pursuant to Fish and Game Code section 2074.6.

Clara Hunt's milkvetch is a short annual herb of the legume family that has white petals with bright purple tips. There are six small populations of Clara Hunt's milkvetch, all located in Napa and Sonoma Counties within ten miles of St. Helena. The species is generally found in oak woodlands, in sparsely vegetated openings without significant shrub or tree overstory, and appears to be adapted to poor quality, acidic soils that may limit competition from other plants.

The populations have not been monitored annually; however, there is sufficient information available to suggest that since the species was first listed in 1991, one population has declined and another population may be extirpated or only exist in the soil seed bank. The August 1989 "Report to the Fish and Game Commission on the Status of Clara Hunt's Milkvetch (*Astragalus clarianus*)" recommended that Clara Hunt's milkvetch be listed as endangered and identified the following factors affecting the ability of the species to survive and reproduce: present or threatened modification or destruction of habitat, predation, and stochastic (chance) extinction events due to small population size. In addition to the factors identified in 1989, the Department has identified invasive plants, vegetation community succession, and possibly climate change and herbivory as factors affecting the ability of Clara Hunt's milkvetch to survive and reproduce. The scientific information available to the Department indicates that Clara Hunt's milkvetch is in serious danger of extinction in all or a significant portion of its range due to one or more causes. Because of the rarity of Clara Hunt's milkvetch, the loss of all or a significant portion of an individual Clara Hunt's milkvetch population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range.

The Department recommends that the Commission find that the petitioned action to list Clara Hunt's milkvetch as an endangered species is warranted, and further recommends implementation of the management recommendations and recovery measures described in this Status Review.

INTRODUCTION

Listing History

This Status Review addresses Clara Hunt's milkvetch (*Astragalus claranus* Jeps.), a species that is currently listed as threatened under CESA (Fish & G. Code, § 2050 et seq.; Cal. Code Regs. tit. 14, § 670.2, subd. (b)(6)(A)). The listing history of Clara Hunt's milkvetch is as follows:

On July 1, 1988, Mr. Joe Callizo of the California Native Plant Society submitted a petition to the Commission requesting that Clara Hunt's milkvetch be listed as an endangered species under CESA (Fish & G. Code, § 2050 *et seq.*).

On August 26, 1988, the Commission accepted a Department recommendation to accept the petition and designated Clara Hunt's milkvetch a candidate species while the Department conducted a one-year status review of the species.

In August of 1989, the Department completed a report to the Commission on the status of Clara Hunt's milkvetch, which included a recommendation that the Commission find that the petitioned action to list Clara Hunt's milkvetch as endangered was warranted. After considering the petition, the Department's recommendation and report, and public comments, the Commission decided at a public meeting to designate Clara Hunt's milkvetch as a threatened species under CESA.

In January of 1991, Clara Hunt's milkvetch was designated a threatened species under CESA. The provisions of CESA are summarized in the Management Efforts section of this Status Review

On October 22, 1997, Clara Hunt's milkvetch was listed as endangered under the federal Endangered Species Act.

On November 18, 2019, the Commission received a five-year species review on Clara Hunt's milkvetch from the Department that recommended up-listing the species from threatened to endangered status. This five-year species review was considered equivalent to a petition with a Department recommendation to accept and consider the petition (CDFW 2019b)(Fish & G. Code §§ 2072.7 and 2077).

On January 24, 2020, as required by Fish and Game Code section 2073.3, the Commission published notice of receipt of the five-year species review on Clara Hunt's milkvetch in the California Regulatory Notice Register (Cal. Reg. Notice Register 2020, No. 4-Z, p. 133).

On February 21, 2020, at its scheduled public meeting in Sacramento, California, the Commission considered the Department's five-year species review on Clara Hunt's milkvetch, the Department's recommendation, and comments received. The Commission found that sufficient information existed to indicate the petitioned action may be warranted and accepted the petition for consideration while the Department completed this Status Review.

Subsequently, on March 13, 2020, the Commission published its Notice of Findings in the California Regulatory Notice Register, designating Clara Hunt's milkvetch as a candidate species for endangered status (Cal. Reg. Notice Register 2020, No. 11-Z, p. 421).

Status Review

Pursuant to Fish and Game Code section 2074.6 and section 670.1 of Title 14 of the California Code of Regulations, the Department has prepared this Status Review to indicate whether the petitioned action to up-list Clara Hunt's milkvetch from threatened to endangered status is warranted. An endangered species under CESA is one "which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, over exploitation, predation, competition, or disease" (Fish & G. Code, § 2062).

Using the best scientific information available to the Department, this Status Review includes information on each of the following components pursuant to section 2072.3 of the Fish and Game Code, and section 670.1 of Title 14 of the California Code of Regulations: population trend(s), range, distribution, abundance, life history, factors affecting the species' ability to survive and reproduce, the degree and immediacy of threats, the impact of existing management efforts, the availability and sources of information, habitat that may be essential for the continued existence of the species, and the Department's recommendations for future management activities and other recovery measures to conserve, protect, and enhance the species.

Specifically, this Status Review analyzes whether there is sufficient scientific information to indicate that the continued existence of Clara Hunt's milkvetch throughout all or a significant portion of its range is in serious danger or is threatened by one or a combination of the following factors: present or threatened modification or destruction of its habitat; overexploitation; predation; competition; disease; or other natural occurrences or human-related activities. (Cal. Code Regs., tit. 14, § 670.1, subd. (i)(1)(A).).

Notification, Information Received, and Peer Review

Following the Commission's action to designate Clara Hunt's milkvetch as a candidate species for endangered status, the Department notified affected and interested parties and solicited data and comments on the petitioned action pursuant to Fish and Game Code section 2074.4 (see also Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). Comments on the petitioned action were invited via a general notification dated July 8, 2020, and a tribal notification dated August 6, 2020. These notifications were distributed to tribes, owners and managers of lands supporting Clara Hunt's milkvetch populations, media outlets in the vicinity of Napa and Sonoma Counties, scientists familiar with Clara Hunt's milkvetch, and other interested individuals and organizations. The Department received no comments in response to the general notification and one letter in response to the tribal notification which is included in Appendix A. All comments received are included in Appendix A of this report.

Pursuant to Fish and Game Code section 2074.6, the review process included independent and competent peer review of the draft status review by persons in the scientific/academic community acknowledged to be experts on Clara Hunt's milkvetch and related topics, and possessing the knowledge and expertise to critique the scientific validity of the status review contents. Appendix B contains the specific input provided to the Department by the individual peer reviewers, the Department's written response to the input, and any amendments made to the status review (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)(2)). Independent experts that reviewed the Status Review are listed in Table 1, below.

Table 1. Status Review Peer Reviewers

Name	Affiliation
Monica Delmartini	Sonoma County Agricultural Preservation and Open Space District
Dr. Robert E. Preston	ICF
Jake Ruygt	Independent

This Status Review was prepared by Jeb McKay Bjerke in the Department's Habitat Conservation Planning Branch, Native Plant Program.

BIOLOGY

Species Description

Clara Hunt's milkvetch is a slender annual herb of the legume family (Fabaceae), with mature plants growing to heights of approximately 7 to 23 cm (3 to 9 inches) (Ruygt 1994). Stems of Clara Hunt's milkvetch branch from near the base of the plant and curve or angle upwards, and plants are sparsely covered with small appressed hairs (Jepson 1925; Wojciechowski and Spellenberg 2012). Like most other species of the genus *Astragalus*, the leaves of Clara Hunt's milkvetch are composed of smaller segments called leaflets that are arranged in pairs with one terminal leaflet centered at the end of the leaf. Clara Hunt's milkvetch leaves have two to four pairs of leaflets that have deeply notched tips (see cover photo). The root zone of Clara Hunt's milkvetch is approximately 10 cm (4 inches) deep, and swelling observed along the primary roots suggests that the species may have a symbiotic relationship with a fungus that is referred to as a mycorrhizal association (Ruygt 1994).

Like most plants in the legume family, the flowers of Clara Hunt's milkvetch are bisexual and are pea-like, which means that they have one large upper petal called a banner, two smaller side petals called wings, and two fused lower petals called a keel (Figure 1a). The petals of Clara Hunt's milkvetch are more or less white, and the banner and keel petals have bright purple tips. Clara Hunt's milkvetch flowers are arranged into groups called inflorescences, and vegetative parts of the inflorescences are covered in short black hairs.

Once pollinated, Clara Hunt's milkvetch flowers can develop into 17 to 25 mm ($\frac{2}{3}$ to 1 inch) long fruits called legumes that can split down its length and may remain joined at the base. Clara Hunt's milkvetch fruits are two-chambered, crescent-shaped, tapered at the ends, and sparsely covered with small appressed hairs (Figure 1b). Clara Hunt's milkvetch fruits have a unique stalk-like base that is attached to a peg-like, 1.5 to 2.5 mm ($\sim 1/16$ inch) extension of the flower that is most evident after fruits have dropped from the plant. Fruits generally have between six and twelve seeds (Barneby 1965; Ruygt 1994). Clara Hunt's milkvetch seeds are about 2.0 to 3.3 mm ($\sim 1/8$ inch) long and do not have any specialized dispersal structures (Macdonald 2016). Data collected by Ruygt (1994) suggests that Clara Hunt's milkvetch may produce an average of 29 viable seeds per plant.



Figure 1. Photographs of Clara Hunt's milkvetch (*Astragalus claranus*). (a) Cluster of Clara Hunt's milkvetch flowers. (b) Clara Hunt's milkvetch seeds and fruit (Macdonald 2016). (c) Clara Hunt's milkvetch with competing vegetation, including immature Mediterranean grasses

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Taxonomy

A type specimen is the individual or individuals that were studied to describe and name a new species. The type specimen of Clara Hunt's milkvetch was collected by Clara A. Hunt, a botanist from St. Helena in Napa County, and received by Dr. Willis L. Jepson on April 8, 1909 (CCH 2020). The small, unidentifiable milkvetch was first described by Dr. Jepson in 1925, and named "*Astragalus clarianus*" for Clara A. Hunt (Jepson 1925; Yerger 2011). The species was renamed as *Astragalus rattanii* var. *clarianus* in Jepson (1936), but again recognized as *Astragalus clarianus* in Abrams (1944). On September 18, 2003, the spelling of the epithet for Clara Hunt's milkvetch was corrected from "*clarianus*" to "*claranus*" (Jepson Flora Project 2020).

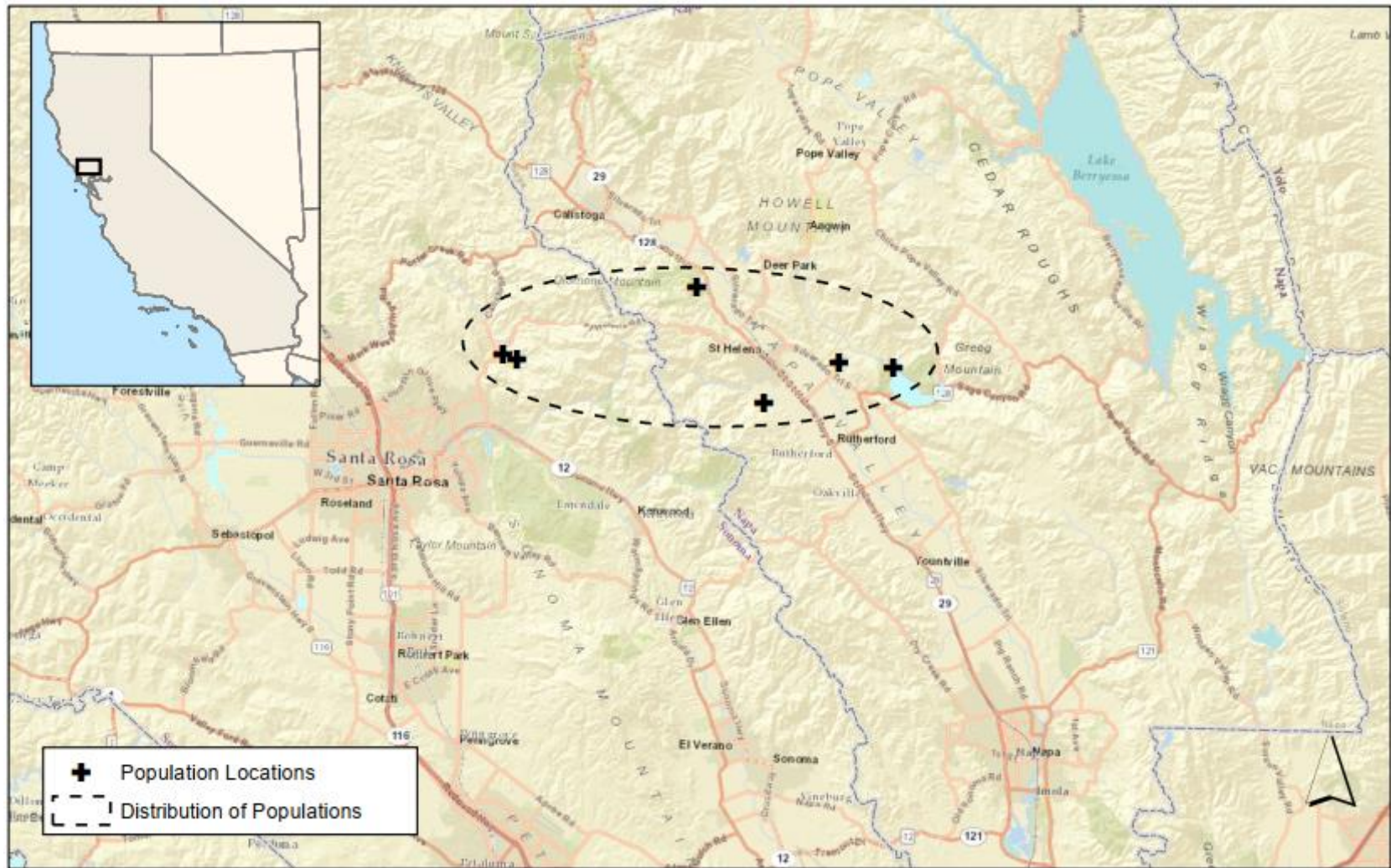
Clara Hunt's milkvetch is a diploid plant, having 11 pairs of chromosomes ($2n=22$) (Liston 1992). In a study of *Astragalus*, Liston (1990a, 1992) compared allele frequencies of three populations of Clara Hunt's milkvetch to compare their genetic similarity and found that they were nearly identical (mean genetic identity value (I) of 0.981); however two populations contained unique alleles that contribute to the overall genetic diversity of the species. Genetic comparisons between Clara Hunt's milkvetch and other *Astragalus* species in the region showed that Clara Hunt's milkvetch was genetically distinct, supporting the recognition of Clara Hunt's milkvetch as a distinct species (Liston 1992).

Range and Distribution

Range is the general geographical area in which an organism occurs. For purposes of CESA and this Status Review, the range is the species' California range (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal.App.4th 1535, 1551). Distribution describes the actual sites where individuals and populations of the species occur within the species' range. Clara Hunt's milkvetch only occurs in California, in the northern Coast Range near St. Helena in Napa County, and northeast of Santa Rosa in Sonoma County, at elevations of about 95 to 360 m (320 to 1175 feet) above sea level (Figure 2) (CNDDDB 2020).

The distribution of Clara Hunt's milkvetch is documented in the California Natural Diversity Database (CNDDDB). Plant taxa, animal taxa, and natural communities that are documented within the CNDDDB are of conservation concern within California and are referred to as "elements." An "element occurrence" (occurrence) is a location record for a site which contains an individual, population, nest site, den, or stand of a special status element, and each occurrence for an element is assigned a number in the CNDDDB for tracking purposes. Populations, individuals, or colonies that are located within 0.40 kilometer (1/4 mile) of each other generally constitute a single occurrence, sometimes with multiple "parts" (Bittman 2001). The CNDDDB occurrence records for Clara Hunt's milkvetch were updated in May 2019, in conjunction with the preparation of a five-year species review (CDFW 2019b). There are currently six occurrences of Clara Hunt's milkvetch that are documented in the CNDDDB. For ease of reference, each occurrence has been named as a separate "population" in Table 2. A detailed distribution map for Clara Hunt's milkvetch is included in this Status Review as Figure 3.

The Napa County populations of Clara Hunt's milkvetch are in the Napa River watershed that drains to San Pablo Bay. The Sonoma County populations of Clara Hunt's milkvetch are in the Mark West Creek watershed that flows to the Russian River and the Pacific Ocean. The exact location that the type specimen of Clara Hunt's milkvetch was collected from is unknown. The



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 Sources: Esri, Garmin, USGS, NPS

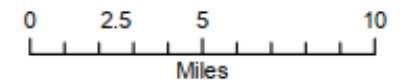
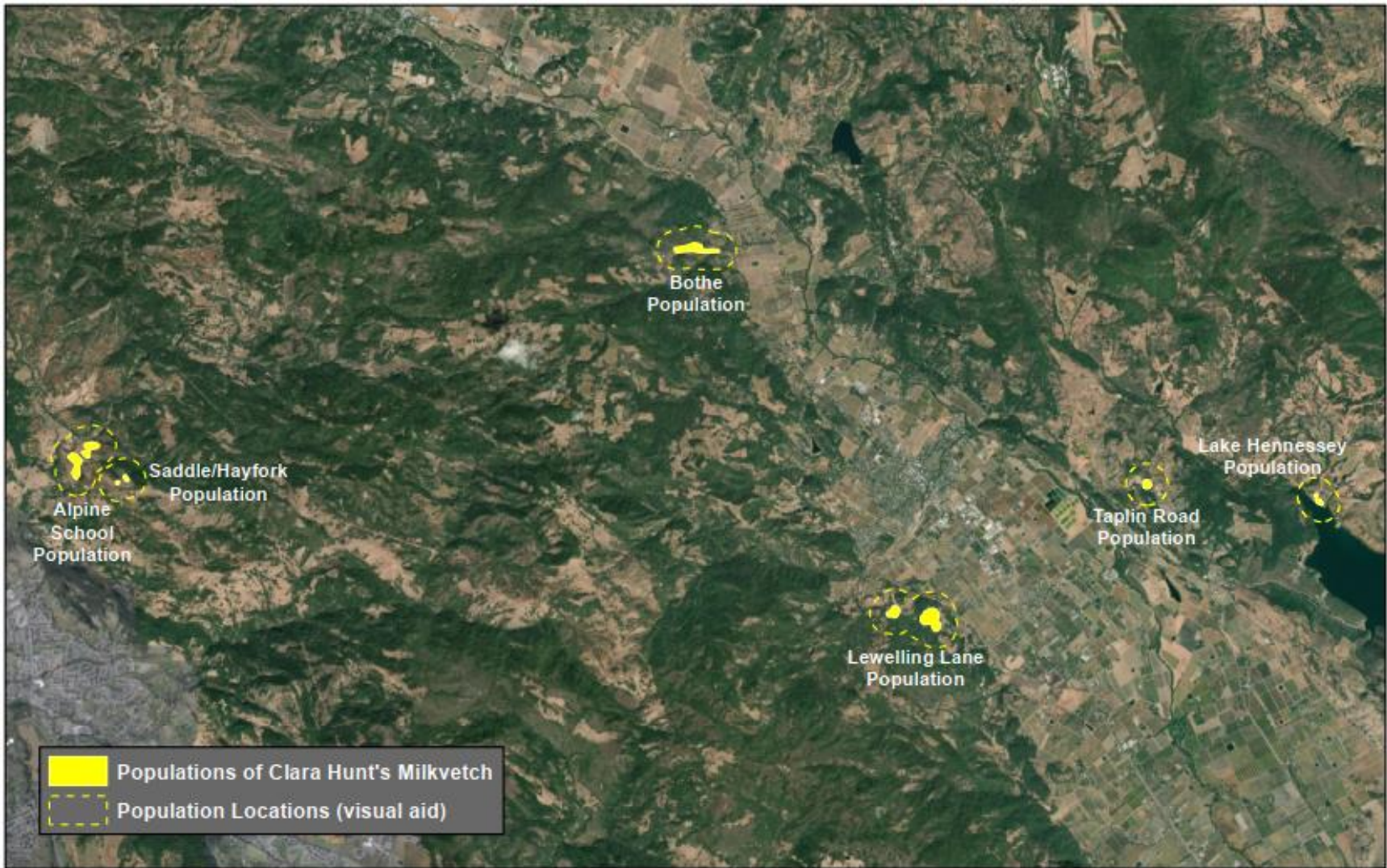


Figure 2. Regional Vicinity of Clara Hunt's milkvetch (*Astragalus claranus*) Populations

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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 3

Table 2. Clara Hunt's Milkvetch Populations

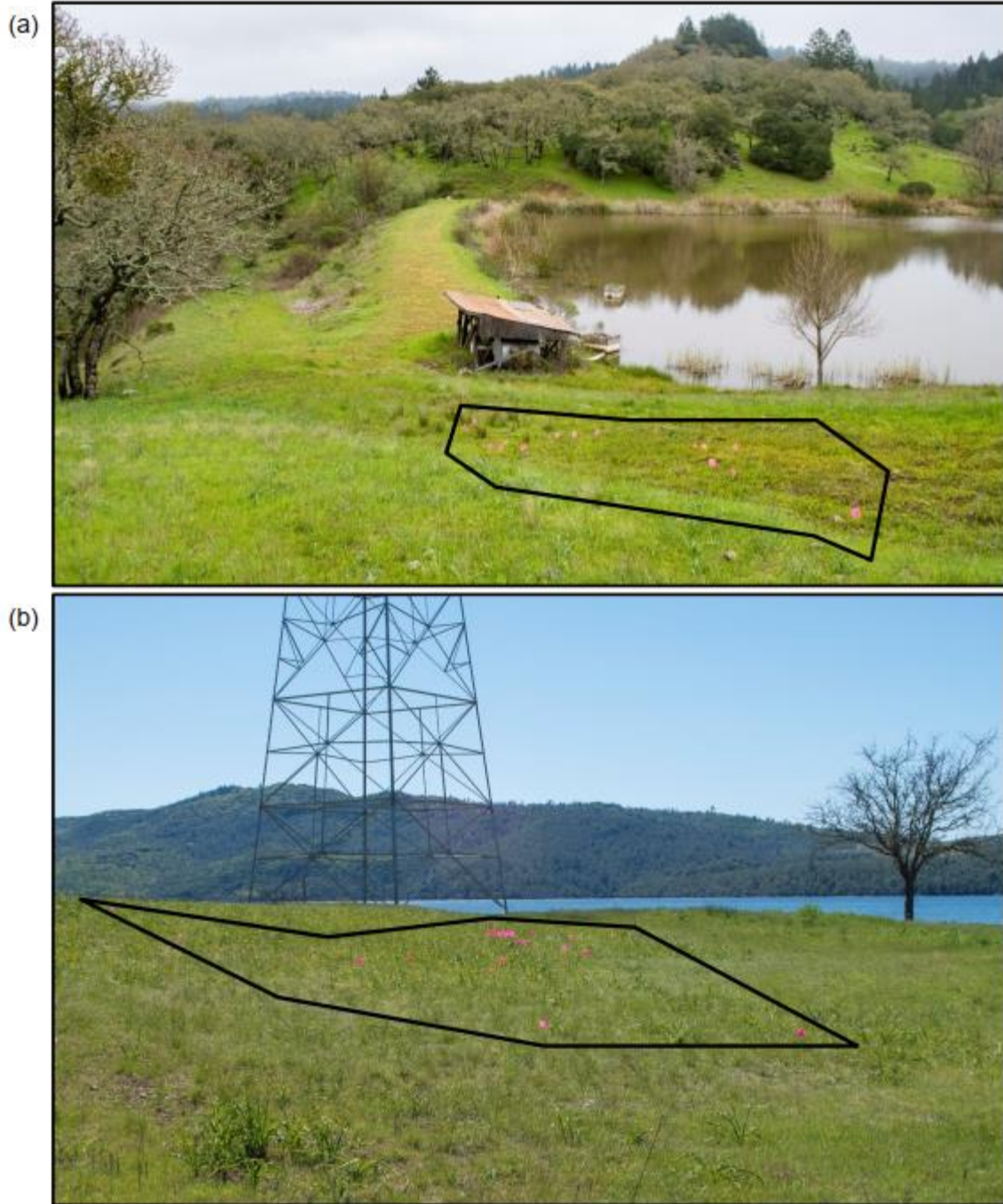
<i>Population Name</i>	<i>CNDDB Element Occurrence Number*</i>	<i>County</i>	<i>Land Ownership</i>
Alpine School	3	Sonoma	Private with conservation easement
Bothe	7	Napa	State Park
Lake Hennessey	11	Napa	City of Napa; Private
Lewelling Lane	12	Napa	Private
Saddle/Hayfork	14	Sonoma	Private with conservation easement; Sonoma County
Taplin Road	13	Napa	Private

*Occurrence numbers are assigned sequentially as they are added to the CNDDDB. Once an occurrence number is used for a species it is not reused later. Therefore, there may appear to be occurrences missing for some species if occurrences have been deleted due to misidentification, merging of occurrences, or other factors.

collection location was only described as “St. Helena”. Another collection was made in 1922 from “Near St. Helena”. The town of St. Helena has expanded since 1922, and therefore the site of the type locality may have been eliminated. It is also possible that the type specimen was collected from one of the known populations surrounding St. Helena.

All documented Clara Hunt’s milkvetch populations are located within an approximately 10-mile radius of St. Helena. If undocumented populations of Clara Hunt’s milkvetch existed in the past, urban development, agricultural development, and/or the flooding of the valley to fill Lake Hennessey may have eliminated them. There may also be additional, undocumented populations of Clara Hunt’s milkvetch. The locations of known Clara Hunt’s milkvetch populations are described as follows:

Alpine School: The Alpine School Population is one of two populations of Clara Hunt’s milkvetch in Sonoma County. The Alpine School Population is approximately 15 kilometers (9.5 miles) west of St. Helena and approximately 10 kilometers (6 miles) northeast of downtown Santa Rosa. The Alpine School Population is located on private property and is southeast of the intersection of St. Helena and Calistoga Roads (Figure 4a). The Alpine School Population has two separate parts in the CNDDDB, based on surveys conducted intermittently since the late 1980s. Historical collections suggest that Clara Hunt’s milkvetch was also present across from the historic Alpine School, on the north side of St. Helena Road, but this area now has vineyards and a horse stable (McCarten 1985). The Alpine School Population is approximately 0.6 kilometer (0.4 mile) west of the Saddle/Hayfork Population, which is described in more detail below. The private landowner of the property containing the Alpine School Population also owns a portion of the Saddle/Hayfork Population.



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Figure 4. Photographs of Clara Hunt's Milkvetch (*Astragalus claranus*) Habitat. (a) Alpine School Population of Clara Hunt's milkvetch on April 8, 2019, with pink pin flags marking locations of plants. Location of plants is outlined and view is approximately to the northeast; (b) Lake Hennessey Population of Clara Hunt's milkvetch on April 2, 2020, with pink pin flags marking locations of 49 plants. Location of plants is outlined and view is approximately to the southeast.

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Bothe: The Bothe Population is one of four populations of Clara Hunt's milkvetch in Napa County. The Bothe Population is mapped within Bothe-Napa Valley State Park, approximately five kilometers (3.1 miles) northwest of St. Helena. The Bothe Population is mapped as one long population in the CNDDDB that begins approximately 190 meters (620 feet) west of the Historic Bale Grist Mill and extends approximately 0.8 kilometer (0.5 mile) to the west.

Lake Hennessey: The Lake Hennessey Population is located in Napa County. The Lake Hennessey Population is located on the north edge of Lake Hennessey, approximately 7 kilometers (4.4 miles) east of St. Helena. The Lake Hennessey Population has two separate parts in the CNDDDB, both adjacent to Conn Valley Road. The northern part of the Lake Hennessey Population is on the north side of Conn Valley Road on private property. The southern part of the Lake Hennessey Population is on the south side of Conn Valley Road, between the road and Lake Hennessey, on land owned by the City of Napa and associated with the Lake Hennessey reservoir (Figure 4b).

Lewelling Lane: The Lewelling Lane Population is located in Napa County. The Lewelling Lane Population is located on the west side of the Napa Valley, approximately 2 kilometers (1.4 miles) south of St. Helena, and southwest of the western terminus of Lewelling Lane. The Lewelling Lane Population has two separate parts. The western part of the population is mapped on three private parcels. The eastern part of the population is mapped on five private parcels. This population is close enough to St. Helena that it may have been the population that the type specimen of Clara Hunt's milkvetch was collected from, although this cannot be confirmed.

Saddle/Hayfork: The Saddle/Hayfork Population is located in Sonoma County. The Saddle/Hayfork Population is approximately 15 kilometers (9.5 miles) west of St. Helena and approximately 10 kilometers (6 miles) northeast of downtown Santa Rosa. The Saddle/Hayfork Population occurs on private property that is protected by a conservation easement, and a small portion of it is on the adjacent Saddle Mountain Open Space Preserve owned and managed by the Sonoma County Agricultural Preservation and Open Space District. As currently mapped in the CNDDDB, the Saddle/Hayfork Population has two separate parts. However, this mapping is based on observations from only 2019 and 2020. Prior to 2018, Clara Hunt's milkvetch plants were also observed to the southeast of the Saddle Mountain Open Space Preserve plants observed in 2019 and 2020 (Evans pers. comm. 2019, Delmartini pers. comm. 2020). This indicates that the Saddle/Hayfork Population may be more extensive than it is currently mapped. Figures 5a and 5b show western and eastern portions of the Saddle/Hayfork Population in 2020. The Saddle/Hayfork Population is approximately 0.6 kilometer (0.4 mile) east of the Alpine School Population, which is described in more detail above. The private landowner of the property containing the Alpine School Population also owns a portion of the Saddle/Hayfork Population.

Taplin Road: The Taplin Road Population is located in Napa County. The population is located approximately 4 kilometers (2.5 miles) east of St. Helena, on the north side of Taplin Road. The Taplin Road Population occurs on a single private parcel.

Life History

Like many plants in the legume family, Clara Hunt's milkvetch exhibits physical seed dormancy, which means there is a physical barrier (seed coat) that prevents moisture from entering seeds (Ruygt 1994; Baskin and Baskin 1998). This seed coat prevents seed germination, even if other environmental factors such as moisture and temperature are favorable, and allows Clara Hunt's

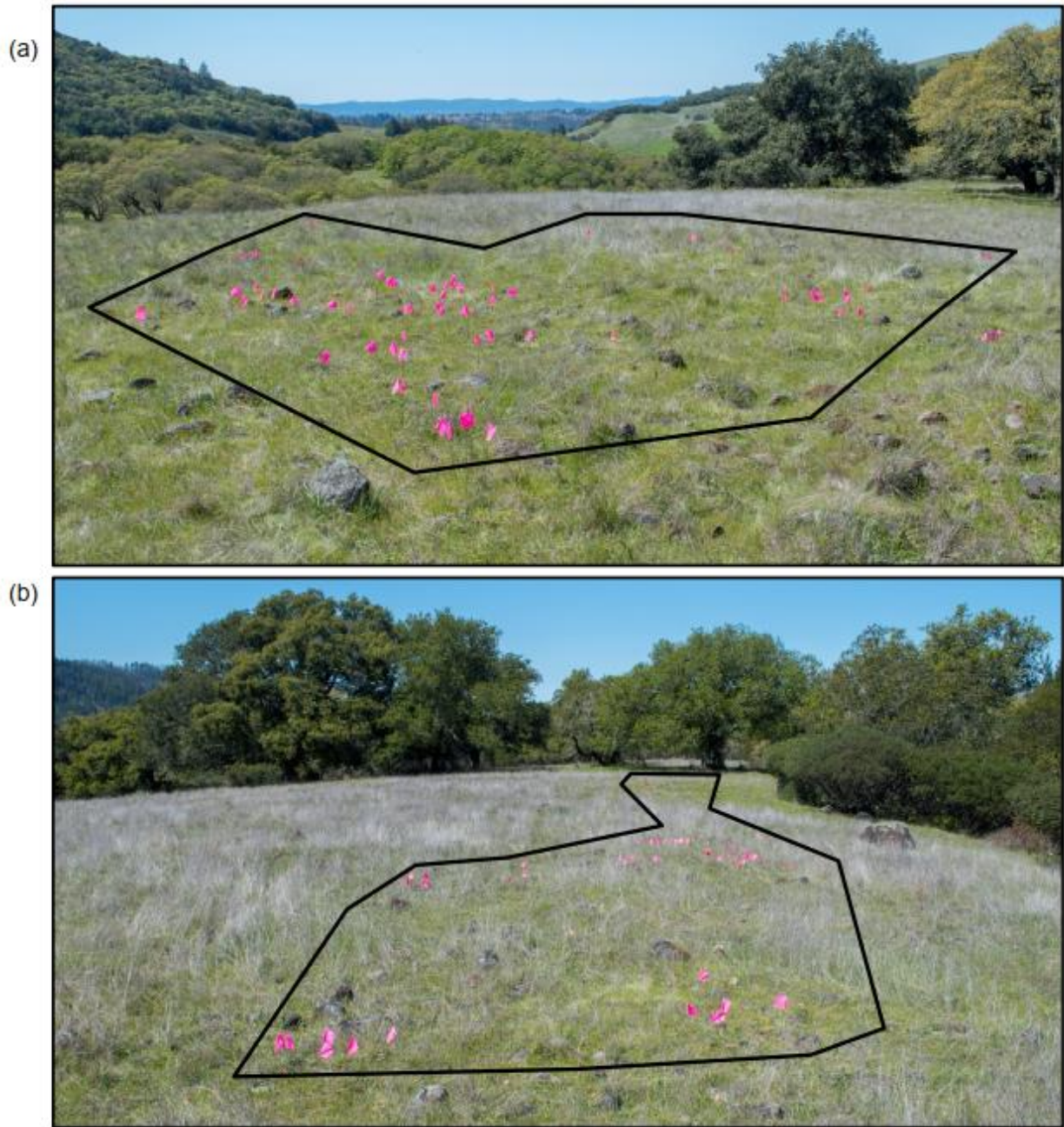


Figure 5. Photographs of Clara Hunt's Milkvetch (*Astragalus claranus*) Habitat at the Saddle/Hayfork Population. (a) Western part of the Saddle/Hayfork Population of Clara Hunt's milkvetch on April 1, 2020. View is approximately to the west; population is outlined. (b) An eastern part of the Saddle/Hayfork Population of Clara Hunt's milkvetch on April 1, 2020 (some plants behind photographer are not in view). View is approximately to the northwest; population is outlined.

milkvetch to form a persistent soil seed bank. Clara Hunt's milkvetch seeds are reported to require scarification to initiate germination in the lab, such as by nicking the seed coat with a razor blade (Ruygt 1994; CDFW 2010; Rancho Santa Ana Botanic Garden 2018). Rainfall, animal activity, or other natural forces are likely needed to agitate soil particles to naturally scarify the seed coat of Clara Hunt's milkvetch seeds to initiate germination.

Reports indicate that Clara Hunt's milkvetch seeds typically germinate as early as October and as late as March, depending on rainfall patterns (Hunter 1989; Ruygt 1994). After germination, seedlings have been observed growing at a slow rate from November until late February or early March, followed by a period of accelerated growth and development until mid- or late-April (Ruygt 1994). Ruygt also observed that individuals that germinated in April and May failed to mature.

Clara Hunt's milkvetch flowers from March to early May. Flowering within an individual population has been observed to occur over a span of three to four weeks (Delmartini pers. comm. 2020); however, different populations may begin flowering and reach peak flowering at different times in the same year (Ruygt 1994).

Clara Hunt's milkvetch is likely insect pollinated but plants are also capable of self-fertilization (Ruygt 1994). Bee pollination is a common mode of pollination in the *Astragalus* genus and bees have been observed visiting Clara Hunt's milkvetch plants (Green and Bohart 1975; Sugden 1985; Karron 1987; Liston 1992). Ruygt (1994) did not observe any pollinators during multiple site visits to populations in 1993 and 1994 and suggested that Clara Hunt's milkvetch may be visited by pollinators that are active at night or twilight.

Based on data collected from the Lake Hennessey and Lewelling Lane populations in 1993, Ruygt estimated that 35 to 50 percent of Clara Hunt's milkvetch flowers developed into mature fruit. In one experiment, Ruygt also found that fruit production was 25 percent lower in plants when pollinators were excluded, indicating that while pollinators may increase fruit production, they are not a requirement. Fruits have been observed on plants as early as April 16. Fruits tend to split apart and release seeds only after becoming wet (Liston 1990a). With no obvious dispersal agents or mechanisms, the dispersal ability of Clara Hunt's milkvetch seeds appears to be low, which likely limits the potential for colonization of unoccupied habitat.

Clara Hunt's milkvetch is an annual plant, and the plants die shortly after producing seeds. Plants become desiccated and break apart during the warm summer months, and populations of Clara Hunt's milkvetch are nearly undetectable for most of the year.

Similar-looking Plants

In addition to Clara Hunt's milkvetch, there are 12 other species and varieties of *Astragalus* that are known to occur in the North Coast Ranges Bioregion of California (Jepson Flora Project 2020, Ruygt pers. comm. 2020). Only five of these are annual plants like Clara Hunt's milkvetch: Brewer's milkvetch (*Astragalus breweri*), Gambel's milkvetch (*Astragalus gambelianus*), Jepson's milkvetch (*Astragalus rattanii* var. *jepsonianus*), Rattan's milkvetch (*Astragalus rattanii* var. *rattanii*), and slender rattleweed (*Astragalus tener* var. *tener*) (Ruygt 2020). There are records of Brewer's milkvetch and Gambel's milkvetch several miles from Clara Hunt's milkvetch populations (CCH 2020). Much of the historical misidentification of Clara Hunt's milkvetch has been due to its superficial similarity with Jepson's milkvetch. The combination of bright purple tips on Clara Hunt's milkvetch's generally white banner and keel petals (cover photo), along with a peg-like extension on the flower receptacle (evident after fruit drop), distinguishes Clara

Hunt's milkvetch's from the other annual species and varieties of *Astragalus* in the North Coast Ranges Bioregion of California. Clara Hunt's milkvetch can also be distinguished from Jepson's milkvetch and slender rattleseed based on the ratio of keel petal length to wing petal length. The keel petal of Clara Hunt's milkvetch is as long as or slightly longer than its narrow wing petals, whereas the keel petal of Jepson's milkvetch is always half as long or shorter than the length of its narrow wing petals (McCarten 1985). The tip of the keel petal of slender rattleseed has two purple spots and the keel petal is shorter than the length of its wing petals, and is concealed by them (Ruygt 2020).

Clara Hunt's milkvetch also looks superficially similar to winter vetch (*Vicia villosa*), which can co-occur, but the two plants can be easily distinguished based on leaf morphology; Clara Hunt's milkvetch leaves do not have tendrils and winter vetch leaves almost always have tendrils.

HABITAT THAT MAY BE ESSENTIAL TO THE CONTINUED EXISTENCE OF THE SPECIES

Clara Hunt's milkvetch is generally found in oak woodlands, in sparsely vegetated openings without significant shrub or tree overstory. Clara Hunt's milkvetch appears to be adapted to poor quality, acidic soil conditions that may limit the growth of other plant species. This tolerance of poor soil conditions allows Clara Hunt's milkvetch to occur in areas with reduced competition from plant species that thrive in richer soil. The Department's preliminary identification of the habitat that may be essential to the continued existence of Clara Hunt's milkvetch includes habitats that: (1) fit the general habitat descriptions provided below, (2) contain any of the six known Clara Hunt's milkvetch populations, and (3) contain any Clara Hunt's milkvetch populations discovered in the future.

Vegetation Communities

The Department uses A Manual of California Vegetation, Second Edition (Sawyer et al. 2009) to classify natural communities within California. The vegetation of Sonoma County has been mapped consistent with A Manual of California Vegetation, Second Edition (Klein et al. 2015a, 2015b), and the vegetation of Napa County has been mapped consistent with the older first edition of A Manual of California Vegetation (Sawyer and Keeler-Wolf 1995; Thorne et al. 2004). Based on these vegetation maps, Clara Hunt's milkvetch appears to be commonly associated with California annual grasslands and with various vegetation types with oak trees as dominant species. Table 3 presents the vegetation types mapped within the vicinity of Clara Hunt's milkvetch populations during county-wide vegetation mapping efforts, but the accuracy of the mapping at specific populations may not have been ground-truthed. Ruygt (1994, pers. comm 2020) reports that despite results of vegetation mapping, the dominant vegetation type at the Bothe Population is actually blue oak (*Quercus douglasii*) alliance, and the dominant vegetation type at the Alpine School population is also dominated by blue oak, with Oregon oak (*Quercus garryana* var. *garryana*) and possibly California black oak (*Quercus kelloggii*) as minor components.

Clara Hunt's milkvetch is generally found in openings, without significant shrub or tree overstory; however, the native shrub and tree species found near Clara Hunt's milkvetch populations include common manzanita (*Arctostaphylos manzanita*), buckbrush (*Ceanothus cuneatus* var. *cuneatus*), birch-leaf mountain-mahogany (*Cercocarpus betuloides* var. *betuloides*), toyon (*Heteromeles arbutifolia*), ponderosa pine (*Pinus ponderosa*), foothill pine (*Pinus sabiniana*), Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), coast live oak (*Quercus agrifolia* var.

Table 3. Vegetation Types Mapped at Clara Hunt's Milkvetch Populations (Sawyer and Keeler-Wolf 1995; Thorne et al. 2004; Klein et al. 2015a, 2015b)

Vegetation Type/Population	Alpine School	Bothe	Lake Hennessey	Lewelling Lane	Saddle/Hayfork	Taplin Road
Manzanita (<i>Arctostaphylos (canescens, manzanita, stanfordiana)</i> ; <i>A. glandulosa</i>) Mapping Unit	X					
California Annual and Perennial Grassland Macrogroup <u>or</u> California Annual Grasslands Alliance	X		X	X	X	X
Coast Live Oak (<i>Quercus agrifolia</i>) Alliance					X	X
Coast Live Oak - Blue Oak (<i>Quercus douglasii</i>) - (Foothill Pine (<i>Pinus sabiniana</i>)) (no formal description (NFD) ¹) Association			X			X
Foothill Pine Alliance				X		
Foothill Pine / Mesic Non-serpentine Chaparral NFD Association				X		
Mixed Oak Alliance (<i>Quercus agrifolia</i> , <i>Q. douglasii</i> , <i>Q. garryana</i> , <i>Q. kelloggii</i> , <i>Q. lobata</i> , <i>Q. wislizenii</i>)	X	X		X	X	X
Oregon White Oak (<i>Quercus garryana</i>) Alliance	X	X				
Serpentine Grasslands NFD Super Alliance				X		
Valley Oak (<i>Quercus lobata</i>) Alliance	X					

¹NFD designates vegetation types that were not formally described within the older first edition of A Manual of California Vegetation, but were designed to be consistent with its established vegetation hierarchy (Sawyer and Keeler-Wolf 1995; Thorne et al. 2004).

agrifolia), blue oak, leather oak (*Quercus durata* var. *durata*), Oregon oak, and California black oak.

Ruygt (1994) observed the following six herbaceous plants in the immediate vicinity of Clara Hunt's milkvetch at all four populations that he studied (Alpine School, Bothe, Lake Hennessey, and Lewelling Lane):

- common soaproot (*Chlorogalum pomeridianum*),
- blue dicks (*Dipterostemon capitatus* ssp. *capitatus*),
- fescue (*Festuca* sp.),
- true babystars (*Leptosiphon bicolor*),
- slender cottonweed (*Micropus californicus* var. *californicus*), and
- California plantain (*Plantago erecta*).

The following plant species were also associated with Clara Hunt's milkvetch in at least three populations in Ruygt's (1994) study:

- Chilean trefoil (*Acmispon wrangelianus*),
- soft chess (*Bromus hordeaceus*),
- sticky mouse-ear chickweed (*Cerastium glomeratum*),
- California goldfields (*Lasthenia californica* ssp. *californica*),
- purple needle grass (*Stipa pulchra*),
- one-sided blue grass (*Poa secunda* ssp. *secunda*),
- purple sanicle (*Sanicula bipinnatifida*), and
- dwarf sack clover (*Trifolium depauperatum* var. *depauperatum*).

Observations of the plant associations at the Saddle/Hayfork Population (Table 3) are consistent with Ruygt's observations; Clara Hunt's milkvetch is commonly found with slender cottonweed, California goldfields, purple sanicle, and dwarf sack clover. Sparse vegetation cover is a common trait of Clara Hunt's milkvetch habitat and may be a necessary condition for the species from the standpoint of competition for light and nutrients (Ruygt 1994, Delmartini pers. comm. 2020). Ruygt also observed that the height of associated species ranged from 6 to 25 cm (2 to 10 inches), and did not shade Clara Hunt's milkvetch plants.

Geology and Soils

Clara Hunt's milkvetch is found in the northern Coast Range of California in a region dominated by north-northwest trending valleys and ridges of mountains that are mostly less than 800 meters (2600 feet) in elevation. The geology of the northern Coast Range is broadly composed of two components: (1) older rocks that are generally highly mixed and deformed and have traveled great distances from the locations where they were formed; and (2) younger, less deformed rocks that are roughly in the same locations where they were formed (Graymer et al. 2007). The older rocks in Napa and eastern Sonoma Counties originated from ancient ocean crusts and deposits, and include: (1) the Great Valley sequence of sandstone, conglomerate, and shale; (2) the Coast Range ophiolite from the Earth's oceanic crust and underlying upper mantle that consists of serpentinite, gabbro, and other rocks which rare plants are often associated with; and (3) the Franciscan Complex, which is a confusing mix of various kinds of thoroughly folded and sheared rocks (Bailey et al. 1964; Alt and Hyndman 1975; Graymer et al. 2007). The younger rocks in Napa and eastern Sonoma Counties include volcanic rocks from the eruption of the Sonoma Volcanic field, and even younger superficial deposits of sandstones and mudstones that often have many fossils.

All known populations of Clara Hunt's milkvetch are within or in close proximity to the northern part of the Sonoma Volcanic field. The rocks in the northern part of the Sonoma Volcanic field surround and extend to the south of the Mount Saint Helena caldera, and are the youngest rocks of the Sonoma Volcanic field (Wagner et al. 2011). The Lake Hennessey and Lewelling Lane populations are also associated with serpentinite rocks from the older Coast Range ophiolite.

There are a variety of different soil series mapped at populations of Clara Hunt's milkvetch by the Natural Resources Conservation Service (Soil Survey Staff 2019). Many of these soil series are noted as loams, and are weathered from volcanic, metavolcanic, and/or sedimentary rock.

Ruygt (1994) excavated six soil pits within one meter of Clara Hunt's milkvetch plants at the Alpine School, Bothe, Lake Hennessey, and Lewelling Lane populations to examine soil properties, and found soils from all pits to be rocky, shallow and well-drained. Ruygt also found the Lake Hennessey Population to be in soil formed from serpentine bedrock, and the Lewelling Lane Population to be in soil formed from serpentine bedrock with volcanic or other metamorphic components. The Alpine School and Bothe populations were both found to occur on soils formed from basalt (volcanic) bedrock. The incline of slopes at Clara Hunt's milkvetch habitat is generally slight (0 to 10 degrees), and the slope aspect varies widely (Ruygt 1993; Department observation).

Based on a soil chemical analysis, Ruygt (1994) found all soils sampled in Clara Hunt's milkvetch habitat to be medium to strongly acidic (pH 5.2-6.0). There were very low levels of manganese at the Bothe and Lewelling Lane populations compared with levels at nearby unoccupied habitat, suggesting that tolerance to low manganese may be a key parameter determining milkvetch habitat at those locations. Clara Hunt's milkvetch also appears to have the ability to tolerate low levels of calcium and potentially toxic levels of magnesium. Clara Hunt's milkvetch may also be tolerant of levels of nickel and aluminum that may be toxic to other plants in acidic soils (McCarten 1986; Ruygt 1994). In summary, Clara Hunt's milkvetch seems adapted to poor quality soils that may limit the growth and competition from other plant species.

Climate, Hydrology and Other Factors

Clara Hunt's milkvetch populations occur in a Mediterranean climate, which consists of cool, wet winters and warm, dry summers. Although precipitation at Clara Hunt's milkvetch populations may occur in any month of the year, over 95 percent of the precipitation falls from October to May, which is typical for much of California. Between 1983 and 2018, the average annual precipitation at Clara Hunt's milkvetch populations was approximately 88 cm (34.8 inches) (PRISM Climate Group 2020). Rainfall can vary dramatically among Clara Hunt's milkvetch populations from month to month and year to year. Among the Clara Hunt's milkvetch populations, climate data suggests that the Bothe Population receives the most precipitation and the Lake Hennessey Population receives the least, although the difference between the two populations is relatively low (approximately 9 cm/3.5 inches) (Ruygt 1994, PRISM Climate Group 2020). Precipitation occurs mainly as rain; snowfall and hail occur infrequently and melt almost immediately. The coldest month of the year at Clara Hunt's milkvetch populations is typically December, which has an average low temperature of approximately 3.8°C (38.8°F). The hottest month of the year is typically July, after Clara Hunt's milkvetch plants have died.

Between 1983 and 1992, Ruygt (1994) noted an apparent positive correlation between November precipitation, as a percentage of average annual precipitation, and the number of

Clara Hunt's milkvetch plants in a monitoring quadrat at the Bothe Population. This could suggest that rainfall earlier in the growing season is a critical factor for Clara Hunt's milkvetch seed germination and establishment.

Clara Hunt's milkvetch likely receives most of its water from precipitation. Ruygt (1994) assessed soil drainage and water holding capacity in soil pits at the Alpine School, Bothe, Lake Hennessey, and Lewelling Lane populations of Clara Hunt's milkvetch. Based on Ruygt's assessment, soil water holding capacity appears to be lowest at the Bothe Population, and highest at the Lewelling Lane and Lake Hennessey populations. Drainage class was assessed as "somewhat excessive" at one of the two soil pits at the Alpine School Population, and was assessed as "well-drained" or "moderately well-drained" at the remaining soil pits at the Alpine School, Bothe, Lake Hennessey, and Lewelling Lane populations of Clara Hunt's milkvetch (Ruygt 1993; Soil Survey Division Staff 1993). This could suggest that Clara Hunt's milkvetch is also adapted to be drought tolerant or tolerant of well-drained soils.

High densities of Clara Hunt's milkvetch plants have been observed in areas disturbed by gopher mounds (Ruygt 1993; Evans pers. comm. 2019). Additionally, after removal of a soil stockpile placed on a portion of the Lake Hennessey Population in the fall of 1990, particularly robust Clara Hunt's milkvetch individuals were found in areas that had been scraped bare (Ruygt 1994). This suggests that soil disturbance and competing vegetation could be important factors affecting germination, establishment, and growth of Clara Hunt's milkvetch.

Clara Hunt's milkvetch occurs in habitats that have been historically subject to periodic wildfire; however, according to California Department of Forestry and Fire Protection records, the vegetation at all of the known Clara Hunt's milkvetch populations has not burned since 1950, and the Department does not have information on when these populations burned prior to 1950 (CalFIRE 2020). The 2020 Glass Fire burned near several populations of Clara Hunt's milkvetch, but the effects of wildfire on Clara Hunt's milkvetch populations and seeds in the soil seed bank is still unknown.

POPULATION TRENDS AND ABUNDANCE

The available information suggests that the abundance of Clara Hunt's milkvetch is very low. There are only six populations of Clara Hunt's milkvetch, all occupying small geographic areas, and all with very low population numbers compared with the population sizes of most established plant species. Available data on the population trends and abundance of Clara Hunt's milkvetch populations have been compiled in Appendix C (Ruygt 1994; USFWS 2009, 2019; CNDDDB 2020).

Clara Hunt's milkvetch populations were monitored and visited regularly in the 1980s and 1990s. Beginning in 1999, visits to Clara Hunt's milkvetch populations occurred less frequently, and no regular monitoring has been reported. Clara Hunt's milkvetch population trends can be difficult to discern. Clara Hunt's milkvetch range-wide number of individuals over time is presented in Figure 6; however, because populations were only visited intermittently since the early 1980s and there was inconsistent survey effort across populations, the yearly range-wide sums of individuals often do not include all populations, and thus may not necessarily be comparable from year to year. Furthermore, the Department recognizes that populations of annual plants can have high inter-annual variability, making it difficult to detect population trends. Annual plant numbers can fluctuate wildly from year to year depending on environmental

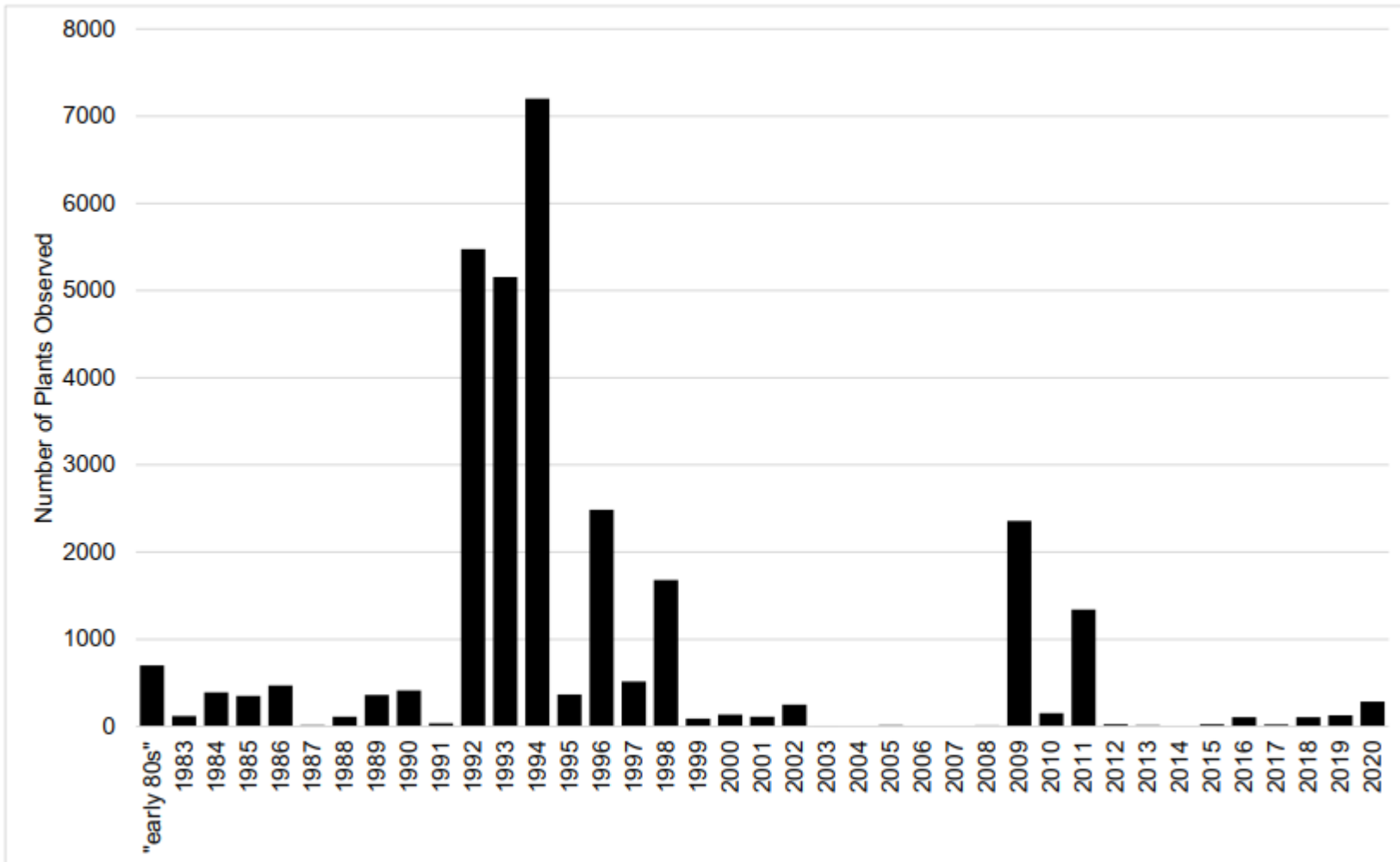


Figure 6. Clara Hunt’s milkvetch (*Astragalus claranus*) plants observed at populations visited during intermittent surveys from "early 1980s" to 2020. Not all populations were visited every year. Appendix C shows the years that visits took place at each population.

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conditions (e.g., timing and amount of rainfall), the germination of seedlings, and seed production in previous years (Fischer and Matthies 1998; Harrison et al. 1999).

Despite limitations in available data, there is information to suggest that one population of Clara Hunt's milkvetch has declined since the Department's 1989 status review and the initial listing of the species in 1991, and another population may be extirpated or only exist in the soil seed bank. The population trends and abundance of each of the known Clara Hunt's milkvetch populations are discussed in more detail below.

Alpine School. The highest number of plants observed at this population was estimated at 4,500 in 1992, and zero plants were observed in 2003 and 2008. Annual counts of over 1,000 plants were observed at this population in six different years (1992, 1993, 1996, 1998, 2009, and 2011), making this one of the two largest known populations of Clara Hunt's milkvetch. It does not appear that this population was surveyed for Clara Hunt's milkvetch between 2012 and 2018. Department staff observed approximately 50 plants at this population in 2019 (see Figure 4a) (CNDDDB 2020). The trend of this population since the Department's 1989 status review is unknown.

Bothe. The highest number of plants observed at this population was 200 in 1992, but there were zero plants observed in 2004, 2012, 2014, 2015, 2019, and 2020. The most recent observation of Clara Hunt's milkvetch at Bothe State Park was eight plants in 2009, and no plants have been found at the Bothe Population since 2009, despite surveys in 2012, 2014, 2015, 2019, and 2020 (CNDDDB 2020). Although this population has only been visited intermittently, the available information suggests that this population may be extirpated or may only exist in the soil seed bank.

Lake Hennessey. The highest number of plants reported at this population was approximately 700 in the early 1980s, and the lowest number of plants observed at this population was one plant in 2011. Populations sizes of over 100 plants were observed several times between 1984 and 1994. The Lake Hennessey Population appears to have only been surveyed six times between 1994 and 2014, and the population was never observed to be over 100 plants during this time, as was observed between 1984 and 1994. Although it is difficult to discern population trends for annual plants, the consistently lower population sizes that have been observed beginning in 1994, compared with before 1994, suggest that the population has declined. Twenty-six Clara Hunt's milkvetch plants were observed at this population in 2015, 19 were observed in 2016, 22 in 2017, 60-150 in 2018, 27 in 2019, and 49 in 2020. Additionally, the north side of Conn Valley Road was searched on March 25, 2017, but no plants were observed (Ruygt pers. comm. 2020). Although this population has not been monitored regularly, the available information suggests that the Lake Hennessey Population has declined to very low numbers since the Department's 1989 status review.

Lewelling Lane. This population is one of the largest two known populations of Clara Hunt's milkvetch. In 1994 there were 6,192 plants reported at this population, which is the highest number of plants ever reported for a population of Clara Hunt's milkvetch. The lowest number of plants observed at this population was 15 in 1991, which is the first year of CNDDDB data recorded for this population. This population does not appear to have been surveyed since 2009, so the trend of this population since the Department's 1989 status review is unknown, but the population is presumed to still be present.

Saddle/Hayfork. This population was first discovered in 2008. The highest number of plants reported at this population was 300 in 2009 and the lowest number of plants observed at this

population was 0 in 2014 and 2017. Forty Clara Hunt's milkvetch plants were observed at the Saddle/Hayfork Population in 2019 and 226 were observed in 2020 (Figure 7). Monitoring efforts at this population prior to 2019 focused on the portion of the population that lies on the Saddle Mountain Open Space Preserve and an approximately one-acre portion of the private property that is directly adjacent. The extent of this population that lies on the Saddle Mountain Open Space Preserve has shrunk significantly in since 2008, with monitoring from 2017 to 2020 only documenting plants within the roadbed immediately adjacent to the private property boundary. As observed between 2008 and 2016, this portion of the population once extended approximately 0.25 acre into the adjacent grassland on the Saddle Mountain Open Space Preserve (Delmartini pers. comm. 2020). The trend of this population since the Department's 1989 status review is unknown.

Taplin Road. The Department only has data on this population from four years: 1997, 1998, 2009, and 2016, but there are photos of Clara Hunt's milkvetch plants at this location from 2019 and 2020, confirming its presence (Calflora 2020; Calphotos 2020). Sixty Clara Hunt's milkvetch plants were present in 1997, 290 were present in 1998, 60 in 2009, 10 in 2016, and an unknown number were present in 2019 and 2020. The trend of this population since the Department's 1989 status review is unknown.

Since the beginning of monitoring efforts in the early 1980s, individual populations of at least one thousand Clara Hunt's milkvetch plants have only been observed in seven years: 1992, 1993, 1994, 1996, 1998, 2009, and 2011. It is not clear why Clara Hunt's milkvetch germination and survival was high in these years, and based on a cursory analysis, Department staff were unable to identify any significant correlations between climate variables and germination and survival. Populations of at least one thousand Clara Hunt's milkvetch plants have only been observed at the Alpine School and Lewelling Lane populations, and these two populations are therefore considered the largest populations of Clara Hunt's milkvetch.

The observed sharp rises and falls in Clara Hunt's milkvetch population sizes suggest that population size is highly dependent on climatic conditions, and a seed bank is present in the soil. Surveys also indicate that population sizes of Clara Hunt's milkvetch can have annual variation that is independent from one another. For example, the Alpine School Population was ten times larger than the Lewelling Lane Population in 1992, and two years later the Lewelling Lane Population was six times larger than the Alpine School Population. Population size in a given year is therefore likely a function of both climate and prior years' contribution to the soil seed bank.

In summary, the abundance of Clara Hunt's milkvetch is very low, and although population trends for annual plants are difficult to discern, there is information to suggest that one of the six populations of Clara Hunt's milkvetch has declined since the the Department's 1989 status review, and another population may be extirpated or only exist in the soil seed bank. Due to the small number of Clara Hunt's milkvetch individuals and the presence of only six or fewer small Clara Hunt's milkvetch populations, the loss of any Clara Hunt's milkvetch population, or the loss of a significant portion of a Clara Hunt's milkvetch population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range.



Service Layer Credit Source Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 50 100 200 Feet

Figure 7. Clara Hunt's milkvetch (*Astragalus claranus*) Plants at the Saddle/Hayfork Population in 2019 and 2020

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FACTORS AFFECTING THE ABILITY TO SURVIVE AND REPRODUCE

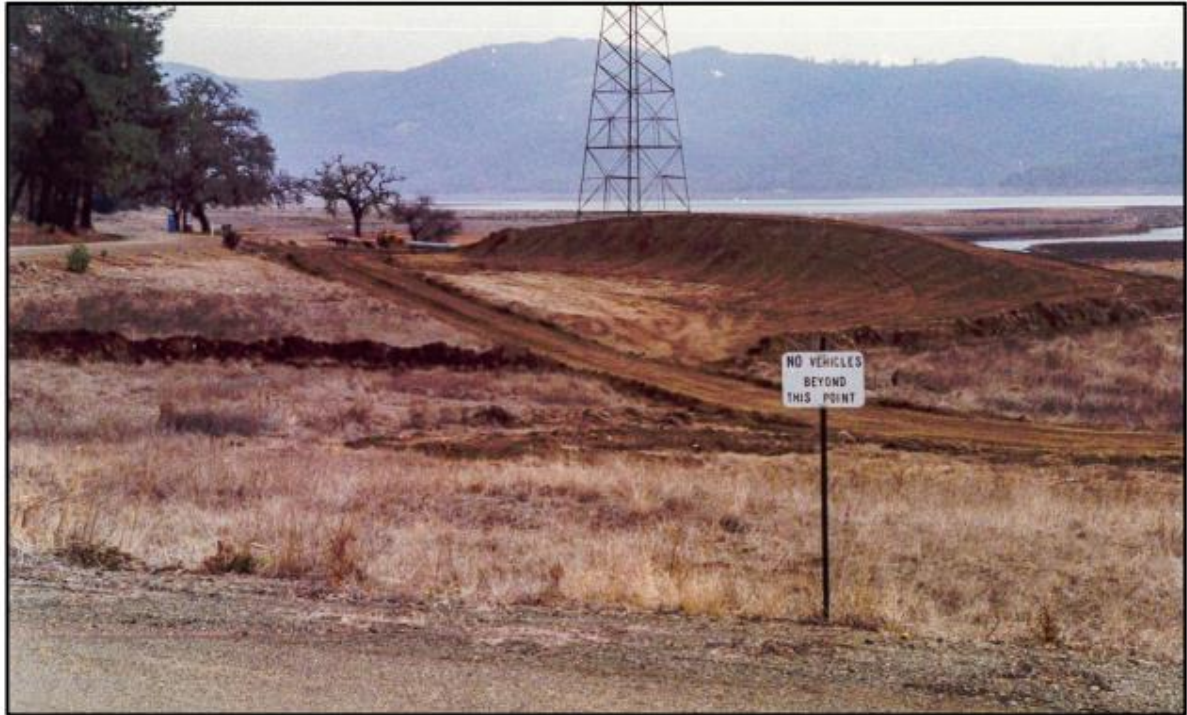
Present or Threatened Modification or Destruction of Habitat

The threat of habitat elimination primarily comes from agricultural or other development activities, and these activities have eliminated some Clara Hunt's milkvetch habitat in the past. The threat of habitat degradation primarily comes from recreational land use, maintenance of infrastructure, improper domestic animal grazing regimes, equipment use, or other unforeseen activities in the future, particularly if those activities result in trampling, excessive or inadequate soil disturbance, hydrological changes, excessive winter or spring herbivory, or the creation of conditions that are favorable for the establishment and spread of invasive plant species. While regulatory mechanisms are in place to protect Clara Hunt's milkvetch habitat from some threats, impacts could still occur from unpermitted activities, or activities that occur and cannot be mitigated. Three Clara Hunt's milkvetch populations are considered to have a moderate to high risk of habitat elimination or degradation, and three populations are considered to have a low risk of habitat elimination or degradation. The risk of habitat elimination or degradation at each of the Clara Hunt's milkvetch populations is discussed below.

Moderate to high risk of habitat elimination or degradation

Lake Hennessey. The threat of continuing habitat elimination and degradation at the Lake Hennessey Population is moderate to high. Prior to listing, the Lake Hennessey Population was likely reduced in size when Lake Hennessey was created in the 1950s by flooding the valley (USFWS 2009). The Lake Hennessey Population is almost entirely on land owned by the City of Napa and a small portion on the north side of Conn Valley Road is on private property. The Lake Hennessey Population is adjacent to the Lake Hennessey reservoir, and is frequently visited for recreation. The City of Napa placed a portable toilet near the population in 1987 or 1988 and continues to maintain a portable toilet and garbage cans for the area (Liston 1990a; Department observation). Trampling by recreational foot traffic could kill individual Clara Hunt's milkvetch plants, and this threat is greatest between November and April when plants are present. A utility tower is maintained immediately adjacent to the population. In the fall of 1990, the City of Napa permitted topsoil vendors to remove topsoil from the drought-exposed bed of Lake Hennessey, and the soil was stockpiled on approximately 30 percent of the Lake Hennessey Population (Figure 8a) (Ruygt 1994). Much of the stockpiled soil was removed in 1992 and 1993. A portion of the population covered by the soil stockpile recovered surprisingly well in 1992, with 325 individuals observed; however, the area was subsequently degraded by the invasion of weedy species such as goatgrass (*Aegilops triuncialis*). In February of 1991, the Department installed a fence along Conn Valley Road to prevent vehicles from driving onto the population. The City of Napa conducts maintenance activities at the Lake Hennessey Population that include annual mowing with a tractor and weed-whacking by hand at a time that is "generally prior to the summer months," but the City of Napa does not use herbicides or pesticides in the area (Kebbas pers. comm. 2020). Sometime between April 2015 and March 2016, wood chips from an unknown source were spread over the area, extending onto a portion of the Lake Hennessey Population (Google Earth 2019). The application of wood chips was not done by the City of Napa (Kebbas pers. comm. 2020). Due to the relatively un-weathered appearance of the wood chips shown in Figure 8b, the addition of wood chips to the area may be a periodic or ongoing occurrence. The addition of wood chips may have various effects on soil attributes. It is unknown whether or not the addition of wood chips to the area has had an effect on Clara Hunt's milkvetch. The Lake Hennessey population also occurs partially on the north side of Conn Valley Road, opposite the City of Napa property. This area was overgrown with invasive grasses and brush in 2019, and sometime in late 2020 the vegetation in this area

(a)



(b)



Figure 8. Human Disturbance to Clara Hunt's milkvetch (*Astragalus claranus*) Habitat at the Lake Hennessey Population. (a) Clara Hunt's milkvetch habitat at the Lake Hennessey Population buried under soil dredged from Lake Hennessey in 1990 (Source: Ruygt 1994, Photo by W. Grummer). (b) Clara Hunt's milkvetch habitat at the Lake Hennessey Population on March 27, 2019 showing wood chips on the site.

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was removed and lightly scraped/scoured (see image in Appendix B, Ruygt pers. comm. 2020). Although the Lake Hennessey Population has not been monitored regularly, the available information suggests that the population has declined since the Department's 1989 status review.

Lewelling Lane. The threat of habitat elimination and habitat degradation from development or change in land use at the Lewelling Lane Population is moderate to high. The Lewelling Lane Population occurs on several private parcels with different landowners, and the land use zoning for these parcels is "Agricultural Preserve" or "Agricultural Watershed" (Napa County 2015). The Agricultural Preserve district classification is: "intended to be applied in the fertile valley and foothill areas of Napa County in which agriculture is and should continue to be the predominant land use, where uses incompatible to agriculture should be precluded and where the development of urban type uses would be detrimental to the continuance of agriculture and the maintenance of open space which are economic and aesthetic attributes and assets of the county" (Napa County Code of Ordinances section 18.16.010). The Agricultural Watershed district classification is: "intended to be applied in those areas of Napa County where the predominant use is agriculturally oriented, where watershed areas, reservoirs and floodplain tributaries are located, where development would adversely impact on all such uses, and where the protection of agriculture, watersheds and floodplain tributaries from fire, pollution and erosion is essential to the general health, safety and welfare" (Napa County Code of Ordinances section 18.20.010). A number of land uses such as agriculture, housing, and wine production could occur in Agricultural Preserve and Agricultural Watershed districts (Napa County Code of Ordinances sections 18.16.20 and 18.20.020), and many of these land uses could result in the elimination or degradation of Clara Hunt's milkvetch habitat.

Taplin Road. The threat of habitat elimination and habitat degradation from development or change in land use at the Taplin Road Population is moderate to high. The Taplin Road Population occurs on one private parcel with the land use zoning of "Agricultural Watershed" (Napa County 2015). A number of land uses such as agriculture, housing, and wine production could occur in the Agricultural Watershed district (Napa County Code of Ordinances section 18.20.020), and many of these land uses could result in the elimination or degradation of Clara Hunt's milkvetch habitat.

Low risk of habitat elimination or degradation

Alpine School. The threat of habitat elimination from development or significant change in land use at the Alpine School Population is low. The Sonoma County Agricultural Preservation and Open Space District holds a conservation easement that protects the property from development and significant land use changes, but this conservation easement does not contain affirmative requirements to conduct habitat restoration or enhancement activities, and therefore does not ensure proactive ecological land management or remove all potential impacts. Degradation of Clara Hunt's milkvetch habitat at the Alpine School Population could still take place as a result of improper domestic animal grazing regimes, equipment use, or other unforeseen activities by the landowner in the future, particularly if the activities result in trampling, excessive or inadequate soil disturbance, hydrological changes, excessive winter or spring herbivory, or the creation of conditions that are favorable for the establishment and spread of invasive plant species. In 2019, the property with the Alpine School Population was used as pasture for an unknown number of horses. The landowner for the Alpine School Population also owns a portion of the Saddle/Hayfork Population, and domestic animals have been able to travel between the two populations, so land use changes could affect both populations simultaneously. Historical scientific collections suggest that the Alpine School

Population previously occupied a larger area that extended to the north side of St. Helena Road. The north side of St. Helena Road was converted to vineyards and a horse stable sometime prior to the early 1980s, reducing the total area of the population (McCarten 1985).

Bothe. The threat of habitat elimination and habitat degradation at the Bothe Population is low because the property is owned and managed by the California Department of Parks and Recreation as Bothe-Napa Valley State Park. There is very little human activity at the Bothe Population because there are no maintained hiking trails in the vicinity, although portions of a decommissioned hiking trail can still be discerned in the area. Modification of habitat at the Bothe Population from vegetation encroachment is discussed below under the heading “Vegetation Community Succession.”

Saddle/Hayfork. The threat of habitat elimination from development or change in land use at the Saddle/Hayfork Population is low. The Saddle/Hayfork Population occurs on two parcels: one is private property that is protected by a conservation easement, and the other is the Saddle Mountain Open Space Preserve that is owned and managed by the Sonoma County Agricultural Preservation and Open Space District for aesthetic and habitat values (Sonoma County Agricultural Preservation and Open Space District 2019). As described for the Alpine School Population above, the conservation easement does not contain affirmative requirements to conduct habitat restoration or enhancement activities, and therefore does not ensure proactive ecological land management or remove all potential impacts. Degradation of Clara Hunt’s milkvetch habitat at the Saddle/Hayfork Population could still occur as a result of modified land uses and land management activities in the future, particularly if land use activities on the private property result in trampling, excessive or inadequate soil disturbance, hydrological changes, excessive winter and spring herbivory, or the creation of conditions that are favorable for the establishment and spread of invasive plant species. In 2019, the portion of the population that occurs on private property was being used as pasture for an unknown number of horses. The landowner for the Alpine School Population also owns a portion of the Saddle/Hayfork Population, and domestic animals have been able to travel between the two populations, so land use changes could affect both populations simultaneously.

Clara Hunt’s milkvetch has been affected by development and changes in land use in the past, and there continues to be a moderate to high risk of habitat elimination or degradation at three of the six Clara Hunt’s milkvetch populations. This risk of habitat elimination or degradation comes from possible conversion of land for agriculture, housing, or wine production; improper domestic animal grazing regimes, equipment use, or other unforeseen activities by private landowners; and recreational use at the Lake Hennessey Population. Due to the small number of Clara Hunt’s milkvetch individuals and the presence of only six or fewer small Clara Hunt’s milkvetch populations, the loss of any Clara Hunt’s milkvetch population, or the loss of a significant portion of a Clara Hunt’s milkvetch population would represent the loss of a significant portion of Clara Hunt’s milkvetch’s total range.

Invasive Plants

Invasive species are often cited as the second greatest threat to biodiversity behind habitat loss (Wilcove et al. 1998; Levine et al. 2003; Pimentel et al. 2004) and North America has accumulated the largest number of naturalized plants in the world (van Kleunen et al. 2015). Many studies hypothesize or suggest that competition is the process responsible for observed invasive species impacts to biodiversity; however, invasive species may impact native species in a variety of ways (Levine et al. 2003). Invasive species may threaten native populations through competition for light, water, or nutrients; the deposition of harmful biochemicals to soil;

alteration of soil chemistry (e.g. pH, salinity); thatch accumulation that inhibits seed germination and seedling recruitment; changes in natural fire frequency; disruptions to pollination or seed-dispersal mutualisms; changes in soil microorganisms; diseases; or other mechanisms. The magnitude of invasive species impacts in Mediterranean habitats, such as those in California, largely depends on the characteristics of the invading species and the habitat being invaded (Fried et al. 2014). The invader's life form and ability to create very dense stands affect the magnitude of the impacts, with creeping plant species having a greater effect (Gaertner et al. 2009; Fried et al. 2014). Invasive species have had greater impacts in areas with high soil moisture (Reever Morghan and Rice 2006; Fried et al. 2014). Invasive species may also influence native species' colonization rates, leading to declines in local diversity over longer timescales (Yurkonis and Meiners 2004). Nitrogen deposition from air pollution may also increase the suitability of previously nutrient-poor habitats for invasive species, allowing such habitats to become more easily invaded (Weiss 1999). Studies have not been conducted on the impact of invasive species on Clara Hunt's milkvetch specifically; however, the negative impacts of plant invasions on Mediterranean ecosystems have been well demonstrated (Gaertner et al. 2009; Fried et al. 2014).

Invasive Mediterranean grasses such as barbed goatgrass, soft chess, annual false brome (*Brachypodium distachyon*), rattlesnake grass (*Briza maxima*), ripgut brome (*Bromus diandrus*), medusahead (*Elymus caput-medusae*), and Italian ryegrass (*Festuca perennis*), have been observed in close proximity to Clara Hunt's milkvetch populations and pose a significant risk to the species (Figure 1c) (Ruygt 1993; Cal-IPC 2019a; Evans pers. comm. 2019). These Mediterranean grasses can compete with Clara Hunt's milkvetch for light, water, and nutrients, and may also form a layer of thatch that inhibits Clara Hunt's milkvetch germination the following year.

Medusahead can produce a thatch layer that is rich in silica and resistant to decay, and thus is of particular concern due to its ability to build up and suppress native seed germination. Medusahead encroachment is currently the most urgent invasive species concern for the Saddle/Hayfork Population (Delmartini pers. comm. 2020). A portion of the Saddle/Hayfork Population is on an ungrazed grassland at the Saddle Mountain Open Space Preserve, and a portion is on the adjacent private property that has been lightly grazed by a small number of horses and cows for approximately 30 years (Delmartini pers. comm. 2020). The increasing density of medusahead and thatch at the Saddle Mountain Open Space Preserve relative to the adjacent property, and the relatively lower abundance of Clara Hunt's milkvetch at the Saddle Mountain Open Space Preserve relative to the adjacent property, indicates that grazing may play an important role in maintaining Clara Hunt's milkvetch habitat in areas invaded by medusahead (Delmartini pers. comm. 2020).

Additional invasive species that are not grasses, such as yellow star-thistle (*Centaurea solstitialis*), bearded creeper (*Crupina vulgaris*), red-stem filaree (*Erodium cicutarium*), French broom (*Genista monspessulana*), burclover (*Medicago polymorpha*), English plantain (*Plantago lanceolata*), and curly dock (*Rumex crispus*) have also been documented in close proximity to Clara Hunt's milkvetch populations (Ruygt 1993; Cal-IPC 2019a, Delmartini pers. comm. 2020).

There is also evidence that invasive weeds may alter the soil microbe community, which can impact the relative fitness of native forbs and ecosystem composition. In a study of yellow star-thistle and barbed goatgrass in serpentine grasslands, Batten et al. (2006) found that the soil microbial community differed significantly between native and invaded areas. Changes to the soil microbial community can impact nutrient cycling processes, and can make inhospitable soils more susceptible to plant species invasions.

Cheat grass (*Bromus tectorum*), an annual grass, is not currently a serious problem in Napa and Sonoma counties; however, most of Napa County and eastern Sonoma County are expected to become suitable habitat for cheat grass by the year 2050 due to climate change (Cal-IPC 2019b). Cheat grass threatens ecosystems by overcrowding native habitats and increasing the frequency and extent of wildfires. Wildfires can increase nitrogen availability, making soils more suitable for cheat grass, which in turn can create a feedback loop by increasing the frequency of fire (Kerns and Day 2017). There is also evidence that cheat grass itself can increase soil nitrogen availability, which could potentially allow it to invade habitats with poor quality soils. Stark and Norton (2015) found that under wet conditions (i.e. winter and spring conditions), cheat grass increased soil nitrogen availability, and that faster rates of nitrogen cycling by cheat grass were accompanied by greater concentrations of soil organic carbon and nitrogen. If cheat grass spreads significantly in Napa and Sonoma counties by the year 2050, it may become a serious additional threat to the continued existence of Clara Hunt's milkvetch.

Sparse vegetation cover is a common trait of Clara Hunt's milkvetch habitat and may be a necessary condition for the species. Invasive plant species can form dense stands of vegetation that are taller than the vegetation in natural Clara Hunt's milkvetch habitat, and thus invasive vegetation may significantly reduce the amount of habitat that is available for Clara Hunt's milkvetch.

Impacts from invasive plant species on Clara Hunt's milkvetch have become more severe since the Department's 1989 status review. In addition, due to the effects of climate change and the continued spread of invasive plants in California, the impacts from invasive plant species on Clara Hunt's milkvetch will likely become a greater threat in the future. Invasive plant species are a significant factor influencing Clara Hunt's milkvetch's ability to survive and reproduce.

Vulnerability of Small Populations

Clara Hunt's milkvetch has a narrow distribution with only six small populations occupying relatively small areas. Although range-wide population monitoring for Clara Hunt's milkvetch has not been conducted, population estimates have always been low, and it has been over 20 years since an individual population reached more than 1,500 plants. The Department recognizes that species with few populations and/or small population sizes are highly vulnerable to extinction due to stochastic (chance), demographic, environmental, and genetic events (Shaffer 1981, 1987; Primack 2006; Groom et al. 2006). Chance events, such as landslides, drought, or fire could result in the loss of all or a significant portion of a Clara Hunt's milkvetch population. Chance environmental conditions that result in seed germination without subsequent growth and reproduction could also deplete the soil seed bank and threaten the long-term persistence of Clara Hunt's milkvetch. Species with small numbers of populations or small populations may also be subject to increased genetic drift and inbreeding depression (Karron 1989; Menges 1991; Ellstrand and Elam 1993). Clara Hunt's milkvetch populations appear to be the smallest at the Bothe Population and Lake Hennessey Population, and these populations may therefore be the most vulnerable to extirpation by chance events.

Impacts to a species that have already taken place may also lead to an "extinction debt" where species that appear abundant disappear over time (Tilman et al. 1994; Kuussaari et al. 2009). Extinction processes often occur with a time delay and populations living close to their extinction threshold might survive for long periods of time despite extinction being inevitable (Hanski and Ovaskainen 2002; Lindborg and Eriksson 2004; Helm et al. 2006; Vellend et al. 2006). Species that are habitat specialists, such as Clara Hunt's milkvetch, may be more sensitive to changes

in habitat and thus more prone to local extinction than generalist species (Helm et al. 2006; Krauss et al. 2010; Cousins and Vanhoenacker 2011; Guardiola et al. 2013).

In a study of several species of *Astragalus*, Liston (1990a) found that while three populations of Clara Hunt's milkvetch are extremely similar genetically, the Lake Hennessey and Alpine School populations have unique alleles that contribute to the overall genetic diversity of the species; therefore, the genetic variation among populations will be important to conserve.

Clara Hunt's milkvetch occurs in such low numbers over such small geographical areas, that even localized accidents and chance events could lead to the extirpation of a population or could have severe and long-lasting negative effects on the ability of the species to survive and reproduce. Due to the small number of Clara Hunt's milkvetch individuals and the presence of only six or fewer small Clara Hunt's milkvetch populations, the loss of any Clara Hunt's milkvetch population, or the loss of a significant portion of a Clara Hunt's milkvetch population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range. Small population size and small number of populations is a significant factor influencing Clara Hunt's milkvetch's ability to survive and reproduce.

Climate Change

Warming of the climate is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia (IPCC 2014). Experimental and empirical evidence indicates that climate change is negatively impacting wildlife species and natural systems across the globe (Parmesan and Yohe 2003; Parmesan 2006). According to the California Global Warming Solutions Act of 2006, climate change is now considered one of the greatest threats to California's ecosystems, and over the current century, climate change will alter the fundamental character, production, and distribution of the ecosystems in California (Snyder et al. 2002; Snyder and Sloan 2005; California Energy Commission 2009b). Climate change is a major challenge to the conservation of California's natural resources, and it will amplify existing threats and create new threats to natural systems.

Numerous studies indicate that by the end of the century California's climate will be considerably warmer than today's, more winter precipitation will fall as rain instead of snow, snowpack will melt much earlier in the year, and snowpack will be substantially diminished (Kim et al. 2002; Knowles and Cayan 2002; Snyder et al. 2002; Miller et al. 2003; Hayhoe et al. 2004; Leung et al. 2004; Vanrheenen et al. 2004; California Energy Commission 2009a, 2009b; Melillo et al. 2014). California is also more vulnerable to climate fluctuations relative to the rest of the United States because it derives a disproportionately large percentage of its water supply from only a small number of winter storms, typically in the form of "atmospheric rivers" which are long and narrow corridors of enhanced water vapor that are often associated with a low-level jet stream of an extratropical cyclone (Dettinger 2011; Dettinger et al. 2011).

Department staff assessed the vulnerability of Clara Hunt's milkvetch to climate change using the NatureServe Climate Change Vulnerability Index Version 3.02 (NatureServe 2016; CDFW 2019a). Based upon the Department's assessment, Clara Hunt's milkvetch has a climate change vulnerability index value of Moderately Vulnerable (MV), indicating that abundance and/or range extent of Clara Hunt's milkvetch within the geographical area assessed is likely to decrease by 2050 due to climate change. Factors contributing to this vulnerability assessment include Clara Hunt's milkvetch's limited seed dispersal capabilities and the species' restriction to habitat with poor quality soils.

The Department is not aware of any other studies examining the potential effects of climate change on Clara Hunt's milkvetch. Climate change is a factor that may influence Clara Hunt's milkvetch's ability to survive and reproduce, but the relative impact that climate change will have on Clara Hunt's milkvetch populations in the future is unknown.

Vegetation Community Succession

Vegetation community succession is a threat to Clara Hunt's milkvetch because Clara Hunt's milkvetch is generally found in sparsely vegetated openings in oak woodland without significant shrub or tree overstory. Over time, shrubs and trees can fill in gaps unless there is a disturbance to maintain these openings in the oak woodland. Growth of trees and shrubs that reduces or eliminates openings in oak woodland that are utilized by Clara Hunt's milkvetch is therefore a threat to the species.

Vegetation community succession is a concern at the Bothe Population and possibly at portions of the Alpine School and other populations. Available information suggests that the Bothe Population may be extirpated or may now only exist in the soil seed bank. Vegetation community succession is a likely contributor to this apparent extirpation because the increase of shrub and tree overstory at the Bothe Population appears to have coincided with the gradual disappearance of plants at the location. Clara Hunt's milkvetch has not been observed at the Bothe Population since 2009, despite surveys in 2012, 2014, 2015, 2019, and 2020. Invasive annual grass species are also present at the Bothe Population, and may have contributed to its decline. Other unknown factors may have contributed to the decline of the Bothe Population as well.

A survey of the Alpine School Population in 2019 found Clara Hunt's milkvetch only growing in a small area in the southern portion of the mapped population, with no plants found in the northern portion of the population. Additional surveys over several years would likely be necessary to determine if Clara Hunt's milkvetch plants are still present in the northern portion of the Alpine School Population, and to assess whether or not vegetation community succession may be factor affecting it.

Vegetation community succession has likely been accelerated by fire suppression and reduced fire frequency within Clara Hunt's milkvetch habitat. Fire is a defining component of California's ecosystems, as it is in most of the world's Mediterranean-climate regions (Keeley et al. 2011, Sugihara et al. 2018). Clara Hunt's milkvetch occurs in habitats that have been subject to periodic wildfire. Lightning is a source of fire ignition in the North Coast Bioregion of California, but ignitions by Native Americans likely accounted for most prehistoric fires, with vegetation adjacent to areas used by Native Americans likely experiencing more frequent fire than vegetation farther away from these areas (Stephens et al. 2018). Napa County and a portion of Sonoma County have been historically occupied by the Wappo tribe. Fire regimes and related ecosystem processes have been profoundly altered by land use practices associated with Euro-American settlement, especially since American settlement began in earnest after 1849. These changes have in turn led to major modifications in vegetation distribution, structure, and composition (Agee 1993; Skinner and Chang 1996; Barbour et al. 2007; Safford and Van de Water 2014; van Wagendonk et al. 2018).

Blue oak forest and woodland alliance is a dominant vegetation community at the Bothe Population and the northern portion of the Alpine School Population (Ruygt 1994, pers. comm 2020). Blue oak woodlands historically had a regime of frequent summer and fall surface fires, fueled by groundlayer perennial bunchgrasses and forbs and downed woody debris (Standiford

et al. 2002, Fryer 2007). The fire return interval for blue oak forest and woodland alliance is 5-15 years (CNPS 2020). Burning by Native Americans has been implicated in maintaining stands of some oak forests and woodlands (Fuchs 2001; Stephens et al. 2018). Studies show that a combination of frequent fire and annual grazing are a prescription for eliminating blue oak regeneration, and this practice has been used in the past to eliminate woodlands (Bartolome et al. 2002, Swiecki and Bernhardt 2002). Lack of burning can lead to a reduction in grass cover and species diversity by shading and by allowing the development of taller understory vegetation, increasing the potential for high intensity fires that can replace entire stands of vegetation (Jimerson and Carothers 2002).

California Department of Forestry and Fire Protection records indicate that prior to 2020, the vegetation at all known Clara Hunt's milkvetch populations had not burned in more than 70 years. After this long period without fire, the 2020 Glass Fire burned near the Bothe Population, but the habitat was not affected by fire (Ruygt pers. comm 2020). The 2020 Glass Fire perimeter bisects the Saddle/Hayfork Population, with a small portion of the population outside of the burned area (Delmartini pers. comm. 2020). The Alpine School Population may have been affected by the 2020 Glass Fire, but the site has not yet been visited to determine if it was burned (Figure 9).

The effect of fire on Clara Hunt's milkvetch has not been studied. The 2020 Glass Fire and other fires in Clara Hunt's milkvetch habitat in the future could have positive or negative effects on the species. Low to moderate intensity fires that reduce competing vegetation and remove thatch could benefit Clara Hunt's milkvetch. High-intensity fires that kill plants or seeds or convert entire vegetation communities could negatively affect the species; however high intensity fire may be relatively rare in grassland and oak woodland habitats. Grassland habitats generally have relatively low fuel loads and flashy fuels that typically result in fast-moving, moderate-intensity fire with very low residence time. Spatially limited areas of high-intensity fire are possible if a grassland contains fuel jackpots such as downed trees or brush piles, and these areas can see significant impacts to soil structure and chemistry and seedbank viability. Likewise, high-intensity fire is rare in oak woodland habitats unless the habitats are significantly invaded by woody species such as Douglas-fir. Wildfires typically occur in summer and fall, while prescribed burning for habitat enhancement often occurs in spring. The relative benefit of spring burning versus summer and fall burning to enhance Clara Hunt's milkvetch habitat is currently unknown. Furthermore, changes in habitat resulting from fire could promote the establishment and spread of invasive plant species that are detrimental to Clara Hunt's milkvetch.

The elimination of tree and shrub overstory at the Bothe Population in the future may be beneficial for the population, but unless seeds remain in the soil seed bank, reduction in vegetation canopy may occur too late to help the population reestablish itself naturally. Reduction in thatch and the density of competing grassland species at the Saddle/Hayfork Population from the 2020 Glass Fire may have positive effects for the species. Ongoing monitoring of Clara Hunt's milkvetch populations may provide more insight into the effects of fire, vegetation community succession, and reduction in thatch and competing grasses on Clara Hunt's milkvetch.

Vegetation community succession is a likely contributor to the apparent extirpation of the Bothe Population, and is therefore is a threat to Clara Hunt's milkvetch. Due to the small number of Clara Hunt's milkvetch individuals and the presence of only six or fewer small Clara Hunt's milkvetch populations, the loss of the Bothe Population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range.

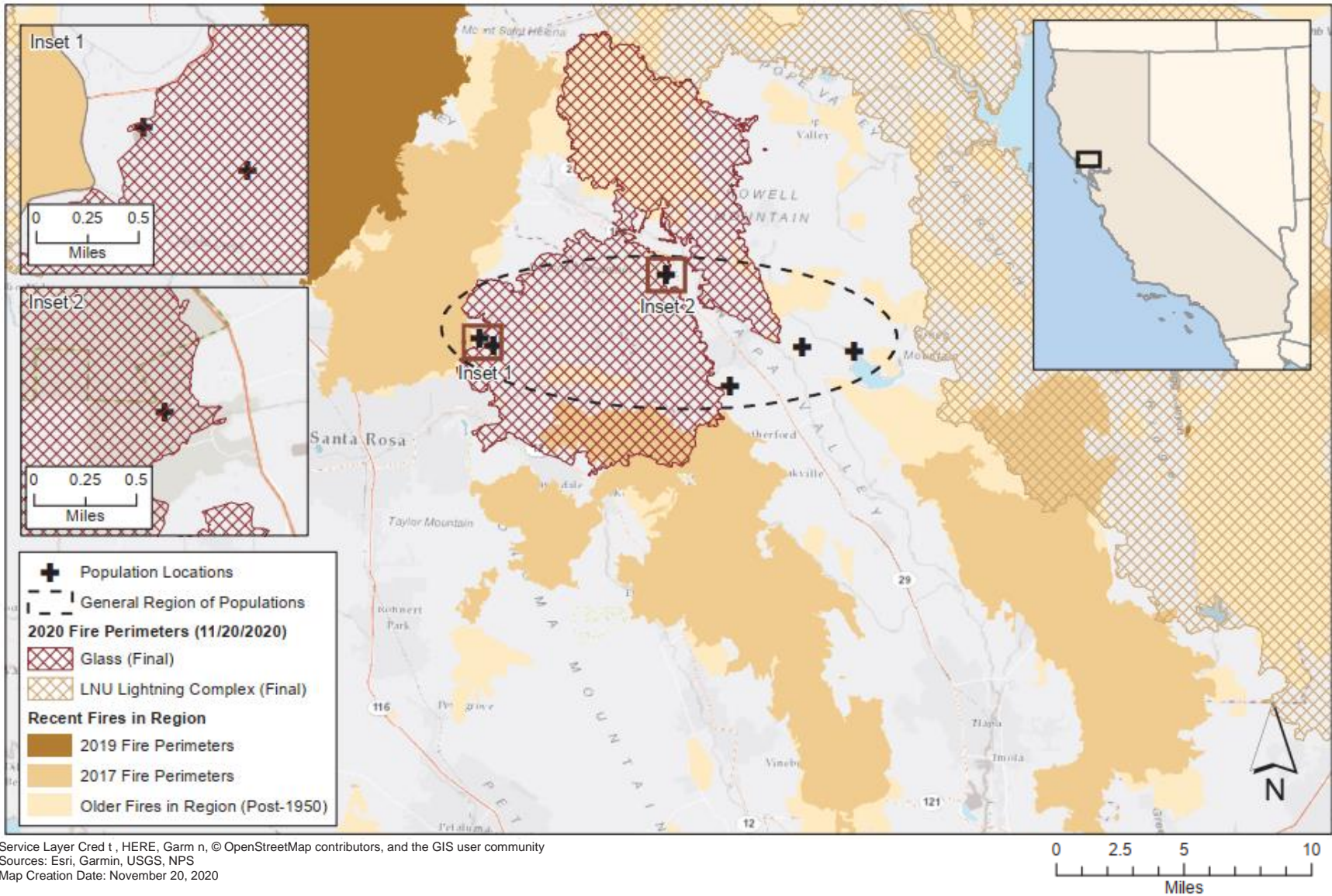


Figure 9. Wildfires in the Vicinity of Clara Hunt's milkvetch (*Astragalus claranus*) Populations, 1950 - November 20, 2020

California Department of Fish and Wildlife
 Status Review of Clara Hunt's Milkvetch (*Astragalus claranus*)

Herbivory and Predation

Evidence of herbivory and predation of Clara Hunt's milkvetch in the form of partial loss of leaves, severed flower heads, and penetration of fruit walls has been observed. Ruygt (1994) observed a spittle bug (*Aphrophora* sp.) and an aphid (Aphidoidea) on Clara Hunt's milkvetch plants, although no damage from these insects was observed. Ruygt also conducted a study excluding flying pollinators from 55 Clara Hunt's milkvetch plants at the Lewelling Lane Population in 1994, and observed fruit parasitism and herbivore damage of plants outside of pollinator exclusion screens to be substantially higher (67%) than plants within pollinator exclusion screens. While some herbivory and predation is expected in natural systems, comprehensive herbivory and predation studies have not been conducted, and it is unknown whether or not herbivory and predation are significant factors affecting the ability of Clara Hunt's milkvetch populations to survive and reproduce.

The Alpine School Population and a portion of the Saddle/Hayfork Population have been subject to grazing by horses and cattle. These and other populations could also be subject to grazing by other domestic animals in the future. It is unknown whether grazing by horses and/or other domestic animals is beneficial or detrimental to the species or its habitat.

MANAGEMENT EFFORTS

There are currently no rangewide management efforts or federal recovery plans for Clara Hunt's milkvetch. Some state and federal laws may provide some protection for Clara Hunt's milkvetch.

Saddle Mountain Open Space Preserve Management Plan

A portion of the Saddle/Hayfork Population is on the Saddle Mountain Open Space Preserve, owned by Sonoma County. The Sonoma County Agricultural Preservation and Open Space District finalized a management plan for the Saddle Mountain Open Space Preserve in October 2019 that includes management strategies for enhancement of plant communities and habitats; native plant revegetation; establishment of buffer zones; restoration of landscape disturbance processes; management of visitor use impacts; and ongoing monitoring and evaluation of biological resources (Sonoma County Agricultural Preservation and Open Space District 2019). The Department issued Sonoma County Agricultural Preservation and Open Space District a CESA permit in January 2020 for a study to determine whether prescribed burning in the grassland of the Saddle Mountain Open Space Preserve can help to decrease competition from invasive grasses and expand the Clara Hunt's milkvetch in the Saddle/Hayfork Population. This project will include one to three prescribed burns in late May to early June over the course of a five-year period, after the necessary approvals and permits are obtained.

Implementation of invasive species control, habitat enhancement, and fuel management projects under the Saddle Mountain Open Space Preserve Management Plan could be beneficial for the protection and expansion of the Saddle/Hayfork Population of Clara Hunt's milkvetch; however, even if implemented these projects are not likely to affect a significant portion of Clara Hunt's milkvetch's range because the vast majority of the Saddle/Hayfork Population does not occur on Saddle Mountain Open Space Preserve, and instead occurs on the adjacent private property.

Conservation Seed Banking

Clara Hunt's milkvetch seed was collected from the Alpine School, Lake Hennessey, Lewelling Lane, and Taplin Road Populations in 2009, and approximately 1,969 seeds are stored at the California Botanic Garden (formerly known as Rancho Santa Ana Botanic Garden) conservation seed storage facilities (Rancho Santa Ana Botanic Garden 2018). California Botanic Garden conducted germination tests on 30 Clara Hunt's milkvetch seeds in 2009, approximately four months after they were collected. After breaking the seed coat and placing the seeds in agar, 29 (97%) of the Clara Hunt's milkvetch seeds successfully germinated (CDFW 2010).

Conservation Easement and Other Land Protections

The Sonoma County Agricultural Preservation and Open Space District holds a conservation easement that protects the Alpine School Population and a portion of the Saddle/Hayfork Population from development and significant land use changes; the remainder of the Saddle/Hayfork Population is on land owned and managed by the Sonoma County Agricultural Preservation and Open Space District. The Bothe Population is owned and managed by the California Department of Parks and Recreation as Bothe-Napa Valley State Park, and it is also protected from development and significant land use changes.

Regulatory and Listing Status

Some state and federal environmental laws apply to activities undertaken in California that may provide some level of protection for Clara Hunt's milkvetch and its habitat. In addition, non-regulatory rare plant rankings may provide some protection through public awareness and impact disclosure and avoidance during project planning. The following is not an exhaustive list.

Federal Endangered Species Act

In 1997 the United States Fish and Wildlife Service (USFWS) designated Clara Hunt's milkvetch an endangered species under the federal Endangered Species Act. USFWS has not designated critical habitat for Clara Hunt's milkvetch. The federal Endangered Species Act provides limited regulatory protections for threatened and endangered plants growing on non-federal lands.

California Endangered Species Act

Clara Hunt's milkvetch was designated a threatened species under CESA in 1990. CESA prohibits the import, export, take, possession, purchase, or sale of Clara Hunt's milkvetch, or any part or product of Clara Hunt's milkvetch, except as otherwise provided by the Native Plant Protection Act, California Desert Native Plants Act, or Fish and Game Code, such as through a permit or agreement issued by the Department under the authority of the Fish and Game Code (Fish & G. Code, § 2080 *et seq.*). For example, the Department may issue permits that authorize the incidental take of listed and candidate species if the take is incidental to an otherwise lawful activity, impacts of the authorized take are minimized and fully mitigated, the activity will not jeopardize the continued existence of the species, and other conditions are met (Fish & G. Code, § 2081, subd. (b).). The Department may also authorize the take and possession of Clara Hunt's milkvetch for scientific, educational, or management purposes (Fish & G. Code, § 2081, subd. (a).).

California Environmental Quality Act

State and local agencies must conduct environmental review under the California Environmental Quality Act (CEQA) for discretionary projects proposed to be carried out or approved by the public agency unless the agency properly determines the project is exempt from CEQA (Pub. Resources Code, § 21080). If a project has the potential to substantially reduce the habitat, decrease the number, or restrict the range of any rare, threatened, or endangered species, the lead agency must make a finding that the project will have a significant effect on the environment and prepare an environmental impact report (EIR) or mitigated negative declaration as appropriate before proceeding with or approving the project (Cal. Code Regs., tit. 14, §§ 15065(a)(1), 15070, and 15380.). An agency cannot approve or carry out any project for which the EIR identifies one or more significant effects on the environment unless it makes one or more of the following findings: (1) changes have been required in or incorporated into the project that avoid the significant environmental effects or mitigate them to a less than significant level; (2) those changes are in the responsibility and jurisdiction of another agency and have been, or can and should be, adopted by that other agency; or (3) specific economic, legal, social, technological, or other considerations make infeasible the mitigation measures or alternatives identified in the environmental impact report (Pub. Resources Code, § 21081; Cal. Code Regs., tit. 14, §§ 15091 and 15093.). For (3), the agency must make a statement of overriding considerations finding that the overriding benefits of the project outweigh the significant effects on the environment. CEQA establishes a duty for public agencies to avoid or minimize such significant effects where feasible (Cal. Code Regs., tit. 14, § 15021.). Impacts to Clara Hunt's milkvetch, as a CESA-threatened species, must be identified, evaluated, disclosed, and avoided or mitigated under the Biological Resources section of an environmental document prepared pursuant to CEQA.

Natural Heritage Program Ranking

All natural heritage programs, such as the CNDDDB, use the same ranking methodology originally developed by The Nature Conservancy and now maintained by NatureServe (2012). This ranking methodology consists of a global rank describing the rank for a given taxon over its entire distribution, and a state rank describing the rank for the taxon over its state distribution. Both global and state ranks reflect a combination of rarity, threat, and trend factors. Clara Hunt's milkvetch has been assigned a global rank of G1 and a state rank of S1, indicating that the species is critically imperiled both within California and globally, with a very high risk of extinction due to extreme rarity, very steep declines, or other factors. Natural heritage ranking does not provide any regulatory protections, but is often considered during the CEQA process.

California Rare Plant Rank

The Department works in collaboration with the California Native Plant Society and botanical experts throughout the state to assign rare and endangered plants a California Rare Plant Rank reflective of their status. Clara Hunt's milkvetch has been assigned a California Rare Plant Rank of 1B.1. Plants with a California Rare Plant Rank of 1B are rare throughout their range and most of them are endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century. The threat code extension of ".1" indicates that the species is seriously threatened in California, with over 80 percent of occurrences threatened or a high degree and immediacy of threat. California Rare Plant Ranking does not provide any regulatory protection, but is often considered during the CEQA process.

SCIENTIFIC DETERMINATIONS REGARDING THE STATUS OF CLARA HUNT'S MILKVETCH IN CALIFORNIA

The preceding sections of this Status Review describe the best scientific information available to the Department, with respect to the key factors identified in the regulations. The section below considers the significance of any threat to the continued existence of Clara Hunt's milkvetch for each of the factors.

Present or Threatened Modification or Destruction of Habitat

The six known populations of Clara Hunt's milkvetch are all threatened to some degree by present or threatened modification or destruction of habitat. This modification or destruction of habitat could occur as a result of ongoing land use, changes in land use, or development at Clara Hunt's milkvetch populations. Climate change, invasive plants, and/or vegetation community succession could also contribute to this modification or destruction of Clara Hunt's milkvetch habitat.

Ongoing use of land is a significant threat at the Lake Hennessey Population because the property is used for power transmission, water storage at Lake Hennessey, and recreation. The current recreational use at the Lake Hennessey Population, as well as the maintenance activities at the site, are immediate and ongoing threats to the population, particularly because available information suggests that the Lake Hennessey Population has declined since the Department's 1989 status review, and since Clara Hunt's milkvetch was first listed in 1991.

The Alpine School, Lewelling Lane, Taplin Road and most of the Saddle/Hayfork populations are on private property and continue to be vulnerable to changes in land use and other landowner activities. Land use activities on private property such as improper domestic animal grazing regimes, equipment use, trampling, or other unforeseen activities could occur at any time, and could damage populations or habitat. Education and outreach to landowners may reduce the degree and immediacy of the threat from changes in land use and other landowner activities, but these activities nevertheless continue to threaten the Alpine School, Lewelling Lane, Taplin Road, and most of the Saddle/Hayfork populations of Clara Hunt's milkvetch.

Protections at the Bothe Population, Alpine School Population and the Saddle/Hayfork Population provide protection from development, and therefore the threat of proposed development at these populations is not considered significant. The Department is not aware of any development projects proposed at the Taplin Road or Lewelling Lane populations at this time, so the Department does not consider development of these populations to be an immediate threat, but development could still be proposed in the future. Development therefore remains a significant potential threat to the Taplin Road and Lewelling Lane populations of Clara Hunt's milkvetch.

Due to the small number of Clara Hunt's milkvetch individuals and the presence of only six or fewer small Clara Hunt's milkvetch populations, the loss of any Clara Hunt's milkvetch population, or the loss of a significant portion of a Clara Hunt's milkvetch population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range. The Department considers modification or destruction of habitat to be a significant threat to the continued existence of Clara Hunt's milkvetch.

Overexploitation

Clara Hunt's milkvetch is not threatened by overexploitation. The species is not known to be in the nursery trade, nor is the Department aware of any other use of the species by humans. As a threatened plant species under CESA, possession of Clara Hunt's milkvetch is unlawful without a permit from the Department. The Department does not consider overexploitation to be a significant threat to the continued existence of Clara Hunt's milkvetch.

Predation

All six populations may be threatened to some degree by herbivory and predation, but more information on this potential threat is needed. The degree and immediacy of threats from herbivory and predation are not currently known. The Department does not know whether or not herbivory and predation are significant factors affecting the ability of Clara Hunt's milkvetch populations to survive and reproduce.

Competition

Invasive plants are present at all Clara Hunt's milkvetch populations and pose an immediate and ongoing threat to the species throughout its range, particularly in situations where an organic thatch layer is allowed to accumulate.

The Bothe, Alpine School, and perhaps other populations are also threatened by vegetation community succession, which may be a result of reduced fire frequencies. Vegetation community succession appears to have already had a significant adverse effect on the Bothe Population, and the population may now be extirpated or may only exist in the soil seed bank.

The Department considers competition with other plants to be a significant threat to the continued existence of Clara Hunt's milkvetch.

Disease

The Department does not have any information on diseases or parasites affecting Clara Hunt's milkvetch. The Department does not consider disease or parasites to be a significant threat to the continued existence of Clara Hunt's milkvetch.

Other Natural Occurrences or Human-related Activities

The inherent vulnerability of small populations is a significant and immediate and ongoing threat to all Clara Hunt's milkvetch populations. Clara Hunt's milkvetch occurs in such low numbers over such small geographical areas, that even localized accidents and chance events could lead to the extirpation of a population or could have severe and long-lasting negative effects on the ability of the species to survive and reproduce. Due to the small number of Clara Hunt's milkvetch individuals and the presence of only six or fewer small Clara Hunt's milkvetch populations, the loss of any Clara Hunt's milkvetch population, or the loss of a significant portion of a Clara Hunt's milkvetch population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range.

In addition, the climate of California is certain to change due to global climate change. By 2050, climate change is likely to have affected Clara Hunt's milkvetch abundance and/or range extent, particularly if conditions in Clara Hunt's milkvetch habitat become more favorable for invasive

plant species such as cheat grass. Climate change is a factor that may influence Clara Hunt's milkvetch's ability to survive and reproduce, but the relative impact that climate change will have on Clara Hunt's milkvetch populations in the future is unknown.

SUMMARY OF KEY FINDINGS

Clara Hunt's milkvetch is a very rare species that is only known from six small populations in Napa and Sonoma counties near St. Helena. The species is generally found in oak woodlands, in sparsely vegetated openings without significant shrub or tree overstory. The species appears to be adapted to poor quality, acidic soils that may limit competition from other plants.

Clara Hunt's milkvetch has received little conservation attention since initial studies were conducted on the species in the early 1990s. Despite a lack of consistent monitoring and limitations in available data, sufficient information is available to suggest that since the Department's 1989 status review, and since the species was first listed in 1991, one of the six populations has declined and another population may be extirpated or only exist in the soil seed bank. The apparent disappearance of one of the six populations is especially concerning because the population is on land protected and managed by the California Department of Parks and Recreation, demonstrating that passive protection of Clara Hunt's milkvetch populations from human-related threats may not be sufficient to ensure the continued existence of the species. Preventing the extinction of Clara Hunt's milkvetch will likely therefore require ongoing monitoring, scientific investigation, and active management.

Clara Hunt's milkvetch continues to be at risk from threatened modification or destruction of habitat, and stochastic (chance) extinction events due to small population size, invasive plants, vegetation community succession, and possibly climate change, herbivory, and predation. Clara Hunt's milkvetch occurs in such low numbers over such small geographical areas, that even localized accidents and chance events could lead to the extirpation of a population or could have severe and long-lasting negative effects on the ability of the species to survive and reproduce. Due to the small number of Clara Hunt's milkvetch individuals and the presence of only six or fewer small Clara Hunt's milkvetch populations, the loss of any Clara Hunt's milkvetch population, or the loss of a significant portion of a Clara Hunt's milkvetch population would represent the loss of a significant portion of Clara Hunt's milkvetch's total range. The best scientific information available to the Department indicates that Clara Hunt's milkvetch is in serious danger of extinction in all or a significant portion of its range due to one or more causes.

RECOMMENDATION FOR THE COMMISSION

CESA requires the Department to prepare this report regarding the status of Clara Hunt's milkvetch in California based upon the best scientific information available to the Department (Fish & G. Code, § 2074.6). CESA also requires the Department to indicate in this Status Review whether the petitioned action is warranted (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f)). Based on the criteria described above, the best scientific information available to the Department indicates that Clara Hunt's milkvetch is in serious danger of becoming extinct in all or a significant portion of its range due to one or more causes including present or threatened degradation and loss of habitat, competition, and other natural occurrences and human-related activities.

The Department recommends that the Commission find the petitioned action to list Clara Hunt's milkvetch as an endangered species to be warranted.

MANAGEMENT RECOMMENDATIONS AND RECOVERY MEASURES

CESA directs the Department to include in its Status Review recommended management activities and other recommendations for recovery of Clara Hunt's milkvetch (Fish & G. Code, § 2074.6; Cal. Code Regs., tit. 14, § 670.1, subd. (f).). Department staff generated the following list of recommended management actions and recovery measures based on considerations from federal agencies, researchers, non-profit organizations, and other interested parties. The following list is not a detailed conservation strategy for Clara Hunt's milkvetch; however, it outlines major components of a plan to prevent the extinction of the species. The Department recommends that the following actions be conducted in coordination with private landowners, the California Department of Parks and Recreation, the Sonoma County Agricultural Preservation and Open Space District, the City of Napa, USFWS, and researchers and other partners, consistent with California's goals of preventing the extinction of rare, threatened, and endangered species.

- Convene a working group or recovery team to complete and implement a recovery plan for Clara Hunt's milkvetch in collaboration with USFWS.
- Implement censusing, demographic monitoring, and soil seed bank analyses of all Clara Hunt's milkvetch populations.
- Assess the response of Clara Hunt's milkvetch populations to the 2020 Glass Fire.
- Determine the most effective management techniques for controlling invasive vegetation and maintaining Clara Hunt's milkvetch habitat via scientific research and/or adaptive management.
- Protect the Lake Hennessey, Lewelling Lane, and Taplin Road populations from habitat elimination and degradation so that all remaining populations of Clara Hunt's milkvetch are protected, and the habitat that is essential for the continued existence of the species is preserved.
- Develop a habitat suitability model for Clara Hunt's milkvetch, and search for additional populations.
- Continue collaboration with the Sonoma County Agricultural Preservation and Open Space District on implementation of an experimental controlled burn and grassland species composition monitoring at and adjacent to the Saddle/Hayfork Population.
- Implement an experimental low-intensity controlled understory burn or vegetation clearing at the Bothe Population in collaboration with the California Department of Parks and Recreation and the California Department of Forestry and Fire Protection. Investigate whether low-intensity controlled understory fire is an appropriate management technique for maintaining Clara Hunt's milkvetch habitat, and what would be the optimal fire-return interval.
- If habitat manipulation efforts at the Bothe Population do not result in growth and reproduction of the species, implement a species reintroduction project at Bothe-Napa Valley State Park.
- Investigate ways to reduce impacts from recreational use, invasive species, ongoing management activities, and remnant topsoil piles at the Lake Hennessey Population in collaboration with the City of Napa.

- Work with landowners to ensure that impacts to Clara Hunt's milkvetch populations on private property are avoided in the future, and explore possible landowner incentives for ongoing habitat protection and management.
- Request that California Botanic Garden conduct seed viability tests on the Clara Hunt's milkvetch seed collected in 2009, and collect additional Clara Hunt's milkvetch seed from wild populations, if necessary. Collect seeds for long-term conservation storage from the Saddle/Hayfork Population, and from the Bothe Population if plants are rediscovered there. Investigate whether any herbarium vouchers contain viable seeds.
- Determine the genetic variability in the remaining Clara Hunt's milkvetch populations, as necessary, to inform future conservation actions.
- Conduct other research, as necessary, to inform future conservation actions.

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APPENDIX A: Comments from Affected and Interested Parties on the Petitioned Action



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



August 6, 2020

Dear Honorable Tribal Representative:

NOTIFICATION OF STATUS REVIEW FOR CLARA HUNT'S MILKVETCH

The California Department of Fish and Wildlife (Department) has initiated a status review of Clara Hunt's milkvetch (*Astragalus claranus*) pursuant to Fish and Game Code section 2074.6, and is providing this notice pursuant to Fish and Game Code section 2074.4, and the Department's Tribal Communication and Consultation Policy to solicit data and comments on the petitioned action from interested and affected parties. The Department is committed to open communication with your Tribe under its Tribal Communication and Consultation Policy, which is available through the Department's Tribal Affairs webpage at <https://www.wildlife.ca.gov/General-Counsel/Tribal-Affairs>.

The Department has initiated the Clara Hunt's milkvetch status review following related action by the Fish and Game Commission (Commission), having provided notice on March 3, 2020, designating Clara Hunt's milkvetch a candidate for endangered status under the California Endangered Species Act (Cal. Reg. Notice Register 2020, No. 11-Z, p. 421; Fish & G. Code, § 2074.2). As a candidate species, Clara Hunt's milkvetch receives the same legal protection afforded to an endangered or threatened species (Fish & G. Code, § 2085). The Department's five-year species review of Clara Hunt's milkvetch is available at: <https://fgc.ca.gov/CESA#chm>.

The Department has 12 months to evaluate the available information, and report back to the Commission whether the petitioned action is warranted (Fish & G. Code, § 2074.6). The Department's recommendation must be based on the best scientific information available to the Department.

We are providing a map showing the locations of the Clara Hunt's milkvetch populations, which occur in the vicinity of Saint Helena. They are located within Napa and Sonoma Counties, and the following USGS 7.5-minute quadrangles: Calistoga, Kenwood, Rutherford, and Saint Helena.

Anyone with data or comments on Clara Hunt's Milkvetch population trend, range, distribution, abundance, life history, threats to its reproduction or survival, the adequacy of existing management, management recommendations, or other factors related to the status of Clara Hunt's milkvetch is hereby requested to provide such data or comments to the Department. Submission of written comments or data related to the petitioned action via email is preferred. Email may be directed to the Department's contact, Jeb

Tribal Representative
Notification of Status Review for Clara Hunt's Milkvetch
August 6, 2020
Page 2

Bjerke, at jeb.bjerke@wildlife.ca.gov and include "Clara Hunt's milkvetch" in the subject line. Comments may also be submitted by mail, addressed to:

California Department of Fish and Wildlife
Habitat Conservation Planning Branch
Attn: Jeb Bjerke
P.O. Box 944209
Sacramento, CA 94244-2090

To ensure that the Department has adequate time to evaluate data and comments and incorporate them, as appropriate, into its final report to the Commission, the Department is requesting that all comments be submitted by September 7, 2020. The Department will evaluate data and comments received after that date to the extent possible. The Department's written report will indicate, based on the best scientific information available, whether the Department concludes that the petitioned action is warranted or not warranted. Receipt of the status review report will be placed on the agenda for the next available Commission meeting after delivery. The report will be made available to the public at that time. Following receipt of the Department's report, the Commission will allow a 30-day public comment period prior to taking any action on the Department's recommendation.

If you have any questions, please contact Jeb Bjerke via e-mail. If you would like to initiate consultation with the Department concerning the status review for Clara Hunt's milkvetch, please contact the Department's Tribal Liaison, Nathan Voegeli, via email at tribal.liaison@wildlife.ca.gov or by mail addressed to:

California Department of Fish and Wildlife
Attn: Nathan Voegeli, Tribal Liaison
P.O. Box 944209
Sacramento, CA 94244-2090

Please designate and provide contact information for the appropriate Tribal lead person.

We look forward to your response and input on the Clara Hunt's milkvetch status review.

Sincerely,

DocuSigned by:



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Jeff Drongesen, Chief
Habitat Conservation Planning Branch

Tribal Representative
Notification of Status Review for Clara Hunt's Milkvetch
August 6, 2020
Page 3

Enclosure

Map of Clara Hunt's milkvetch distribution

cc: California Department of Fish and Wildlife

Nathan Voegeli, Tribal Liaison
tribal.liaison@wildlife.ca.gov

Isabel Baer, Native Plant Program Manager
Habitat Conservation Planning Branch
isabel.baer@wildlife.ca.gov

Jeb Bjerke, Senior Environmental Scientist
Habitat Conservation Planning Branch
jeb.bjerke@wildlife.ca.gov



YOCHA DEHE
CULTURAL RESOURCES

August 17, 2020

California Department of Fish and Wildlife
Attn: Nathan Voegeli, Tribal Liaison
P.O. Box 944209
Sacramento, CA 94244

RE: Clara Hunts Milkvetch Status Review YD-08112020-03

Dear Mr. Voegeli:

Thank you for your project notification letter dated, August 6, 2020, regarding cultural information on or near the proposed Clara Hunts Milkvetch Status Review, Napa/Sonoma County. We appreciate your effort to contact us.

The Cultural Resources Department has reviewed the project and concluded that it is not within the aboriginal territories of the Yocha Dehe Wintun Nation. Therefore, we respectfully decline any comment on this project. However, based on the information provided, please defer correspondence to the following:

Middletown Rancheria
Attn: THPO
PO Box 1035
Middletown, CA 95461

Please refer to identification number YD - 08112020-03 in any future correspondence with Yocha Dehe Wintun Nation concerning this project.

Thank you for providing us with this notice and the opportunity to comment.

Sincerely,

Isaac Bojorquez
Director of Cultural Resources

cc: Middletown Rancheria



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



Date: July 8, 2020

SUBJECT: NOTIFICATION OF STATUS REVIEW FOR CLARA HUNT'S MILKVETCH

To whom it may concern:

The California Department of Fish and Wildlife (Department) has initiated a status review of the rare plant Clara Hunt's milkvetch (*Astragalus claranus*) pursuant to Fish and Game Code section 2074.6, and is providing this notice pursuant to Fish and Game Code section 2074.4 to solicit data and comments on the petitioned action from interested and affected parties. Clara Hunt's milkvetch is currently listed as a threatened species under the California Endangered Species Act (CESA) (Cal. Code Regs. tit. 14 § 670.2, subd. (b)(6)(A)).

The Department has initiated the Clara Hunt's milkvetch status review following related action by the Fish and Game Commission (Commission), having provided notice on March 13, 2020, designating Clara Hunt's milkvetch as a candidate for endangered species status under the California Endangered Species Act (CESA) (Cal. Reg. Notice Register 2020, No. 11-Z, p. 421; Fish & G. Code, § 2074.2). The Department's five-year species review of Clara Hunt's milkvetch is available at: <https://fgc.ca.gov/CESA#chm>.

The Department has 12 months to evaluate the available information, and report back to the Commission whether the petitioned action is warranted (Fish & G. Code, § 2074.6). The Department's recommendation must be based on the best scientific information available to the Department.

The provisions of CESA continue to apply to Clara Hunt's milkvetch as both a threatened species and as a candidate for endangered status (Fish & G. Code, § 2080; Fish & G. Code, § 2085). Under CESA, it is illegal to import, export, "take", possess, purchase, sell, or attempt to do any of those actions to species that are designated as threatened, endangered, or candidates for listing, unless authorized by permit by the Department. "Take" is defined in the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

Anyone with data or who would like to provide comments regarding Clara Hunt's milkvetch population trend, range, distribution, abundance, life history, threats to its reproduction or survival, the adequacy of existing management, management recommendations, or other factors related to the status of Clara Hunt's milkvetch is hereby requested to provide such data or comments to the Department.

Notification of Status
Clara Hunt's Milkvetch
Date: July 8, 2020
Page 2

Submission of written comments or data related to the petitioned action via email is preferred. Email may be directed to the Department's contact, Jeb Bjerke, at jeb.bjerke@wildlife.ca.gov and include "Clara Hunt's milkvetch" in the subject line. Comments may also be submitted by mail, addressed to:

California Department of Fish and Wildlife
Habitat Conservation Planning Branch
Attn: Jeb Bjerke
P.O. Box 944209
Sacramento, CA 94244-2090

To ensure that the Department has adequate time to evaluate data and comments and incorporate them, as appropriate, into its final report to the Commission, the Department is requesting that all comments be submitted by August 14, 2020. The Department will evaluate data and comments received after that date to the extent possible. The Department's written report will indicate, based on the best scientific information available, whether the Department concludes that the action to list Clara Hunt's milkvetch as endangered is warranted or not warranted. Receipt of the status review report will be placed on the agenda for the next available Commission meeting after delivery. The report will be made available to the public at that time. Following receipt of the Department's report, the Commission will allow a 30-day public comment period prior to taking any action on the Department's recommendation.

If you have any questions regarding this notice, please contact Jeb Bjerke

APPENDIX B: Comments from Peer Reviewers on the Clara Hunt's Milkvetch Status Review Report



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Habitat Conservation Planning Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



November 20, 2020

Monica Delmartini
Sonoma County Ag + Open Space
747 Mendocino Avenue, Suite 100
Santa Rosa, CA 95401
Monica.Delmartini@sonoma-county.org

Dear Monica Delmartini:

Status Review of Clara Hunt's Milkvetch (*Astragalus claranus*); California Department of Fish and Wildlife, Peer Review

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of Clara Hunt's milkvetch (*Astragalus claranus*) (Status Review). Please review the peer review draft of the Department's Status Review, dated November 20, 2020, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the Status Review and its assessment of the status of Clara Hunt's milkvetch in California. **The Department would appreciate receiving your peer review comments on or before December 21, 2020.**

Clara Hunt's milkvetch was designated a threatened species under the California Endangered Species Act (CESA) in January of 1991. On November 18, 2019, the California Fish and Game Commission received a five-year species review on Clara Hunt's milkvetch from the Department that recommended up-listing the species from threatened to endangered status. On March 13, 2020, the Commission published findings formally designating Clara Hunt's milkvetch as a candidate species for endangered status under CESA. Clara Hunt's milkvetch is currently protected under CESA as a threatened species and as a candidate for endangered status.

The Department seeks your scientific peer review as part of formal proceedings pending before the Commission under CESA. The Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to list species as endangered or threatened (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, charged by the Fish and Game Code to provide a report to the Commission based on the best scientific information available indicating whether recommendations to list species are warranted and recommending actions for recovery of those species (Fish & G. Code, § 2074.6).

Monica Delmartini
November 20, 2020
Page 2

The peer review draft of the Department's Status Review forwarded to you today reflects the Department's effort to identify and analyze the best scientific information available regarding the status of Clara Hunt's milkvetch in California. At this time, the Department believes that the best available science indicates that listing the species as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our expected recommendation to the Commission at this point may change following peer review input.

We ask you to focus your peer review on the best scientific information available regarding the status of Clara Hunt's milkvetch in California. As with our own effort to date, your peer review of the science and analysis regarding each of the population and life history categories prescribed in CESA are particularly important (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) as well as whether the information indicates, in your opinion, that Clara Hunt's milkvetch is at serious risk of becoming extinct throughout all or a significant portion of its range in California, or whether the species is likely to become so in California in the foreseeable future. Please note that the Department releases this Status Review to you solely as part of the peer review process, and it is not yet public.

A PDF version of the Status Review is included with this letter. For ease of review, and so we may respond to your comments individually, please submit your comments in list form by page and line number. Please submit your comments electronically to Jeb Bjerke, Senior Environmental Scientist (Specialist) at jeb.bjerke@wildlife.ca.gov. Jeb Bjerke may also be reached at (916) 720-1232. If there is anything the Department can do to facilitate your review, please let us know.

Following receipt and consideration of peer review comments, the Department will prepare and submit its final Status Review and related recommendation to the Commission. Your comments will be included in an appendix to the Department's Status Review and the Department will respond in writing to the peer review comments. After a minimum 30-day public review period and prior to making their decision, the Commission will consider: the Department's recommendation to list Clara Hunt's milkvetch, the Department's Status Review with peer review comments, and public testimony received during a regularly scheduled Commission meeting.

Monica Delmartini
November 20, 2020
Page 3

Thank you again for your contribution to the Status Review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

DocuSigned by:

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Jeff Drongesen, Branch Chief
Habitat Conservation Planning Branch

Enclosures

cc: California Department of Fish and Wildlife

Chad Dibble, Deputy Director
Ecosystem Conservation Division
chad.dibble@wildlife.ca.gov

Isabel Baer, Program Manager
Native Plant Program
Habitat Conservation Planning Branch
isabel.baer@wildlife.ca.gov

Jeb Bjerke, Senior Environmental Scientist (Specialist)
Native Plant Program
Habitat Conservation Planning Branch
jeb.bjerke@wildlife.ca.gov

Clara Hunt's milk vetch status review comments

- Page 10, lines 23-27: Is it confirmed that Rob Evans' pre-2019 observations included plants outside of the areas surveyed in 2019/2020? We can confirm that the full past-known extent of the portion of the population on the Saddle Mountain property was surveyed in the past two years, but uncertain whether Mr. Evans observed plants outside of the recent survey areas on the Hayfork property.
- Page 10, lines 26-27: We can confirm that the past known extent of the population on the Saddle Mountain property extends further southeast of the recently mapped area (the full extent having been surveyed but plants only found and mapped within the roadbed). Plants have not been observed in the area beyond the roadbed for at least the past three years.
- Page 11, lines 9-10: This level of detail may be consistent with the definition of "somewhat synchronous," but we've observed variation in bloom time of 3-4 weeks within a single population.
- Page 12, line 34 through page 14, line 16: These are excellent observations and are consistent with what we've observed for the Saddle/Hayfork population, in which patches of ASCL are strongly associated with *Microcarpus californicus*, *Lasthenia californica*, *Sanicula bipinnatifida*, *Trifolium depauperatum*, and individual ASCL plants are not shaded by adjacent grasses or forbs.
- Page 17, lines 30-31: Monitoring efforts prior to 2019 have been focused on the portion of the population that lies on the Saddle Mountain property and an approximately one-acre portion of the Hayfork property that lies directly adjacent.
- Page 17, line 34: Additional information for this section: the portion of this population that lies on the Saddle Mountain property has shrunk significantly in extent since 2008, with monitoring in 2017-2020 only documenting plants within the roadbed immediately adjacent to the property boundary. Previously, as observed between 2008-2016 this patch extended approximately 0.25 acres into the adjacent grassland on the Saddle Mountain property. We surmise that increased competition and suppression by dense grasses and accumulated thatch, along with associated increasing density of invasive medusahead (*Elymus caput-medusae*) in this ungrazed grassland has resulted in loss of viable habitat for ASCL. The Hayfork property has been lightly grazed by a small number of horses and cows for approximately the past 30 years; this property's grasslands overall appear to contain less medusahead and less thatch buildup and support a much more robust number of ASCL plants at non-roadbed sites.
- Page 18, line 24: Suggest qualifying statement regarding domestic animal grazing as a factor in habitat degradation. Cessation of grazing effectively eliminates disturbance in grasslands (unless they are burned at intervals), and some level of disturbance may be necessary for maintenance of ASCL habitat, particularly in the face of increasing pressure from invasive non-native grassland species. Observations of the Saddle/Hayfork population suggest that low-intensity grazing may support ASCL habitat and complete grazing exclusion may result in habitat degradation. Seasonality of grazing as well as stocking rates are likely key.
- Page 20, lines 3-5: The Hayfork Conservation Easement does not contain affirmative requirements to conduct habitat restoration or enhancement activities. Thus, while the easement does prevent subdivision, development, and major land use changes, it does not ensure proactive ecological land management or remove all potential impacts to the ASCL population. In short, the easement is a big help but doesn't provide the same level of robust

protection that land ownership and management by a public or private conservation entity would ensure.

- Page 20, line 6: Same comment as for page 18 above regarding reference to domestic animal grazing
- Page 21, lines 32-34: It may be worth also noting that medusahead produces a thatch layer that is rich in silica and resistant to decay, and thus is of particular concern due to its ability to build up and suppress native seed germination. Medusahead encroachment is currently the most urgent invasive species concern for the Saddle/Hayfork population.
- Page 21, lines 34-37: The Saddle/Hayfork population is also being increasingly invaded by bearded creeper (*Crupina vulgaris*)
- Page 24, lines 33-34: A portion of Sonoma County is also Wappo ancestral land, including the area where the Saddle/Hayfork ASCL population occurs.
- Page 25, line 12: The Glass Fire perimeter cuts through the Hayfork part of the Saddle/Hayfork population, with a small portion of the Hayfork population outside of the burned area.
- Page 16: Recommend “low to moderate intensity fires” or “lower intensity” (to differentiate from high intensity) as this more accurately captures likely fire behavior in both grasslands and oak woodlands and both can reduce competition and improve habitat conditions for certain species.
- Page 25, line 17: Just noting that high-intensity fire is an unlikely scenario in grassland habitats, where relatively low fuel loads and flashy fuels typically result in fast-moving, moderate-intensity fire with very low residence time. However, spatially limited areas of high-intensity fire are possible if a grassland contains fuel jackpots such as downed trees or brush piles, and these areas can see significant impacts to soil structure and chemistry and seedbank viability. Likewise, high-intensity fire is rare in oak woodland habitats unless they are significantly invaded by woody species like Douglas fir. (Oak woodlands that burned in the October 2017 fire complex, the 2019 Kincadee fire, and the 2020 Glass Fire and Walbridge Fire generally showed low to moderate-severity first-order fire effects, and second-order fire effects observed to date do not indicate significant type conversion in these areas). Seasonality of fires may be a factor for ASCL and this may be worth noting – wildfires typically occur in summer/fall, while prescribed burning for habitat enhancement often occurs in spring, and one or the other may prove to be more optimal, or more impactful, for ASCL.
- Page 25, lines 24-26: ongoing monitoring will also occur for both the ASCL population and broader fire effects for the Saddle/Hayfork population. For this population, reduction in thatch and competing grassland species density and effects on invasive species will likely be the most significant factors, rather than successional reset.
- Page 26, lines 11-12: Very minor point, but the Saddle Mountain mgt. plan was in development for several years prior to 2019, and finalized in October 2019, rather than “early 2019.”
- Page 26, line 40: Recommend editing to “...Population from development and significant land use changes; the remainder of the Saddle/Hayfork Population is on land owned and managed by the Sonoma County Agricultural Preservation and Open Space District.”
- Page 29, line 13: this sentence makes reference to the conservation easement over the privately owned portion of the Saddle/Hayfork population as a protection against development. However, the County designation of the Saddle Mountain Preserve as open space also provides

this protection to the portion on Ag & Open Space land, so it would be more accurate to drop the “most of” and simply refer to the entire population here.

- Page 32, line 14: Recommend editing to “...Space District on implementation of an experimental controlled burn and grassland species composition monitoring at and adjacent to...”
- Page 32, lines 19-20: Recommend editing to “...Investigate whether low-intensity controlled understory fire is an appropriate management technique for maintaining Clara Hunt’s milkvetch habitat, and what the optimal fire-return interval would be for re-entry burning.”

Peer Review Comments from Monica Delmartini on Clara Hunt's Milkvetch (*Astragalus claranus*) Status Review and California Department of Fish and Wildlife Responses

Page	Line	Reviewer Comment	Department Response
10	23-27	Is it confirmed that Rob Evans' pre-2019 observations included plants outside of the areas surveyed in 2019/2020? We can confirm that the full past-known extent of the portion of the population on the Saddle Mountain property was surveyed in the past two years, but uncertain whether Mr. Evans observed plants outside of the recent survey areas on the Hayfork property.	Communication with Rob Evans during site visits suggested that Clara Hunt's milkvetch plants were only observed further southeast of the 2019 and 2020 mapped areas, as is stated in the following peer review comment. Text updated to clarify. Pers. comm. reference added to the document.
10	26-27	We can confirm that the past known extent of the population on the Saddle Mountain property extends further southeast of the recently mapped area (the full extent having been surveyed but plants only found and mapped within the roadbed). Plants have not been observed in the area beyond the roadbed for at least the past three years.	Communication with Rob Evans during site visits suggested that Clara Hunt's milkvetch plants were only observed further southeast of the 2019 and 2020 mapped areas, as is stated in this peer review comment. Text updated to clarify. Pers. comm. reference added to the document.
11	9-10	This level of detail may be consistent with the definition of "somewhat synchronous," but we've observed variation in bloom time of 3-4 weeks within a single population.	Sentence added.
12-14	34-16	These are excellent observations and are consistent with what we've observed for the Saddle/Hayfork population, in which patches of ASCL are strongly associated with <i>Microcarpus californicus</i> , <i>Lasthenia californica</i> , <i>Sanicula bipinnatifida</i> , <i>Trifolium depauperatum</i> , and individual ASCL plants are not shaded by adjacent grasses or forbs.	Additional information added.

Page	Line	Reviewer Comment	Department Response
17	30-31	Monitoring efforts prior to 2019 have been focused on the portion of the population that lies on the Saddle Mountain property and an approximately one-acre portion of the Hayfork property that lies directly adjacent.	Text updated.
17	34	<p>Additional information for this section: the portion of this population that lies on the Saddle Mountain property has shrunk significantly in extent since 2008, with monitoring in 2017-2020 only documenting plants within the roadbed immediately adjacent to the property boundary. Previously, as observed between 2008-2016 this patch extended approximately 0.25 acres into the adjacent grassland on the Saddle Mountain property. We surmise that increased competition and suppression by dense grasses and accumulated thatch, along with associated increasing density of invasive medusahead (<i>Elymus caput-medusae</i>) in this ungrazed grassland has resulted in loss of viable habitat for ASCL. The Hayfork property has been lightly grazed by a small number of horses and cows for approximately the past 30 years; this property's grasslands overall appear to contain less medusahead and less thatch buildup and support a much more robust number of ASCL plants at non-roadbed sites.</p>	Text update. Some text from this comment was added to the "Invasive Plants" section of the status review.

Page	Line	Reviewer Comment	Department Response
18	24	<p>Suggest qualifying statement regarding domestic animal grazing as a factor in habitat degradation. Cessation of grazing effectively eliminates disturbance in grasslands (unless they are burned at intervals), and some level of disturbance may be necessary for maintenance of ASCL habitat, particularly in the face of increasing pressure from invasive non-native grassland species.</p> <p>Observations of the Saddle/Hayfork population suggest that low-intensity grazing may support ASCL habitat and complete grazing exclusion may result in habitat degradation. Seasonality of grazing as well as stocking rates are likely key.</p>	Text updated to “improper domestic animal grazing regimes” in this section. Related text was updated in other sections of the Status Review as well.
20	3-5	The Hayfork Conservation Easement does not contain affirmative requirements to conduct habitat restoration or enhancement activities. Thus, while the easement does prevent subdivision, development, and major land use changes, it does not ensure proactive ecological land management or remove all potential impacts to the ASCL population. In short, the easement is a big help but doesn’t provide the same level of robust protection that land ownership and management by a public or private conservation entity would ensure.	Text updated with additional information about the conservation easement.
20	6	Same comment as for page 18 above regarding reference to domestic animal grazing	Text updated.
21	32-34	It may be worth also noting that medusahead produces a thatch layer that is rich in silica and resistant to decay, and thus is of particular concern due to its ability to build up and suppress native seed germination. Medusahead encroachment is currently the most urgent invasive species concern for the Saddle/Hayfork population.	Text updated.
21	34-37	The Saddle/Hayfork population is also being increasingly invaded by bearded creeper (<i>Crupina vulgaris</i>)	Text updated.

Page	Line	Reviewer Comment	Department Response
24	33-34	A portion of Sonoma County is also Wappo ancestral land, including the area where the Saddle/Hayfork ASCL population occurs.	Text updated.
25	12	The Glass Fire perimeter cuts through the Hayfork part of the Saddle/Hayfork population, with a small portion of the Hayfork population outside of the burned area.	Text updated.
25	16	Recommend “low to moderate intensity fires” or “lower intensity” (to differentiate from high intensity) as this more accurately captures likely fire behavior in both grasslands and oak woodlands and both can reduce competition and improve habitat conditions for certain species.	Text updated.

Page	Line	Reviewer Comment	Department Response
25	17	<p>Just noting that high-intensity fire is an unlikely scenario in grassland habitats, where relatively low fuel loads and flashy fuels typically result in fast-moving, moderate-intensity fire with very low residence time. However, spatially limited areas of high-intensity fire are possible if a grassland contains fuel jackpots such as downed trees or brush piles, and these areas can see significant impacts to soil structure and chemistry and seedbank viability. Likewise, high-intensity fire is rare in oak woodland habitats unless they are significantly invaded by woody species like Douglas fir. (Oak woodlands that burned in the October 2017 fire complex, the 2019 Kincadee fire, and the 2020 Glass Fire and Walbridge Fire generally showed low to moderate-severity first-order fire effects, and second-order fire effects observed to date do not indicate significant type conversion in these areas). Seasonality of fires may be a factor for ASCL and this may be worth noting – wildfires typically occur in summer/fall, while prescribed burning for habitat enhancement often occurs in spring, and one or the other may prove to be more optimal, or more impactful, for ASCL.</p>	<p>Text updated to make it clear that high intensity fire is less likely in grassland and oak woodland habitats.</p>
25	24-26	<p>ongoing monitoring will also occur for both the ASCL population and broader fire effects for the Saddle/Hayfork population. For this population, reduction in thatch and competing grassland species density and effects on invasive species will likely be the most significant factors, rather than successional reset.</p>	<p>Text updated to mention the Saddle/Hayfork population specifically, and discuss possible monitoring of fire effects more generally.</p>
26	11-12	<p>Very minor point, but the Saddle Mountain mgt. plan was in development for several years prior to 2019, and finalized in October 2019, rather than “early 2019.”</p>	<p>Text updated.</p>

Page	Line	Reviewer Comment	Department Response
26	40	Recommend editing to "...Population from development and significant land use changes; the remainder of the Saddle/Hayfork Population is on land owned and managed by the Sonoma County Agricultural Preservation and Open Space District."	Text updated.
29	13	this sentence makes reference to the conservation easement over the privately owned portion of the Saddle/Hayfork population as a protection against development. However, the County designation of the Saddle Mountain Preserve as open space also provides this protection to the portion on Ag & Open Space land, so it would be more accurate to drop the "most of" and simply refer to the entire population here.	Text updated.
32	14	Recommend editing to "...Space District on implementation of an experimental controlled burn and grassland species composition monitoring at and adjacent to..."	Text updated.
32	19-20	Recommend editing to "...Investigate whether low-intensity controlled understory fire is an appropriate management technique for maintaining Clara Hunt's milkvetch habitat, and what the optimal fire-return interval would be for re-entry burning."	Text updated.



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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



November 20, 2020

Dr. Robert E. Preston
980 9th Street, Suite 1200
Sacramento, CA 95814
Robert.Preston@icf.com

Dear Dr. Preston:

Status Review of Clara Hunt's Milkvetch (*Astragalus claranus*); California Department of Fish and Wildlife, Peer Review

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of Clara Hunt's milkvetch (*Astragalus claranus*) (Status Review). Please review the peer review draft of the Department's Status Review, dated November 20, 2020, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the Status Review and its assessment of the status of Clara Hunt's milkvetch in California. **The Department would appreciate receiving your peer review comments on or before December 21, 2020.**

Clara Hunt's milkvetch was designated a threatened species under the California Endangered Species Act (CESA) in January of 1991. On November 18, 2019, the California Fish and Game Commission received a five-year species review on Clara Hunt's milkvetch from the Department that recommended up-listing the species from threatened to endangered status. On March 13, 2020, the Commission published findings formally designating Clara Hunt's milkvetch as a candidate species for endangered status under CESA. Clara Hunt's milkvetch is currently protected under CESA as a threatened species and as a candidate for endangered status.

The Department seeks your scientific peer review as part of formal proceedings pending before the Commission under CESA. The Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to list species as endangered or threatened (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, charged by the Fish and Game Code to provide a report to the Commission based on the best scientific information available indicating whether recommendations to list species are warranted and recommending actions for recovery of those species (Fish & G. Code, § 2074.6).

Dr. Robert E. Preston
November 20, 2020
Page 2

The peer review draft of the Department's Status Review forwarded to you today reflects the Department's effort to identify and analyze the best scientific information available regarding the status of Clara Hunt's milkvetch in California. At this time, the Department believes that the best available science indicates that listing the species as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our expected recommendation to the Commission at this point may change following peer review input.

We ask you to focus your peer review on the best scientific information available regarding the status of Clara Hunt's milkvetch in California. As with our own effort to date, your peer review of the science and analysis regarding each of the population and life history categories prescribed in CESA are particularly important (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) as well as whether the information indicates, in your opinion, that Clara Hunt's milkvetch is at serious risk of becoming extinct throughout all or a significant portion of its range in California, or whether the species is likely to become so in California in the foreseeable future. Please note that the Department releases this Status Review to you solely as part of the peer review process, and it is not yet public.

A PDF version of the Status Review is included with this letter. For ease of review, and so we may respond to your comments individually, please submit your comments in list form by page and line number. Please submit your comments electronically to Jeb Bjerke, Senior Environmental Scientist (Specialist) at jeb.bjerke@wildlife.ca.gov. Jeb Bjerke may also be reached at (916) 720-1232. If there is anything the Department can do to facilitate your review, please let us know.

Following receipt and consideration of peer review comments, the Department will prepare and submit its final Status Review and related recommendation to the Commission. Your comments will be included in an appendix to the Department's Status Review and the Department will respond in writing to the peer review comments. After a minimum 30-day public review period and prior to making their decision, the Commission will consider: the Department's recommendation to list Clara Hunt's milkvetch, the Department's Status Review with peer review comments, and public testimony received during a regularly scheduled Commission meeting.

Dr. Robert E. Preston
November 20, 2020
Page 3

Thank you again for your contribution to the Status Review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

DocuSigned by:

37E732799B3C452...

Jeff Drongesen, Branch Chief
Habitat Conservation Planning Branch

Enclosures

ec: California Department of Fish and Wildlife

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December 18, 2020

Jeff Drongesen, Branch Chief
Habitat Conservation Planning Branch
California Department of Fish & Wildlife
P.O. Box 94244-2090
Sacramento, CA 94244-2090

SUBJECT: Clara Hunt's Milkvetch (*Astragalus claranus*) Status Report Peer Review

Dear Mr. Drongesen,

Thank you for the opportunity to review the "Status Review of Clara Hunt's Milkvetch (*Astragalus claranus*)". I am a botanist and plant ecologist with over 30 years of experience working with threatened and endangered plant species, including surveys, impact analysis, mitigation, habitat conservation planning, and population monitoring. I have written many species accounts for special-status plants for various types of environmental documents, including EIRs, HCPs, and incidental take permits. I am familiar with Clara Hunt's milkvetch from monitoring the Lake Hennessey population during development of PG&E's Bay Area Operations & Maintenance HCP.

In general, the status review is thorough and well-written, and I believe that it accurately describes the best scientific information currently available. The status review provides detailed information on the species' taxonomy, biology, distribution, and habitat parameters, and it summarizes factors affecting the species ability to persist under present circumstances. To the best of my knowledge, this information appears to be complete, and I have no specific information to add. I have only a few comments and suggestions:

- Page 16, lines 23-26: Rather than simply stating that "population trends are difficult to discern", I suggest that a figure showing population numbers over time (as tabulated in Appendix A) would be more effective.
- Page 16, lines 28-30: "plant numbers can fluctuate wildly from year to year depending on environmental conditions" – climatic data is readily available, so has anyone actually looked for a correlation between rainfall and temperature and plant numbers, beyond Ruygt's observations? Or, is this status review strictly a summary of the literature?
- Page 17, lines 43-44: Again, perhaps looking at climatic data may give clues as to why "It is not clear why Clara Hunt' milkvetch germination and survival was high in those years."

- Page 18, lines 3-4: Again, why wasn't this suggestion tested?

I agree with the assessment that low population numbers make this species especially vulnerable to the threats identified in this status review, and it is reasonable to conclude that the species is likely to become extinct in the foreseeable future unless actions are taken to protect and manage the populations. Consequently, I believe that the evidence summarized in this status review demonstrate that Clara Hunt's milkvetch warrants State listing as "endangered."

Sincerely,

A handwritten signature in cursive script that reads "Robert E. Preston".

Robert E. Preston, Ph.D.
Botanist/Wetland Ecologist
ICF
980 9th Street, Suite 1200
Sacramento, CA 95814

Peer Review Comments from Dr. Robert E. Preston on Clara Hunt’s Milkvetch Status Review and California Department of Fish and Wildlife (CDFW) Responses

Page	Line	Reviewer Comment	Department Response
N/A	N/A	<p>Thank you for the opportunity to review the “Status Review of Clara Hunt’s Milkvetch (<i>Astragalus claranus</i>)”. I am a botanist and plant ecologist with over 30 years of experience working with threatened and endangered plant species, including surveys, impact analysis, mitigation, habitat conservation planning, and population monitoring. I have written many species accounts for special-status plants for various types of environmental documents, including EIRs, HCPs, and incidental take permits. I am familiar with Clara Hunt’s milkvetch from monitoring the Lake Hennessey population during development of PG&E’s Bay Area Operations & Maintenance HCP.</p> <p>In general, the status review is thorough and well-written, and I believe that it accurately describes the best scientific information currently available. The status review provides detailed information on the species’ taxonomy, biology, distribution, and habitat parameters, and it summarizes factors affecting the species ability to persist under present circumstances. To the best of my knowledge, this information appears to be complete, and I have no specific information to add. I have only a few comments and suggestions:</p>	No response needed

Page	Line	Reviewer Comment	Department Response
16	23-26	Rather than simply stating that “population trends are difficult to discern”, I suggest that a figure showing population numbers over time (as tabulated in Appendix A) would be more effective.	A new figure that shows population numbers over time was created for the Status Review (Figure 6). Subsequent figures were renumbered.
16	28-30	“plant numbers can fluctuate wildly from year to year depending on environmental conditions” – climatic data is readily available, so has anyone actually looked for a correlation between rainfall and temperature and plant numbers, beyond Ruygt’s observations? Or, is this status review strictly a summary of the literature?	Pursuant to Fish and Game Code section 2074.8, listing of species under the California Endangered Species Act “does not impose any duty or obligation for, or otherwise require, the commission or the department to undertake independent studies or other assessments of any species when reviewing a petition and its attendant documents and comments.”. Although CESA does not require CDFW to conduct independent studies or other assessments, CDFW staff did conduct a brief cursory review of climate data to look for obvious correlations between climate data and the years when the highest number of Clara Hunt’s milkvetch plants were observed. Based on this cursory analysis, CDFW staff were unable to discern any obvious correlations. A more in-depth analysis was beyond the scope of this Status Review. See response to the following comment, below.
17	43-44	Again, perhaps looking at climatic data may give clues as to why “It is not clear why Clara Hunt’ milkvetch germination and survival was high in those years.”	Text updated to state that based on a cursory analysis, CDFW staff were unable to discern any obvious correlations between climate data and these years of relatively high Clara Hunt’s milkvetch germination and survival.
18	3-4	Again, why wasn’t this suggestion tested?	See response to previous comment, above.

Page	Line	Reviewer Comment	Department Response
N/A	N/A	I agree with the assessment that low population numbers make this species especially vulnerable to the threats identified in this status review, and it is reasonable to conclude that the species is likely to become extinct in the foreseeable future unless actions are taken to protect and manage the populations. Consequently, I believe that the evidence summarized in this status review demonstrate that Clara Hunt's milkvetch warrants State listing as "endangered."	No response needed



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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



November 20, 2020

Jake Ruygt
jruygt@comcast.net

Dear Jake Ruygt:

Status Review of Clara Hunt's Milkvetch (*Astragalus claranus*); California Department of Fish and Wildlife, Peer Review

Thank you for agreeing to serve as a scientific peer reviewer for the California Department of Fish and Wildlife (Department) Status Review of Clara Hunt's milkvetch (*Astragalus claranus*) (Status Review). Please review the peer review draft of the Department's Status Review, dated November 20, 2020, that is included with this letter. The Department seeks your expert analysis and input regarding the scientific validity of the Status Review and its assessment of the status of Clara Hunt's milkvetch in California. **The Department would appreciate receiving your peer review comments on or before December 21, 2020.**

Clara Hunt's milkvetch was designated a threatened species under the California Endangered Species Act (CESA) in January of 1991. On November 18, 2019, the California Fish and Game Commission received a five-year species review on Clara Hunt's milkvetch from the Department that recommended up-listing the species from threatened to endangered status. On March 13, 2020, the Commission published findings formally designating Clara Hunt's milkvetch as a candidate species for endangered status under CESA. Clara Hunt's milkvetch is currently protected under CESA as a threatened species and as a candidate for endangered status.

The Department seeks your scientific peer review as part of formal proceedings pending before the Commission under CESA. The Commission is a constitutionally established entity distinct from the Department, exercising exclusive statutory authority under CESA to list species as endangered or threatened (Fish & G. Code, § 2070). The Department serves in an advisory capacity during CESA listing proceedings, charged by the Fish and Game Code to provide a report to the Commission based on the best scientific information available indicating whether recommendations to list species are warranted and recommending actions for recovery of those species (Fish & G. Code, § 2074.6).

The peer review draft of the Department's Status Review forwarded to you today reflects the Department's effort to identify and analyze the best scientific information

Conserving California's Wildlife Since 1870

available regarding the status of Clara Hunt's milkvetch in California. At this time, the Department believes that the best available science indicates that listing the species as endangered under CESA is warranted. We underscore, however, that scientific peer review plays a critical role in the Department's effort to develop and finalize its recommendation to the Commission as required by the Fish and Game Code. Our expected recommendation to the Commission at this point may change following peer review input.

We ask you to focus your peer review on the best scientific information available regarding the status of Clara Hunt's milkvetch in California. As with our own effort to date, your peer review of the science and analysis regarding each of the population and life history categories prescribed in CESA are particularly important (Cal. Code Regs., tit. 14, § 670.1(i)(1)(A)) (i.e., present or threatened habitat modification, overexploitation, predation, competition, disease, and other natural occurrences or human-related activities that could affect the species) as well as whether the information indicates, in your opinion, that Clara Hunt's milkvetch is at serious risk of becoming extinct throughout all or a significant portion of its range in California, or whether the species is likely to become so in California in the foreseeable future. Please note that the Department releases this Status Review to you solely as part of the peer review process, and it is not yet public.

A PDF version of the Status Review is included with this letter. For ease of review, and so we may respond to your comments individually, please submit your comments in list form by page and line number. Please submit your comments electronically to Jeb Bjerke, Senior Environmental Scientist (Specialist) at jeb.bjerke@wildlife.ca.gov. Jeb Bjerke may also be reached at (916) 720-1232. If there is anything the Department can do to facilitate your review, please let us know.

Following receipt and consideration of peer review comments, the Department will prepare and submit its final Status Review and related recommendation to the Commission. Your comments will be included in an appendix to the Department's Status Review and the Department will respond in writing to the peer review comments. After a minimum 30-day public review period and prior to making their decision, the Commission will consider: the Department's recommendation to list Clara Hunt's milkvetch, the Department's Status Review with peer review comments, and public testimony received during a regularly scheduled Commission meeting.

Jake Ruygt
November 20, 2020
Page 3

Thank you again for your contribution to the Status Review effort and the important input it provides during the Commission's related proceedings.

Sincerely,

DocuSigned by:

37E732799B3C452...

Jeff Drongesen, Branch Chief
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Enclosures

ec: California Department of Fish and Wildlife

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Re: ***Astragalus claranus* Status Report** – peer review

Dear Mr. Bjerke,

Thank you for assembling this report and permitting me the opportunity to provide comments. The following comments pertain to the accuracy of the report and to the current status of the some populations of *Astragalus claranus* (Clara Hunt's Milkvetch). The comments refer to specific lines in the document but my comments may warrant alterations in other locations in the report:

Pg 11, line 32 – I suggest adding *Astragalus tener* ssp. *tener* to the list of 4 closely related species. Although the range does not overlap with *A. claranus*, this species occurs in the North Coast Ranges including Napa County (although there are no recent records and it may be extirpated), is an annual and bears some morphological similarities to Clara Hunt's Milkvetch.

Pg 11, line 42 – “keel petal” -clarify that it is the keel to wing length that distinguishes the two species: keel is equal to or slightly longer than the length of the wings in *A. claranus* and shorter than and generally concealed by the wings in *A. rattanii*.

Pg 13, Table 3 – the designation of vegetation alliances at the 6 sites is confusing to me. There is no Blue Oak Alliance included in the table. It appears to have been replaced by Oregon Oak Alliance which I believe to be inaccurate. See further comments below.

Pg 15, line 15 – correct misspelling of “Ruygt”

Pg 16, line 11 – “several populations were burned” Specifically ... (Bothe ? No, I checked this in the field and the habitat was not affected by the fire) and Alpine School/ Hayfork ? (Maps indicate site burned but I was able to visit the sites)

Pg 17, line 18 – Add - No plants were observed on the north side of Conn Valley Road in 2017 (Ruygt, 3-25-17)

Pg19, line 25 – “Lewelling” population includes multiple parcels. ASCL may occur on two of the three Lewelling parcels and an outlying sub-population to the north is on property owned by a second landowner (I don't know if this clarification is needed) [Note: This population is close enough to the town to be considered to be “St. Helena” as indicated on the type specimen although this can not be confirmed]

Pg 24, line 40 – states that Oregon White Oak Forest is the dominant vegetation type at Bothe. I believe this is inaccurate and should be corrected to Blue Oak Woodland. (see my 1994 report page 26, also Figures 14, 15). I believe the Alpine School habitat is also dominated by Blue Oak. Oregon and black oak may be minor components in these communities.

Pg 25, line 14 – Glass Fire burned Bothe site ? - No. Location visited Dec. 20, 2020. (See also above)

Pg 28, line 41 – Lake Hennessey population occurs partially on the north side of the road opposite the City of Napa property. This area was overgrown with invasive grasses and brush in 2019. Recently this area was brushed out and lightly scraped/scoured (see image below).

Pg 32, line 32 & 33 – “collect seeds.... Bothe”. This is no longer feasible due to lack of presence noted in last several years. Seeds are perhaps available and viable on herbarium vouchers?

Jake Ruygt
Botanist
3549 Willis Drive
Napa, CA




North side of Conn Valley Road recently cleared, scoured and fenced

Peer Review Comments from Jake Ruygt on Clara Hunt's Milkvetch (*Astragalus claranus*) Status Review and California Department of Fish and Wildlife Responses

Page	Line	Reviewer Comment	Department Response
		Thank you for assembling this report and permitting me the opportunity to provide comments. The following comments pertain to the accuracy of the report and to the current status of the some populations of <i>Astragalus claranus</i> (Clara Hunt's Milkvetch). The comments refer to specific lines in the document but my comments may warrant alterations in other locations in the report	Relevant alterations have been made throughout the Status Review.
11	32	I suggest adding <i>Astragalus tener</i> ssp. <i>tener</i> to the list of 4 closely related species. Although the range does not overlap with <i>A. claranus</i> , this species occurs in the North Coast Ranges including Napa County (although there are no recent records and it may be extirpated), is an annual and bears some morphological similarities to Clara Hunt's Milkvetch.	A discussion of slender rattleweed (<i>Astragalus tener</i> var. <i>tener</i>) was added to the Similar-looking Plants section of the Status Review.
11	42	"keel petal" -clarify that it is the keel to wing length that distinguishes the two species: keel is equal to or slightly longer than the length of the wings in <i>A. claranus</i> and shorter than and generally concealed by the wings in <i>A. rattanii</i> .	Text updated to clarify.

Page	Line	Reviewer Comment	Department Response
13	Table 3	the designation of vegetation alliances at the 6 sites is confusing to me. There is no Blue Oak Alliance included in the table. It appears to have been replaced by Oregon Oak Alliance which I believe to be inaccurate. See further comments below.	Table 3 presents the vegetation types mapped within the vicinity of Clara Hunt's milkvetch populations during county-wide vegetation mapping efforts, but the accuracy of the mapping at specific populations was not necessarily ground-truthed. The text has been updated to reflect this, and to mention the presence of blue oak woodland at the Alpine School and Bothe populations.
15	15	correct misspelling of "Ruygt"	Text corrected
16	11	"several populations were burned" Specifically ... (Bothe ? No, I checked this in the field and the habitat was not affected by the fire) and Alpine School/ Hayfork ? (Maps indicate site burned but I was able to visit the sites)	Text updated to indicate that the 2020 Glass Fire burned near several populations of Clara Hunt's milkvetch, and not that the fire burned them directly.
17	18	Add - No plants were observed on the north side of Conn Valley Road in 2017 (Ruygt, 3-25-17)	Text updated
19	25	"Lewelling" population includes multiple parcels. ASCL may occur on two of the three Lewelling parcels and an outlying sub-population to the north is on property owned by a second landowner (I don't know if this clarification is needed) [Note: This population is close enough to the town to be considered to be "St. Helena" as indicated on the type specimen although this can not be confirmed]	The number of parcels that the Lewelling Lane Population occurs on is discussed under the "Range and Distribution" section of the Status Review. A sentence was added to the discussion of the Lewelling Lane Population under the "Range and Distribution" section of the Status Review to mention the possibility that the type specimen was collected from the population.

Page	Line	Reviewer Comment	Department Response
24	40	states that Oregon White Oak Forest is the dominant vegetation type at Bothe. I believe this is inaccurate and should be corrected to Blue Oak Woodland. (see my 1994 report page 26, also Figures 14, 15). I believe the Alpine School habitat is also dominated by Blue Oak. Oregon and black oak may be minor components in these communities.	The text has been updated to focus more on fire in blue oak woodland, instead of Oregon oak woodland. References updated.
25	14	Glass Fire burned Bothe site ? - No. Location visited Dec. 20, 2020. (See also above)	Text updated to indicate that the 2020 Glass Fire burned near several populations of Clara Hunt's milkvetch, and not that the fire burned them directly.

Page	Line	Reviewer Comment	Department Response
28	41	<p>Lake Hennessey population occurs partially on the north side of the road opposite the City of Napa property. This area was overgrown with invasive grasses and brush in 2019. Recently this area was brushed out and lightly scraped/scoured (see image below).</p> 	<p>This information was added to the text in the “Present or Threatened Modification or Destruction of Habitat” section of the Status Review.</p>
32	32 & 33	<p>“collect seeds.... Bothe”. This is no longer feasible due to lack of presence noted in last several years. Seeds are perhaps available and viable on herbarium vouchers?</p>	<p>Text updated to clarify that seeds should be collected from the Bothe Population if plants are rediscovered there, and that the viability of seeds on herbarium vouchers should also be investigated.</p>

APPENDIX C: Table of Clara Hunt's Milkvetch Population Information

Appendix C: Table of Clara Hunt's Milkvetch Population Information

Population Name	EO#	"early 80s"	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Alpine School	3					17		24	50	322		4,500	2,660	994		2,100	350	1,106	7				0*				0*	1,500		1,000-1,500								25-75	
Bothe	7		120**	142	150	53?	14	8	110	90	11	200	101	7	21	39*		30		2	3		8	0	15		8			0		0	0				0	0	
Lake Hennessey	11	~700		200 300	200	400		81	200	2	10	325	156	9		15*		42								3 or 4	40		1		15	26	19	22	60-150	27	49		
Lewelling Lane	12										15	450	2,238	6,192	345+	332+	106	212	83	134	108	251					450												
Saddle/Hayfork	14																									pres	300	152+	90	25		0		77	0	2	40	226	
Taplin Road	13																60	290									60						10			pres	pres		
Total Plants Censused (approximate)		700	120	392	350	470	14	113	360	414	36	5475	5155	7202	366	2486	516	1680	90	136	111	251	8	0	15	4	10	2358	152	1341	25	15	0	26	106	22	107	127	285

1,000 - 10,000 Plants

100 - 1,000 Plants

10 - 100 Plants

1-10 Plants or present

0 Plants or unknown

pres = present

*California Natural Diversity Database does not have a primary source for this number, It was included in a table compiled by the US Fish and Wildlife Service for their 2009 5-year status review.

** McCarten (1985) says 28 in 1983