A.25 FERRIS' MILKVETCH (*ASTRAGALUS TENER VAR. FERRISAE*)


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A.25.1 Legal and Other Status

Ferris' milkvetch has no legal status under the federal Endangered Species Act; however, it is included in the *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS 2005), hereafter "Recovery Plan." Ferris' milkvetch also has no current legal status under the California Endangered Species Act (DFG 2011).

The California Native Plant Society (CNPS) includes Ferris' milkvetch on California Rare Plant Rank 1B (formerly List 1B): Plants Rare, Threatened, or Endangered in California and Elsewhere, its highest endangerment rating (CNPS 2010). As such, it is eligible for state listing under Sec. 1901, Chapter 10 (Native Plant Protection Act) or Sections 2062 and 2067 of the California Department of Fish and Game Code (California Endangered Species Act).

A.25.2 Species Distribution and Status

A.25.2.1 Range and Status

The Recovery Plan reports 18 occurrences of Ferris' milkvetch distributed through the Sacramento Valley. Seven historical records are from Butte County, near Biggs, Nord, Oroville Road, the Sacramento River, and in the Upper Butte Basin Wildlife Management Area. Some of these sites are within the boundary of the Northeastern Sacramento County Vernal Pool Region. Four additional occurrences have been discovered and mapped within that region since 1989. Seven additional occurrence sites are distributed in the Solano-Colusa Vernal Pool region, in Solano, Colusa, Yolo, and Glenn counties. One is in Sutter County near Yuba City (USFWS 2005, CNDDB 2007).

A.25.2.2 Distribution and Status in the Plan Area

As of January 2007, the California Natural Diversity Database (CNDDB) includes eight total occurrences of Ferris' milkvetch, four of which are in Butte County (see Figure A.25-1, *Ferris's Milkvetch Modeled Habitat and Recorded Occurrences*).

The location of one occurrence from 1922 is unknown and another is now in intensive rice production. Three occurrences are located in the Llano Seco division of the Sacramento National Wildlife Refuge (CNDDB Occurrences 11, 12, and 13), and one is in the Gray Lodge Wildlife Area (occurrence 15). All are as listed as "presumed extant," but during surveys for the Recovery Plan, Occurrence 15 contained only two plants and is described in poor condition; no Ferris' milkvetch plants were seen at the three other sites. Only two of the 18 total documented occurrences of the taxon were found again during the Recovery Plan surveys. CNDDB records indicate that in 1996 an estimated 200 Ferris' milkvetch plants were present at each of the Sacramento National Wildlife Refuge occurrences and that there were two plants at the Gray Lodge Wildlife Area occurrence in 2002. No plants were found at the sites of the three Sacramento National Wildlife Refuge occurrences in 2002 surveys and Joe Silveira of USFWS reported that no plants have been detected during surveys of the Sacramento National Wildlife Refuge or the Llano Seco unit of the Upper Butte Basin Wildlife Area during surveys since 1996 (Silveira pers. comm. April 4, 2012). Based on this information, it is likely that these occurrences are extirpated from the Plan Area.

There is some discrepancy in documented populations of this taxon between the Recovery Plan and the CNDDB. The Recovery Plan mentions additional populations of Ferris' milkvetch in Butte City, in the Upper Butte Basin Wildlife Management Area and at Mountain House; these populations are not reported in the CNDDB.

A.25.3 Habitat Requirements and Special Considerations

Ferris' milkvetch has historically been found in a diversity of alkaline or sub-alkaline, low-elevation (less than 60 meters) habitat types, including marshes, drainage edges, fallow rice fields, and vernally wet meadows, typically within a valley grassland matrix. The taxon is often found in areas containing vernal pools, but it is not strictly a vernal pool subspecies. Soil substrate is typically dry, adobe clay, which is often heavy. The appearance and morphology of Ferris' milkvetch is somewhat variable depending on its habitat and associated species (USFWS 2005).

Associated plants have not consistently been reported in occurrence records, but have included Hairy checkerbloom (*Sidalcea hirsuta*), bog bulrush (*Scirpus mucronatus*), blunt spikerush (*Eleocharis obtusa*), Lemmon's canary grass (*Phalaris lemmonii*), yellowray goldfields (*Lasthenia glabrata*), European wild rye (*Lolium multiflorum*), dwarf dwarf-cudweed (*Hestperevax caulescens*), Sacramento mesamint (*Pogogyne zizyphoroides*), harlequin

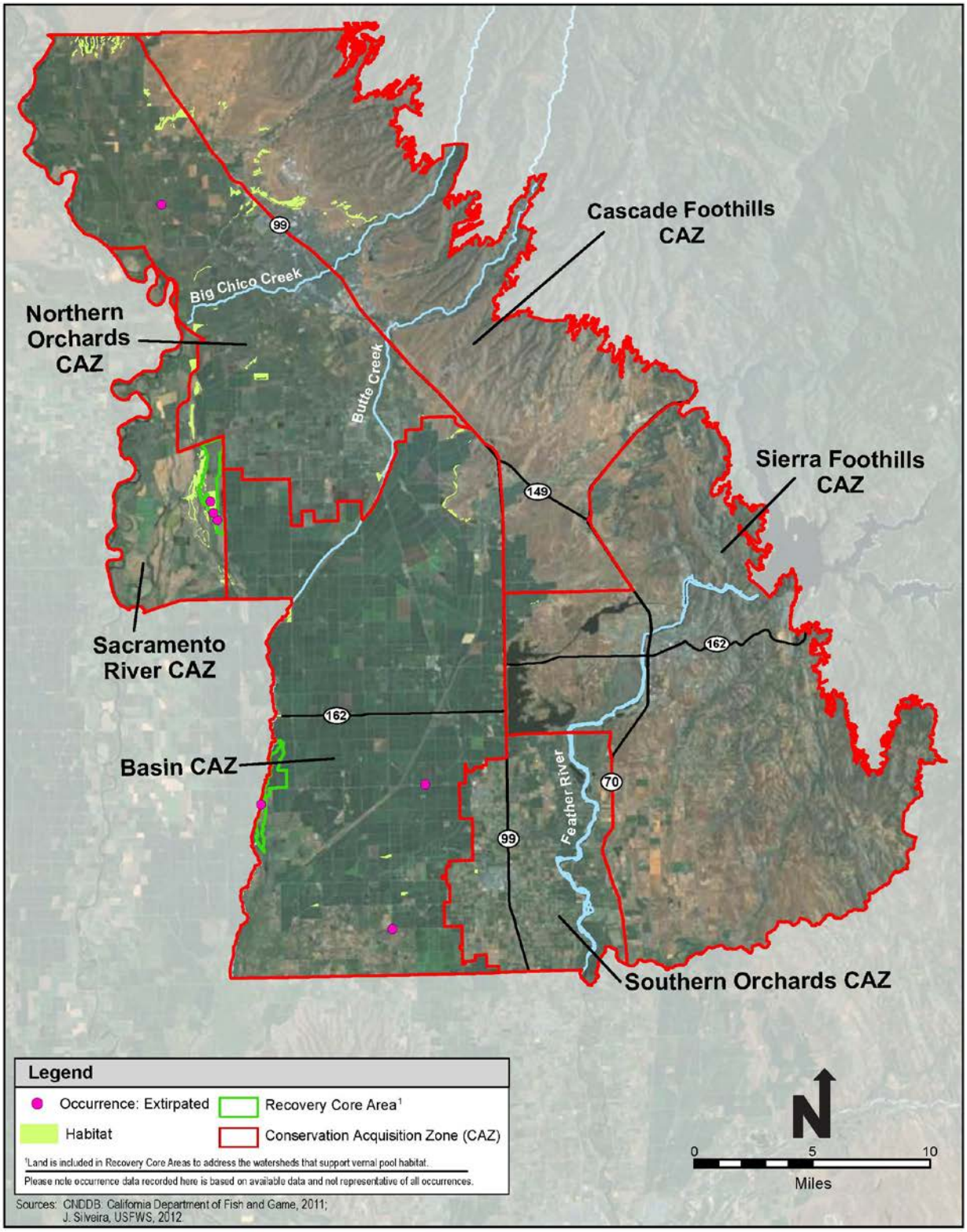

Figure A.25-1. Ferris's Milkvetch Modeled Habitat and Recorded Occurrences

calicoflower (*Downingia insignis*), and other grasses and forbs (Hickman 1993, USFWS 2005, CNDDB 2007).

A.25.4 Life History

Ferris' milkvetch blooms in April to May, and has an upright or ascending stem 6 to 26 centimeters tall. According to the USFWS, there is speculation that Ferris' milkvetch, also known by an alternate common name Sacramento Valley milkvetch, is an ecomorph of the more common vernal pool conspecific, Alkali milkvetch (*Astragalus tener* var. *tener*) (USFWS 2005).

The identification of *Astragalus* to subspecies is challenging. Demographic and pollination studies have not been conducted for Ferris' milkvetch; therefore, little is known about these aspects of Ferris' milkvetch life history. Germination requirements are not known. Biologists have speculated based on the floral morphology that all subspecies within *Astragalus tener*, including Ferris' milkvetch, are pollinated by butterflies.

A.25.5 Threats

Threats to vernal pool and surrounding habitat in the Plan Area, including alkali meadow habitat for Ferris' milkvetch, are described in the Recovery Plan (USFWS 2005) and include the following:

- Habitat loss and fragmentation consequent to urbanization, agricultural conversion, and mining; and habitat alteration and degradation due to changes to natural hydrology, invasive species, incompatible grazing regimes (including insufficient grazing for prolonged periods), infrastructure projects (such as roads and utility projects), recreational activities (such as off-highway vehicles and hiking), erosion, climatic and environmental change, and contamination.
- Conversion of land uses from intact natural communities (primarily grasslands) or livestock pastures to more intensive agricultural uses, such as croplands; or from one crop type to another. The most immediate threat to Ferris' milkvetch is that its habitat has largely been converted from vernally wet grassland to flood-irrigated rice fields (USFWS 2005).
- Competition from invasive species is a factor contributing to the decline of plant species in these habitat types. Ferris' milkvetch is threatened by nonnative plant invasion at the Upper Butte Basin Wildlife Management Area and throughout the Sacramento Valley. Increasing dominance by competitors may also contribute to changes in hydrology and livestock grazing practices (USFWS 2005).
- Changes in hydrology that result in a change in the timing, frequency, and duration of inundation in vernally wet Ferris' milkvetch habitat can reduce suitability for the species. The hydrology in vernal pool and adjacent habitats has been altered by construction of flood control structures, such as levees and other water barriers, and changes in runoff, such as irrigation or construction of roads and culverts. Ferris' milkvetch may be negatively impacted by active management of wetlands for waterfowl production, as in

the Gray Lodge Wildlife Refuge. The increased duration and depth of inundation may decrease habitat suitability for the subspecies, which is not historically found in inundated wetlands (USFWS 2005).

- The decline of pollinator species due to habitat fragmentation and the loss of upland habitats that support pollinators is a potential threat. Specific insects that pollinate Ferris' milkvetch have not yet been identified; therefore, it is not possible at this time to assess their status and determine if protection of pollinators or their habitat is necessary. If essential pollinators are declining through habitat loss, however, Ferris' milkvetch may be declining in response (USFWS 2005).
- All of the known occurrences of Ferris' milkvetch total fewer than 100 individuals per occurrence (CNDDB 2007). Small populations are threatened with extirpation from random events, such as extreme weather and lack of genetic diversity. Small, less genetically diverse populations are less likely to adapt and survive environmental changes, even relatively minor events (USFWS 2005).
- Several other threats to vernal pool habitat, vernally wet alkali meadows, and their associated species were identified in the Recovery Plan. Water contamination can occur from use of herbicides, fertilizers, and other chemicals commonly used in urban and agricultural settings. Fertilizers may also contribute to the growth of invasive plants (USFWS 2005). Increased human presence may lead to overuse, trampling (by walking or off-road vehicles), vandalism, and dumping (USFWS 2005). Habitat alteration may also occur due to large-scale climate and environmental changes, such as global warming, that lead to changes in the precipitation pattern and atmospheric conditions (USFWS 2005).

A.25.6 Relevant Conservation Efforts

All of the CNDDB-documented populations of Ferris' milkvetch in the Plan Area are on public lands, but no dedicated conservation efforts are being undertaken (USFWS 2005, CNDDB 2007).

A.25.7 Species Habitat Suitability Model

A.25.7.1 Habitat

Ferris' milkvetch habitat includes areas with suitable soil type within the following land cover types:

- Grassland;
- Grassland with vernal swale complex; and
- Vernal pool and altered vernal pool.

The following soil survey map units support low-elevation clay-based soil series with poor drainage that are considered to be suitable soil types for Ferris' milkvetch present within the Plan

Area: Anita-Galt complex (100), Bosquejo clay (104), Busacca clay loam (105), Bosquejo clay loam (109), Clearlake clay (118), Gridley taxadjunct clay loam (120), Gridley taxadjunct-Calcic Haploxerolls complex (125), Gridley taxadjunct loam (127), Liveoak sandy clay loam (138), Liveoak-Galt taxadjunct complex (139), Marcum-Gridley clay loam (143), Farwell clay loam (175), Dodgeland silty clay loam (180), Dodgeland silty clay loam (181), Esquon-Clearlake complex (220), Llanoseco silty clay loam (250), Whitecabin-Ordferry silty clays (252), Whitecabin-Ordferry complex (255), Ordferry silty clay (260), Galt clay (336), Galt clay loam (337), Subaco taxadjunct clay (400), Calcic Haploxerolls (416), Conejo clay loam (420), Oxyaquic Xerofluvents clay (439), Haploxerolls clay loam (448), Lofgren-Blavo complex (500), Lofgren-Blavo complex (501), Edjobe silty clay (519), Esquon-Neerdobe complex (520), Clearlake silty clay loam (522), Esquon silty clay loam (523), Neerdobe clay loam (528).

A.25.7.2 Assumptions

Ferris' milkvetch has historically been found in a diversity of alkaline or sub-alkaline soil, low-elevation habitat types, including marshes, drainage edges, fallow rice fields, and vernally wet meadows (USFWS 2005). Areas with emergent wetland and managed wetland land are not considered to be habitat as they do not support self-sustaining populations of the species. Typically found within a valley grassland matrix, the taxon is often found in areas containing vernal pools but it is not strictly a vernal pool species (USFWS 2005). Given these habitat preferences, suitable habitat is defined as the grassland, grassland with vernal swale complex, vernal pool, and altered vernal pool types, when present on suitable clay-based soils within the Modesto and Basin geologic formations in the Plan Area. Suitable habitat for the plant was selected by intersecting selected land cover types with selected soil map units.

The NRCS Soil Survey for Butte County was used to select suitable soils within the Plan Area (NRCS 2006b). Soils that support Ferris' milkvetch are defined as lowland, poorly drained, alkali and sub-alkali soils that overlie the Basin and Modesto (e.g., lowland, alluvial deposits) geologic formations. Soils are typically adobe clay (CNDDB 2007). To determine suitable soils for Ferris' milkvetch, the CNDDB and various NRCS soil surveys were used to initially identify the relationship between Ferris' milkvetch occurrences and soil map units within and outside Butte County (NRCS 1968, NRCS 1972, NRCS 1977, NRCS 2006a, NRCS 2006b, CNDDB 2007). Selected soils map units were those that occur within the Plan Area and that support historical or current Ferris' milkvetch occurrences within or outside the County. Physical and chemical characteristics (e.g., soil pH, percent clay, hydrologic soil groupings, and parent material) were examined to verify the suitability of these soils, and to identify additional suitable soils within the Plan Area (NRCS 2006). Generally soils that fall within the Basin and Modesto formation, with high clay content and poor drainage, were considered suitable. All soils were cross-referenced with existing research on the plant. NRCS was consulted to confirm that appropriate soils were chosen in the Plan Area (Conlin pers. comm.).

A.25.8 Recovery Plan Goals

A general statement for recovery of Ferris' milkvetch is presented in the Recovery Plan: to ensure protection of the full geographic, genetic, and ecological extent of this species and to improve the circumstances that caused its decline. Declines must be halted and reversed, and the taxon must be restored to the point where populations are stable or increasing without active human intervention. Little is known about Ferris' milkvetch population dynamics and many aspects of its lifecycle; therefore, restoration must be iterative and management adaptive.

A.25.9 References

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Personal Communications

Andrew Conlin, Soil Scientist. USDA - Natural Resources Conservation Service (NRCS). December 4, 2007 – phone conference with Drs. Paul Cylinder and Letty Brown.