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RARE PLANT SURVEY RESULTS AND HABITAT ASSESSMENT FOR LOWER DEER CREEK, TRIBUTARY TO THE SACRAMENTO RIVER, TEHAMA COUNTY, CALIFORNIA

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1 INTRODUCTION

The Deer Creek Flood and Ecosystem Improvement Project (hereafter "project") seeks to improve flood protection, ecosystem function, and salmonid habitat along Deer Creek within the context of a working landscape. Deer Creek supports native spring-run and fall-run Chinook Salmon, making it a high priority for habitat protection and enhancement. Private and public ownership, combined with a largely unimpaired flow regime above the Sacramento River valley floor, have created habitat refugia for anadromous fish, as well as for diverse riparian vegetation. The project is currently preparing CEQA/NEPA documents for environmental compliance. This technical memorandum has been prepared in support of the CEQA/NEPA process and describes the rare plant and sensitive plant community surveys that occurred in spring and summer 2018 in the project area. Methods used to describe the project area in relation to vegetation resources, and to document the presence or absence of special status plants and natural communities pre-project, are presented below.

Specific objectives of this plant investigation are to:

Describe vegetation and soils in the project area using existing information sources (i.e., no field data were collected) such as vegetation maps, agency botanists, Web Soil Survey, and California Natural Diversity Database (CNDDB) community data;

Conduct seasonally appropriate surveys for rare, threatened, and endangered plant species and sensitive natural communities; and document and report any rare, threatened, and endangered plant species and sensitive natural communities observed within the specified project areas.

2 PROJECT LOCATION AND DESCRIPTION

Deer Creek is located in southeastern Tehama County, at the north end of the Sacramento Valley (Figure 1). The headwaters begin in the southern Cascade Range, flowing approximately 60 miles from Butt Mountain in Lassen National Forest to the confluence with the Sacramento River. The upper 49 miles flow through mountainous terrain, meadows, and steep canyons, and are beyond the scope of this document. The lower 11 miles flow through alluvial deposits of the eastern Sacramento Valley. As such, the geological and biological setting along Deer Creek is complex and varied. This memo focuses on the lower 6 miles of the watershed where the project is located, as Deer Creek flows across the valley to its confluence with the Sacramento River.

2.1 Proposed Project Description

The Deer Creek Flood and Ecosystem Improvement Project includes a variety of design measures, including levee setbacks, bank stabilization, flood easements, bridge improvements, diversion structure improvements, and levee improvements (Table 1, Figure 2). At the upstream end near river mile 6, improvements to Red Bridge would be coupled with levee setbacks and flood easements to convey higher flows and large wood through the bridge and allow some natural channel migration. Improvements to the Stanford-Vina Ranch Irrigation Company (SVRIC) Diversion Dam could improve sediment continuity and fish passage (Figure 2). Approximately 1.5 miles downstream, bank protection coupled with levee setbacks and improvements and flood easements could widen the floodway to allow greater flow conveyance, channel migration, and natural development of instream habitat (Figure 2). Additional elements include bank protection and levee improvements to protect valuable existing pasture and infrastructure (Figure 2).

The proposed elements intend to protect the working landscape on Deer Creek while improving habitat conditions for salmonids. All proposed elements occur within four discrete “survey areas” (yellow lines in Figure 3) that collectively total approximately 350 acres. To determine the botanical resources that occur or have the potential to occur in the actual project footprint, a larger “scoping area” was defined (green line in Figure 3). The scoping area occurs on two USGS 7.5’ quadrangles (Vina, Richardson Springs NW). Habitats within the scoping area were described to provide context for plants within an approximate one-mile radius of the project area (Figure 3). Soils within the scoping area were described per California Department of Fish and Wildlife plant survey protocols (CDFW 2018).

Figure 1. Location of the Deer Creek Flood and Ecosystem Improvement Project where rare plant and sensitive natural community surveys were conducted in spring and summer 2018. Figure prepared by MEI (DCWC 2008).

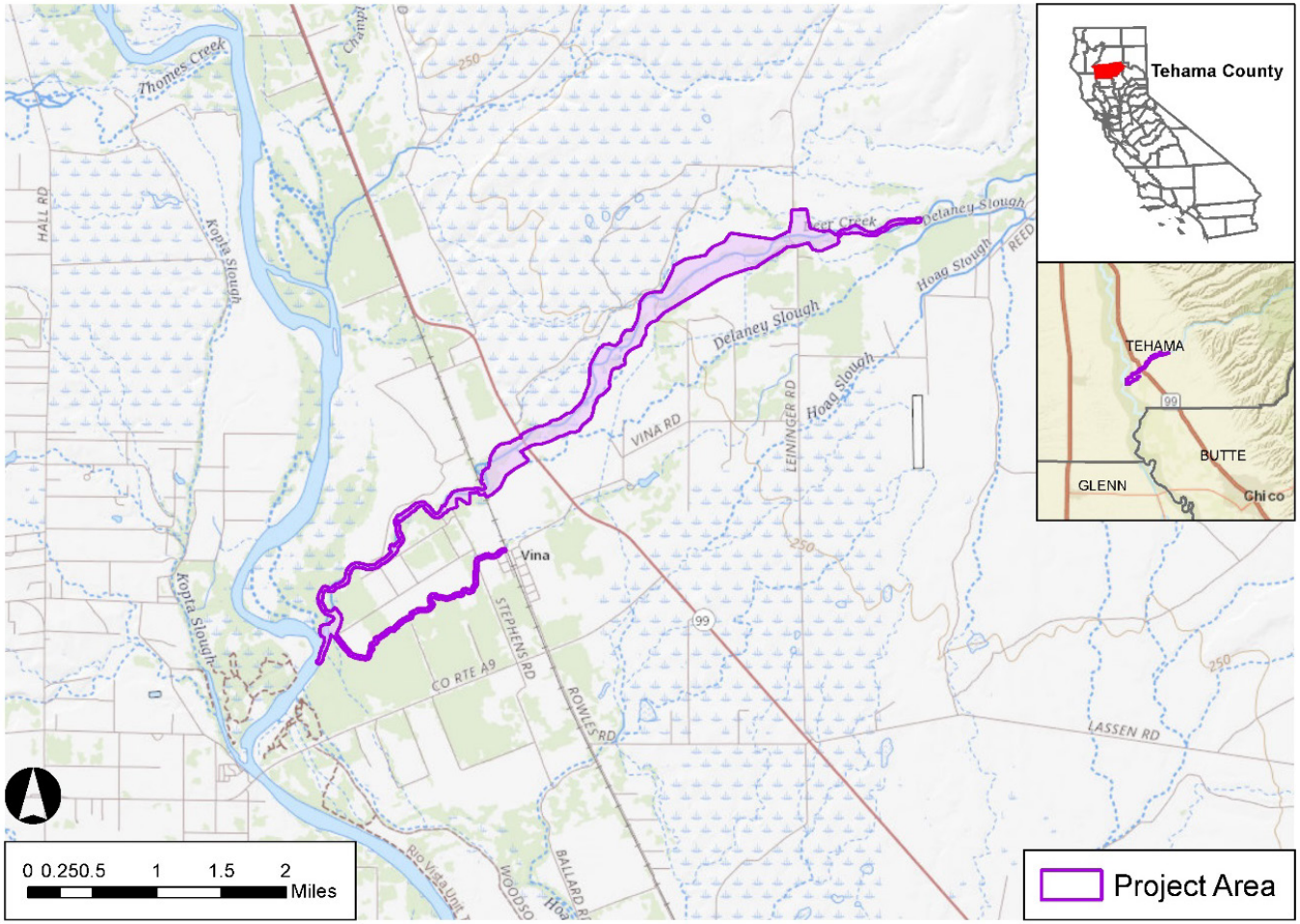

Table 1. Location and description of project elements proposed for the Deer Creek Flood and Ecosystem Improvement Project.

Location on Deer Creek	Element	Objective
Upstream of Red Bridge	Modify existing levee on north bank	Remove existing levee to allow flooding on existing easement
Upstream of Red Bridge	Improve/raise road and levee	Coupled with levee modification above, raise Leininger Rd north of Red Bridge and construct new levee as needed along northern boundary of easement
Upstream of Red Bridge	Bank protection improvements	Improve bank protection and existing project levee to protect current ecological function and reduce future flooding risk to downstream landowners
Red Bridge	Improve Red Bridge	Raise and widen Red Bridge to reduce upstream backwater effects and excessive channel bed scour and bank erosion
Red Bridge to SVRIC Diversion Dam	Levee setbacks	Set back existing project levees on north and south banks to widen the floodway to allow for higher flood conveyance and encourage natural geomorphic function in this reach
Red Bridge to SVRIC Diversion Dam	Sediment removal and grading	Increase channel capacity by removing sediment deposits upstream of SVRIC Diversion Dam and improve grade
SVRIC Diversion Dam	Improve diversion dam structure	Improve sediment routing and fish passage by modifying and/or improving the existing diversion dam
SVRIC Diversion Dam to Hwy 99	Floodway and migration easement	Provide compensation to north and south bank landowners in exchange for increased flood disturbance to allow natural channel migration, floodplain reconnection, and development of riparian vegetation

SVRIC Diversion Dam to Hwy 99	Remove existing non-project levee on south bank	Improve floodplain dynamics and sediment transport in the reach while streamlining the flood protection system
SVRIC Diversion Dam to Hwy 99	Bank protection improvements	Prevent channel migration into irrigated pasture using bioengineered bank stabilization techniques
Hwy 99 to Railroad Grade	Set back non-project levee on south bank	Increase channel capacity and floodway width between Hwy 99 and the railroad
Downstream of Railroad Grade	Ring levee	Prevent flooding of laundry facility at Monastery of New Clairvaux

Figure 2. Location of proposed project elements for the Deer Creek Flood and Ecosystem Improvement Project.

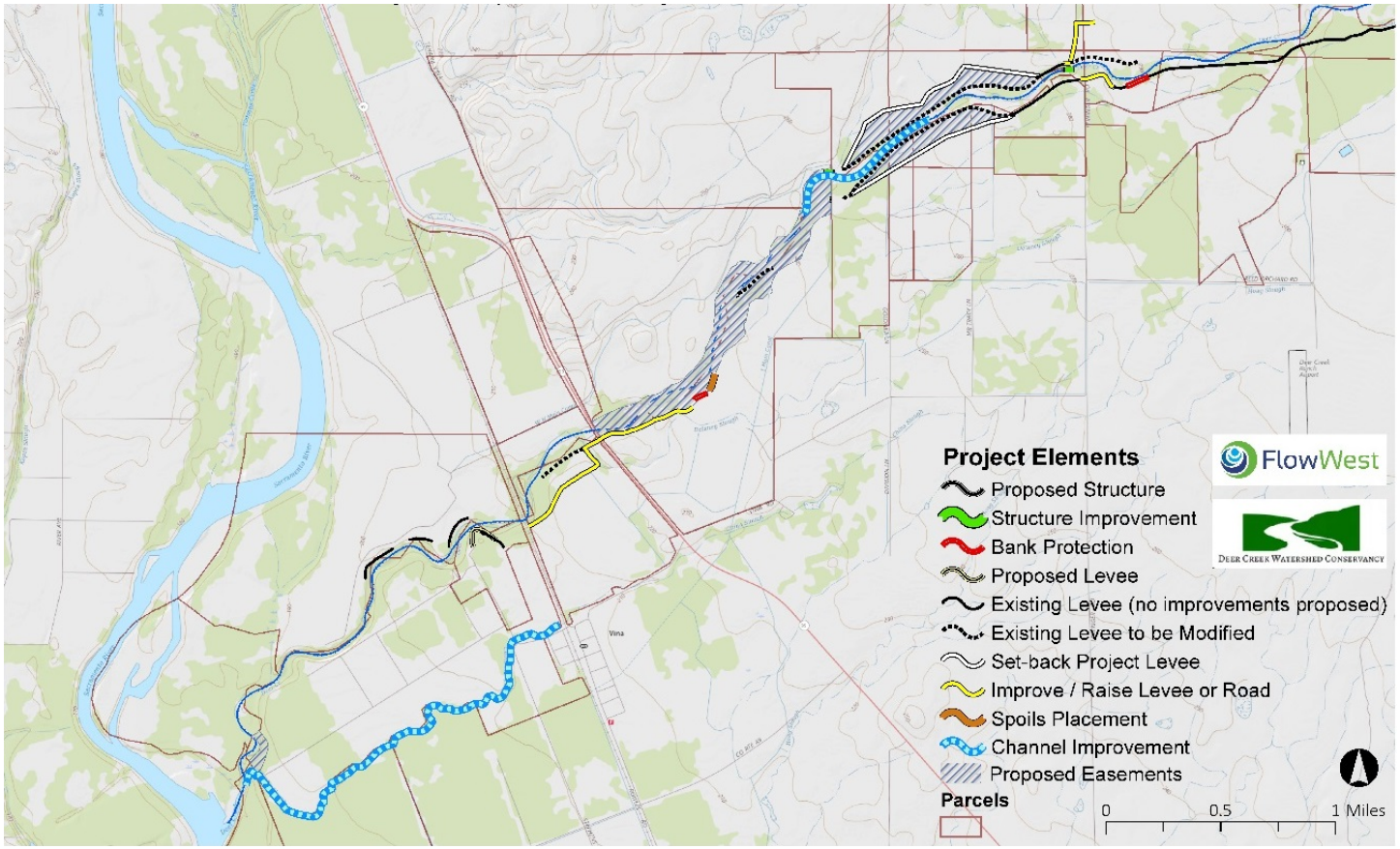

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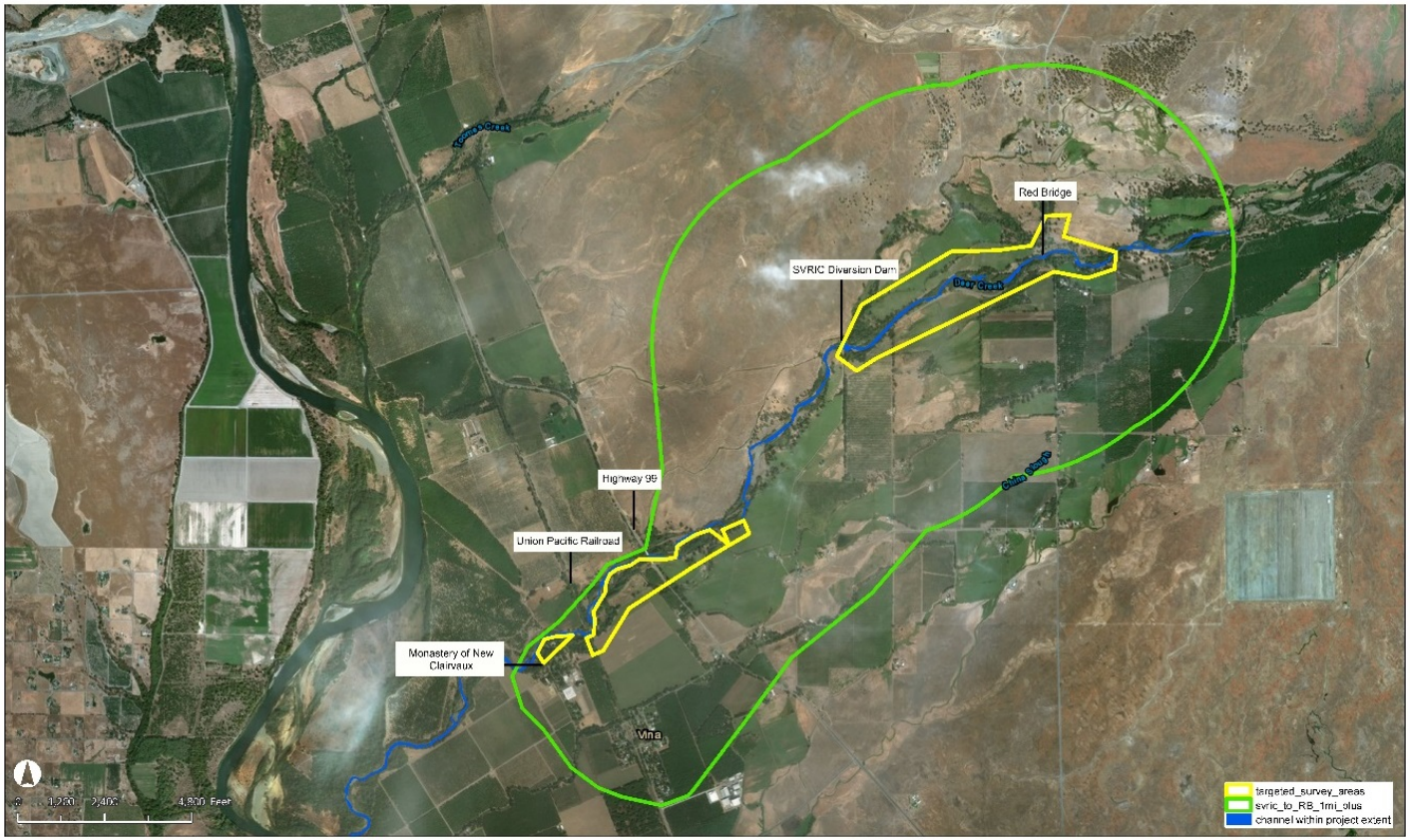
Figure 3. Location of Deer Creek Flood and Ecosystem Improvement Project, showing broad "scoping area" (green line) and targeted "survey areas" (yellow lines).



2.2 Soils in the Project Area

Soils in the broader scoping area were varied and occurred in nine different series (Table 2, Appendix A). Molinos, Tuscan, and Vina series were the most abundant in the scoping area, with many smaller pockets and patches of less common series. Molinos and Vina soils are typically younger soils and well-drained, while Tuscan soils are older and underlain by a cemented layer of hardpan 10–20 inches from the surface. The cemented layer is a barrier to plant roots and water drainage and therefore is a large contributing factor to vegetation patterns in Deer Creek.

Soils in the survey areas were less diverse. Riverwash occurred as the dominant series within the active channel (Figure 4), and Molinos soils occurred on the floodplains (Figure 5). Soils in the Vina series tended to occur farther from the channel and covered more extensive areas beyond the survey boundaries. At the upstream end of the project, a small area of moderately deep Keefers loam (Km) occurred on the north side of the creek upstream of Red Bridge and beyond the levee (Figure 4). Most of the vegetation in the survey areas was growing on riverwash and Molinos soils.

Table 2. Description of soil map units that occur in the scoping area for the Deer Creek Flood and Ecosystem Improvement Project (USDA 1967).

Soil Map Code	Map Unit Name	Description
Ad	Anita clay	Ranges from 10–20 inches in depth.
Af	Anita clay, moderately deep	Depth to cemented layer is 20–36 inches. Drainage is imperfect, and water may stand on soil surface in some places for several weeks.
Ag	Anita clay, deep	Depth to cemented layer is 36–60 inches. Most areas are ponded during winter and early spring and are used for pasture and range in early summer.
An	Anita cobbly clay	Ranges from 10–22 inches in depth.
IcD	Inks very cobbly sandy clay loam, 1–13% slopes; MLRA 18	On low rounded hills east of the Sacramento River. Depth ranges from 10–24 inches. Well drained.
Kf	Keefers loam, 0–3% slopes	On low terraces east of the Sacramento River. Most areas are parallel to the stream channels and are long and narrow. Depth to cemented layer is 36–60 inches, which is impenetrable to plant roots and water.

Soil Map Code	Map Unit Name	Description
Km	Keefers loam, moderately deep, 0–3% slopes	Depth to cemented layer is 24–48 inches, which causes a perched water table to form in winter.
LaB	Laniger fine sandy loam, 0–8% slopes	Most of this soil is about 4 miles northeast of Vina. Depth to cemented layer is 15–36 inches. Well drained. Most areas are too uneven and too shallow for agriculture. Erosion hazard is slight.
LbB	Laniger fine sandy loam, deep, 0–8% slopes	Similar to LaB, except depth to cemented layer is 30–48 inches. Well drained. Erosion hazard increases in cultivated areas.
Lm	Los Robles clay loam, moderately deep, 0–3% slopes	Located along edges of alluvial fans adjacent to Tuscan soils. In many places, occurs as long, narrow, fairly small areas. Depth to cemented layer is 36–48 inches.
Lo	Los Robles loam, 0–3% slopes	All of this soil is located on stream floodplains east of the Sacramento River. Well drained. Depth of soil is more than 72 inches except where adjacent to Tuscan soils, which are underlain by cemented substrate at a depth of about 48 inches.
My	Molinos fine sandy loam, 0–3% slopes, MLRA 17	Occurs on most recent alluvium east of the Sacramento River. Many areas are less than 100 acres in size and form long narrow stringers parallel to major streams. Well to somewhat excessively drained.
Mzd	Molinos fine sandy loam, deep over gravel	Occurs mostly in long narrow areas close to active streams. Very gravelly subsoil at a depth of 36–60 inches but otherwise similar to My.
Mzm	Molinos fine sandy loam, moderately deep over gravel	Underlain by gravelly subsoil at depth of 18–36 inches, but otherwise similar to My. Most areas less than 50 acres in size.
Mzr	Molinos fine sandy loam, deep over rock	Underlain by an unrelated cemented layer at a depth of 36–60 inches, which causes a perched water table during wet winters. Water table varies considerably. Otherwise similar to My.
Mzs	Molinos gravelly fine sandy loam	Depth of soil is more than 60 inches. Subsoil generally more gravelly than My but otherwise similar.
Mzt	Molinos complex, channeled	Occurs along active streams east of the Sacramento River. Consists of variable

Soil Map Code	Map Unit Name	Description
		proportions of any of the Molinos soils. All areas subject to flooding.
Rr	Riverwash	Occurs in channels of intermittent and perennial streams, made of sand and gravel deposits, some of which are mined. No agricultural value.
TsB	Tuscan loam, 1–5% slopes	Nearly free of cobblestones but otherwise similar to TuB. Easier to manage for pasture and range.
TtB	Tuscan clay loam, 1–8% slopes	Surface layer nearly free of cobblestones but otherwise similar to TuB.
TuB	Tuscan cobbly loam, 1–5% slopes	Occurs on old, gently sloping terraces east of the Sacramento River with slightly hummocky microrelief. Rounded cobblestones 3–10 inches in diameter are scattered across 1–10% of soil surface. Depth to cemented layer is 10–20 inches and water drains laterally from the soil.
VnA	Vina loam, 0–2% slopes, MLRA 17	Occurs east of the Sacramento River. Most areas have a smooth surface. Well drained.
Vw	Vina loam, water table, 0–3% slopes	Depth to unrelated cemented layer of Tuscan soil at 48–72 inches. Drainage is imperfect and a perched water table forms at a depth of 20–40 inches when irrigated, which may damage some deep-rooted crops.

Figure 4. Soil map of upstream project area, showing levees (LVS) extending from the SVRIC Diversion Dam at the downstream end to above Leininger Road at the upstream end. Soil types are delineated in orange, and the approximate survey area is shown in teal. Riverwash (Rr) was the only soil type in the areas surveyed between the levees, except for a small area of moderately deep Keefers loam (Km) on the north side of the creek upstream of Red Bridge and beyond the levee.

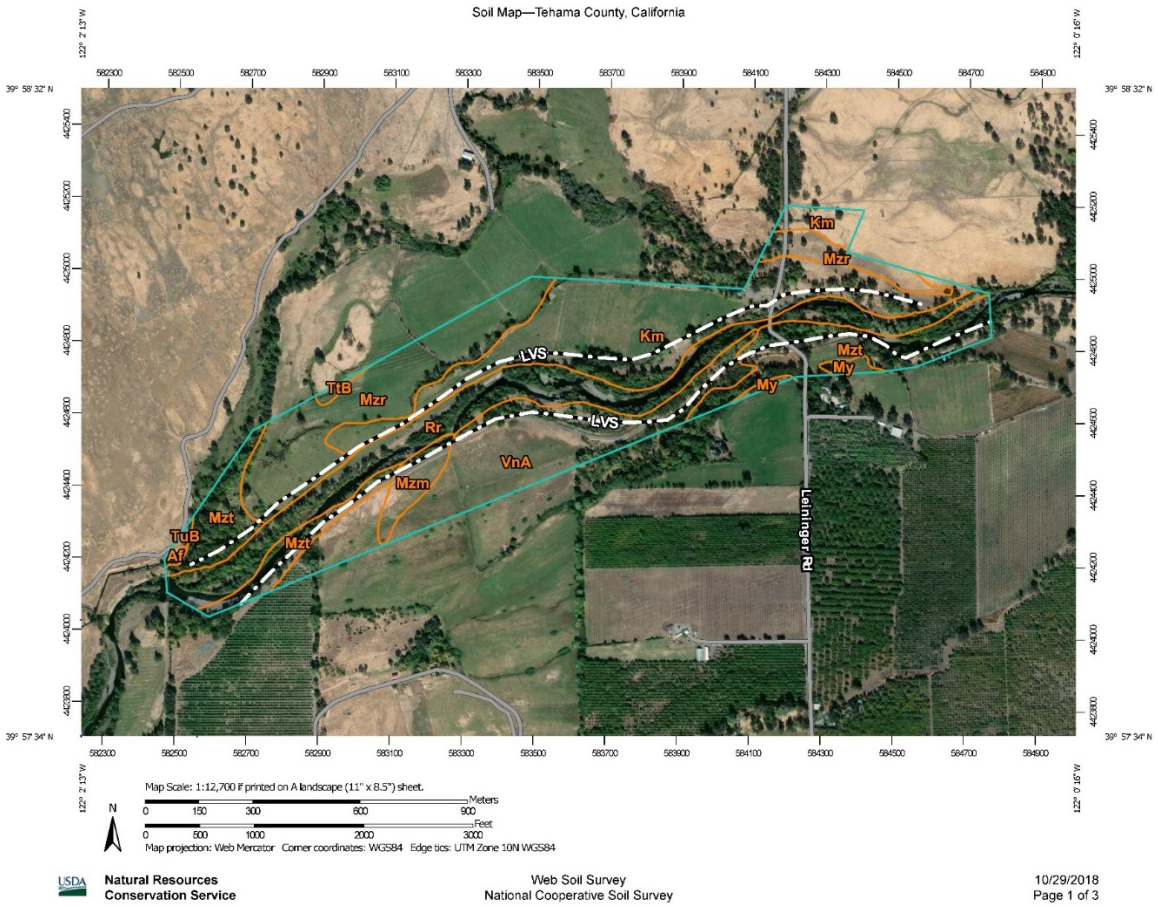
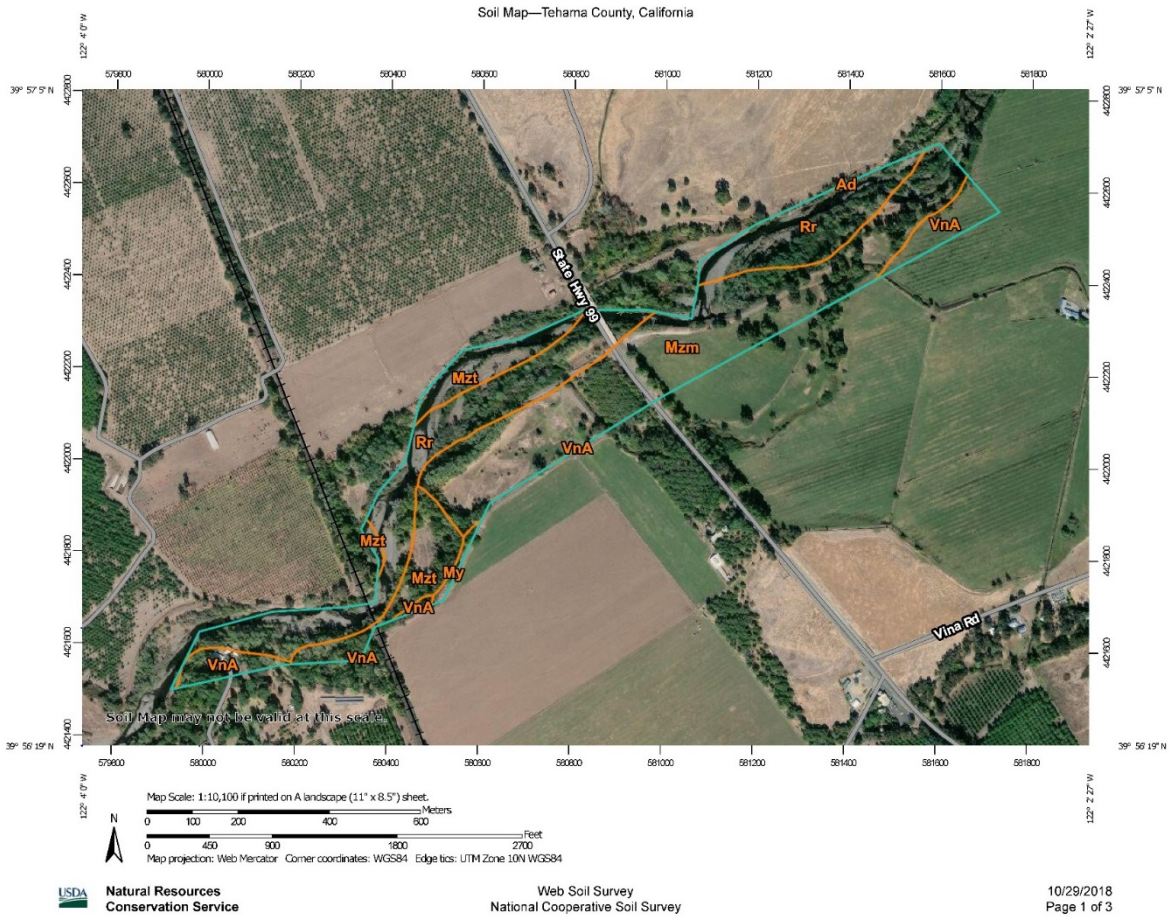


Figure 5. Soil map of downstream project area. Soil types are delineated in orange, and the approximate survey area is shown in teal. Riverwash (Rr) was the most abundant soil type in the survey area. Other soil types were predominantly in the Molinos series, including moderately deep Molinos fine sandy loam (Mzm) and channelized Molinos complex (Mzt). Vina loam (VnA) occurred in the agricultural lands outside of the riparian corridor.



2.3 Biological Setting

The project occurs in Ecoregion 7: Central California Valley (Griffith et al. 2016). The ecoregion concept is based on the distribution of biotic and abiotic factors that contribute to similar ecosystem features; ecoregions have similar types of environmental resources (Griffith et al. 2016). The ecoregion classification has been developed for North America, with finer levels of nested classes specific to smaller regions in the continent. The Central California Valley bioregion is characterized by mostly flat, intensively farmed plains that once consisted of oak woodlands and savannahs, prairies, vernal pools, freshwater wetlands, and riparian woodlands.

Within the scoping area, the gently sloping terraces on the northern upstream portion of the creek host annual grasslands that are used for dryland pasture and range. Scattered pockets of blue oak woodland occur, especially near the upper portions near the Deer Creek Irrigation District (DCID) Diversion Dam. On the north side of Deer Creek, large areas of California annual forb/grassland vegetation occur and provide habitat for vernal pool and valley and foothill grassland species. On the south side of Deer Creek, much of the land has been converted to agriculture. Orchards, pastures, and vineyards predominate, although there are remnant stringers of riparian vegetation (mostly valley oak and Fremont cottonwood) along Delaney and China sloughs and the irrigation ditches (Figure 3).

Within the survey areas, the mostly level floodplains of Deer Creek have been developed to support pasture, fruit and nut orchards, and vineyards. Woody riparian vegetation and wetlands are also present, with cottonwoods, mixed willows, and valley oaks featuring strongly. The riparian corridor of Deer Creek is dominated by valley oak woodland (*Quercus lobata* woodland alliance), Fremont cottonwood forest (*Populus fremontii* forest alliance), California sycamore woodlands (*Platanus racemosa* woodland alliance), and smaller patches of white alder groves (*Alnus rhombifolia* forest alliance), narrowleaf willow thickets (*Salix exigua* shrubland alliance), and arroyo willow thickets (*Salix lasiolepis* shrubland alliance). Many of these cover types are sensitive natural communities. Barren gravel bars occur within the bankfull channel. The unconsolidated gravels, sands, and silts are constantly mobilized and redeposited by Deer Creek flows, resulting in dynamic channel morphology. However, the presence of levees, constructed as part of the U.S. Army Corps of Engineers levee project and also by private landowners, has limited the extent of natural channel migration within the scoping area.

3 METHODS

Prior to conducting field surveys, a list of rare, threatened, and endangered species, and sensitive natural communities, with the potential to occur in the project area was compiled by querying the California Native Plant Society (CNPS) Online Inventory of Rare and Endangered Plants of California (CNPS 2018), the California Natural Diversity Database (CNDDB, CDFW 2018), and the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) website (Table 3). Some plants are formally listed as either Endangered or Threatened under the Federal Endangered Species Act and/or the California Endangered Species Act. Plant species not formally listed may still be rare, as determined by CNPS and CDFW using the California Rare Plant Rank (CRPR) system. The CRPR indicates the degree of rarity of California species. Plants with a CRPR of 1 or 2 meet the CEQA definition of rare or endangered, and potential impacts to these species

must be considered during impact analysis, while plants with a CRPR of 3 or 4 may need to be considered depending on local rarity, declining trends, or other factors. A complete description of rarity listings may be found in Appendix B.

The CNPS and CNDDB searches involved a "nine-quad" search centered around the USGS 7.5' quadrangle in which the project is located. In this case, the project area spans two quadrangles (Vina and Richardson Springs NW) and therefore two nine-quad searches were conducted, and the results compiled into a single list of "target" species (Table 3). A total of 37 target rare plant species have been documented within the nine-quad query area (Table 3). Seven sensitive natural communities have also been documented: Coastal and valley freshwater marsh, Great Valley cottonwood riparian forest, Great Valley mixed riparian forest, Great Valley valley oak riparian forest, Great Valley willow scrub, Northern hardpan vernal pool, and Northern volcanic mud flow vernal pool.

Because most of the property within the larger scoping area is privately owned, vegetation resources were also explored using existing vegetation maps (GIC and CDFW 2016, Kondolf et al. 2008) and available aerial photography (e.g., Google Earth imagery), as well as opportunistic field visits where feasible.

Table 3. List of rare, threatened, and endangered plant species with the potential to occur within the Deer Creek scoping area. Rarity rankings listed under the Endangered Species Act are indicated by (F) for the federal list and (S) for the state list. Rarity ranking definitions can be found in Appendix B.

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
Agrostis hendersonii	Henderson's bent grass	Apr–June	• Valley and foothill grassland (mesic) • Vernal pools	3.2
Astragalus pauperculus	depauperate milk-vetch	Mar–June	Vernally mesic, volcanic. • Chaparral • Cismontane woodland • Valley and foothill grassland	4.3
Astragalus tener var.*ferrisae*	Ferris' milk-vetch	Apr–May	• Meadows and seeps (vernally mesic) • Valley and foothill grassland (subalkaline flats)	1B.1

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
Calycadenia oppositifolia	Butte County calycadenia	Apr–July	Openings; volcanic, granitic, or serpentinite. • Chaparral • Cismontane woodland • Valley and foothill grassland • Meadows and seeps • Lower montane coniferous forest	4.2
Calystegia atriplicifolia ssp. *buttensis*	Butte County morning glory	May–July	Rocky, sometimes roadsides. • Chaparral • Lower montane coniferous forest • Valley and foothill grassland	4.2
Campylopodiella stenocarpa	flagella-like atractylocarpus	N/A (moss)	• Cismontane woodland	2B.2
Castilleja rubicundula ssp. *rubicundula*	pink creamsacs	Apr–June	Serpentinite. • Chaparral (openings) • Cismontane woodland • Valley and foothill grassland • Meadows and seeps	1B.2
Clarkia gracilis ssp. *albicaulis*	white-stemmed clarkia	May–July	Sometimes serpentinite. • Chaparral • Cismontane woodland	1B.2

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
Cryptantha crinita	silky cryptanta	Apr–May	Gravelly streambeds. • Cismontane woodland • Lower montane coniferous forest • Riparian forest • Riparian woodland • Valley and foothill grassland	1B.2
Downingia pusila	dwarf downingia	Mar–May	• Valley and foothill grassland • Vernal pools	2B.2
Erythranthe glaucescens	shield-bracted monkeyflower	Feb–Aug (Sept)	Serpentinite seeps, sometimes streambanks • Chaparral • Cismontane woodland • Lower montane coniferous forest	4.3
Euphorbia hooveri	Hoover's spurge	July–Sept (Oct)	• Vernal pools	1B.2 Threated (F)
Euphorbia ocellata ssp. *rattanii*	Stony Creek spurge	May–Oct	• Chaparral • Riparian scrub (streambanks) • Valley and foothill grassland (sandy or rocky)	1B.2
Fritillaria pluriflora	adobe-lily	Feb–Apr	Often adobe. • Chaparral • Cismontane woodland • Valley and foothill grassland	1B.2
Gratiola heterosepala	Boggs Lake hedge-hyssop	Apr–Aug	Clay	1B.2

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
			• Marshes and swamps (lake margins) • Vernal pools	Endangered (S)
Hemizonia congesta	Mendocino tarplant	July–Nov	Sometimes serpentinite. • Cismontane woodland • Valley and foothill grassland	4.3
Hesperevax caulescens	hogwallow starfish	Mar–June	Sometimes alkaline. • Valley and foothill grassland (mesic, clay) • Vernal pools (shallow)	4.2
Hibiscus lasiocarpos var. *occidentalis*	woolly rose-mallow	June–Sept	Often riprap on sides of levees. • Marshes and swamps (freshwater)	1B.2
Imperata brevifolia	California satintail	Sept–May	Mesic. • Chaparral • Coastal scrub • Mojavean desert scrub • Meadows and seeps (often alkali) • Riparian scrub	2B.1
Juglans hindsii	Northern California black walnut	Apr–May	• Riparian forest • Riparian woodland	1B.1
Juncus leiospermus var. *leiospermus*	Red Bluff dwarf rush	Mar–June	Vernally mesic. • Chaparral • Cismontane woodland • Vernal pools • Valley and foothill grassland	1B.1

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
			• Meadows and seeps	
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	Feb–June	• Marshes and swamps (coastal salt) • Playas • Vernal pools	1B.1
Legenere limosa	legenere	Apr–June	• Vernal pools	1B.1
Limnanthes floccosa ssp. *californica*	Butte County meadowfoam	Mar–May	• Valley and foothill grassland (mesic) • Vernal pools	1B.1 Endangered (F) Endangered (S)
Limnanthes floccosa ssp. *floccosa*	woolly meadowfoam	Mar–May (June)	Vernally mesic. • Chaparral • Cismontane woodland • Valley and foothill grassland • Vernal pools	4.2
Monardella venosa	veiny monardella	May, July	Mesic • Cismontane woodland • Lower montane coniferous forest • Meadows and seeps • Valley and foothill grassland • Vernal pools	1B.1
Navarretia heterandra	Tehama navarretia	Apr–June	Heavy clay. • Cismontane woodland • Valley and foothill grassland	4.3
Navarretia leucocephala ssp. *bakeri*	Baker's navarretia	Apr–July	Mesic. • Cismontane woodland	1B.1

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
			• Lower montane coniferous forest • Meadows and seeps • Valley and foothill grassland • Vernal pools	
Navarretia nigelliformis ssp. *nigelliformis*	adobe navarretia	Apr–June	Clay, sometimes serpentinite. • Valley and foothill grassland (vernally mesic) • Vernal pools (sometimes)	4.2
Orcuttia pilosa	hairy Orcutt grass	May–Sept	• Vernal pools	1B.1 Endangered (F) Endangered (S)
Orcuttia tenuis	slender Orcutt grass	May–Sept (Oct)	Often gravelly • Vernal pools	1B.1 Threatened (F) Endangered (S)
Paronychia ahartii	Ahart's paronychia	Feb–June	• Cismontane woodland • Valley and foothill grassland • Vernal pools	1B.1
Polygonum bidwelliae	Bidwell's knotweed	Feb–June	Volcanic. • Chaparral • Cismontane woodland • Valley and foothill grassland	4.3
Rhynchospora californica	California beaked-rush	May–July	• Bogs and fens	1B.1

Latin Name	Common Name	Blooming Period	Habitat(s)	Rarity Ranking
			• Lower montane coniferous forest • Meadows and seeps (seeps) • Marshes and swamps (freshwater)	
Sagittaria sanfordii	Sanford's arrowhead	May–Oct (Nov)	• Marshes and swamps (assorted shallow freshwater)	1B.2
Sidalcea robusta	Butte County checkerbloom	Apr, June	• Chaparral • Cismontane woodland	1B.2
Tuctoria greenei	Greene's tuctoria	May–July (Sept)	• Vernal pools	1B.1 Endangered (F) Rare (S)

The floristic surveys were conducted twice within the identified survey areas during 2018 to capture the different blooming periods for the 37 target species (Figure 3, Table 4). During the field surveys, a complete list of all species encountered in the survey area was compiled (Appendix C). The surveys were floristic and all habitats within the survey area were visited (CDFW 2018, CNPS 2001). Rare plant surveys within the survey areas occurred almost exclusively in the riparian corridor of Deer Creek, with the exception of pasture surveys on the right bank upstream of Highway 99. Surveys in dense riparian vegetation covered as much area as possible; however, dense viny undergrowth and shrubs limited access to parts of the riparian corridor. Inaccessible areas were surveyed from multiple access points to the extent possible. The extremely dense understory, such as California grape, Himalayan and California blackberries, California pipevine, and poison oak in some stands, and arroyo willow in other stands, limited the habitat available for other species. Surveys in grazed pastures and grasslands followed informal parallel walking transects. The transects used nearby landmarks (i.e., trees, fence lines, roads) rather than permanent reference points, and were spaced approximately 10 feet apart. In areas where the grassland vegetation was diverse, the transects were spaced approximately 5 feet apart. Taxonomy follows the Jepson Manual, 2nd Edition (Baldwin et al. 2012) and the PLANTS database (USDA 2016).

Surveys were conducted twice in 2018: a spring survey that occurred April 9–12, and a summer survey that occurred July 1–3 (Table 4). The spring survey was timed to specifically coincide with the end of the blooming period for adobe lily *(Fritillaria pluriflora)*, and also coincided with the blooming period for 24 other species. The summer survey was timed to capture the blooming time of 12 additional species (Table 4). The

remaining species is a moss that could be seen and identified during both the April and July survey.

Prior to conducting each survey, rare plant locations documented near the survey areas were identified via the CNDDB database and visited to determine the phenological development of target species. Most of the target species that occurred closest to Deer Creek were vernal pool species, which were not expected to occur within the survey areas identified in this report (Figure 3). Due to the complexity of vernal pool habitats and plant species, vernal pool surveys for the Deer Creek Flood and Ecosystem Enhancement Project were conducted by another consultant and are not reported here. However, vernal pool species were visited to become familiar with local phenology in the unlikely event that any of the species were encountered in the survey areas, outside their normal habitats.

In the spring, a large amount of time was spent searching for adobe lily reference populations. One location of adobe lily reported in the CNDDB database was within 500 ft but outside of the downstream survey area on the north side of the creek just upstream of the Highway 99 bridge; however, access was not granted to visit that site. The timing of the surveys occurred near the end of the blooming season for adobe lily; however, even if flowers were no longer visible, the leaves of adobe lily are distinctive enough from associated grassland species that plants would have been visible. Other extensive occurrences were previously documented along the Highway 99 corridor in 1993, prior to widening of the Highway 99 corridor. None of the plants could be located in April 2018, despite extensive efforts to find them. However, adobe lily was not expected to occur within the survey areas because its preferred habitat conditions (vernal pool and wet grassland settings with red clay soil) were not present in most of the areas surveyed.

Additional reference populations of rare species at nearby vernal pools (e.g., Hog Lake, Vina Plains Preserve) were visited to determine the phenological stages of documented species. On April 8, 2018, woolly meadowfoam (*Limnanthes floccosa* ssp. *floccosa*) and Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*) were observed in flower at Hog Lake. On June 30, 2018, Hoover's spurge (*Euphorbia hooveri*), hairy Orcutt grass (*Orcuttia pilosa*), and Greene's tuctoria (*Tuctoria greenei*) were observed in flower at Vina Plains Preserve.

Most of the riparian vegetation along Deer Creek can be classified as one or more sensitive natural communities. Based on a consultation with CDFW botanist Diana Hickson on May 6, 2018, existing vegetation maps created by the CDFW and the Geographical Information Center at Chico State University in 2013 were used as baseline maps during field surveys (CDWR and GIC 2013). The Great Valley Ecoregion Vegetation dataset [ds2632] was downloaded from the Biogeographic Information and Observation System (BIOS) viewer of the CNDDB and maps were printed for use in the field. During field surveys, cover type attribution on the existing maps was checked and corroborated and any changes noted. Boundaries of designated cover types in the 2013 vegetation maps were not updated during 2018 rare plant surveys because vegetation mapping was beyond the scope of this effort. The field-annotated existing vegetation maps served as documentation of the sensitive natural communities within the survey area.

Field surveys occurred within the four survey areas shown in Figure 3. The actual extent of the spring and summer surveys was reduced due to landowner specifications. For example, the area between Red Bridge at the upstream end and SVRIC Diversion Dam at the

downstream end was surveyed from the north bank levee across Deer Creek to the south bank levee; areas beyond the levees extending to the survey area boundary were not surveyed at the landowners' request. Areas where project activities are expected to occur beyond the survey boundaries (i.e., levee setbacks between Red Bridge and SVRIC Diversion Dam) may require additional surveys prior to project commencement. For specific survey coverage during the July survey (when streamflows were lower and more instream area could be accessed), see Appendix C.

Table 4. Dates, survey times, and personnel for rare plant and sensitive natural community surveys on Deer Creek in 2018.

Season	Date	Survey Time	Personnel	Notes
Spring	4/9/2018	7 hrs 45 min	Sunny Loya	Survey time does not include 2 hrs spent looking for reference population of *Fritillaria pluriflora*
Spring	4/10/2018	6 hrs	Sunny Loya	Survey time does not include 1 hr 30 min spent looking for reference populations of *Fritillaria pluriflora* and vernal pool species
Spring	4/11/2018	6 hrs 30 min	Sunny Loya	Survey time does not include 1 hr 45 min spent looking for reference populations of *Fritillaria pluriflora*
Spring	4/12/2018	5 hrs 30 min	Sunny Loya	Survey time does not include 2 hrs 30 min spent looking for reference populations of *Fritillaria pluriflora*
Summer	7/1/2018	8 hrs	Sunny Loya	*Erythranthe glaucescens* encountered and documented
Summer	7/2/2018	8 hrs	Sunny Loya	*Erythranthe glaucescens* encountered and documented
Summer	7/3/2018	8 hrs 25 min	Sunny Loya	*Erythranthe glaucescens* encountered and documented

4 RESULTS AND DISCUSSION

Deer Creek riparian vegetation was mostly composed of three sensitive natural communities: Great Valley valley oak riparian forest and Great Valley cottonwood riparian forest, with smaller patches of California sycamore alluvial woodland. Other cover types included white alder, narrowleaf willow, California annual grasslands, and Mediterranean California naturalized annual and perennial grasslands. No changes were made to the cover type attributes of the existing vegetation maps, and therefore the extent of sensitive plant communities in the survey area is the same as in the Great Valley Ecoregion Vegetation dataset [ds2632].

Following project implementation, the overall extent of the sensitive natural communities may decrease in the short term due to streambank erosion. The levee setbacks proposed between Red Bridge and the SVRIC Diversion Dam, and the flood easement on the north bank upstream of Red Bridge, will increase the floodway width and allow for natural channel migration. Several patches of sensitive natural communities occur on the levee banks and are only a single tree wide. Many of the legacy trees (i.e., 100 years or older) in these patches have at least half of their root volumes exposed (Figure 6) and will very likely be scoured away as the channel migrates into its wider floodway. While the restoration of this natural process is one of the objectives of the Deer Creek Flood and Ecosystem Improvement Project, it will result in localized loss of mature riparian trees that will take at least 50 years to replace structurally. However, the contribution of large wood to the channel will improve salmonid habitat and geomorphic processes that facilitate long-term riparian vegetation initiation, establishment, and resiliency. The sensitive natural communities in the survey area will also likely benefit from the increased area for colonization and growth, hydrologic connection between the floodplain and the channel, and increased in-channel substrate diversity.

Figure 6. Legacy valley oak tree in a narrow band of Great Valley valley oak riparian forest growing on a levee on Deer Creek, showing highly exposed roots and the likelihood for scour once levees are set back. In this case, the Great Valley valley oak patch is a single tree wide, and the area of this sensitive natural community would be greatly reduced if the tree were lost to scour.

A total of 297 plant species were identified in the rare plant survey areas (Appendix D). During the spring surveys (April 9–12), flows ranging from 700 cfs to 1,200 cfs made much of the riparian area inaccessible. Flows had receded to approximately 100 cfs during the summer survey (July 1–3), thus exposing a much larger proportion of the survey area to field visitation and the colonization by plants.

During the summer survey, a seedling with the potential to be woolly rose mallow (*Hibiscus lasiocarpos* ssp. *occidentalis*) was observed (Figure 7). It had two heart-shaped leaves with irregularly dentate margins and palmate venation. The upper surface of each leaf was velutinous (i.e., velvety) and the underside had stellate hairs along the veins. This combination of traits strongly suggests the plant may have been woolly rose mallow. No mature individuals were identified during surveys. Woolly rose mallow blooms from June to September and has very showy, distinctive flowers that range from 2.5 to 4 inches wide. The summer survey occurred well within the blooming period and it is likely that mature individuals would have been located if they were present. Woolly rose mallow has a California Rare Plant Rank 1B.2 (Appendix B) and is protected under CEQA (Appendix B).

The habitat within the survey area is suitable for woolly rose mallow and it is possible this species may occur along Deer Creek. Woolly rose mallow grows in freshwater marshes and swamps, specifically on moist, freshwater-soaked river banks and low peat islands in sloughs, though it has also been found on riprap and levees. It frequently co-occurs with obligate wetland plants such as cattails (*Typha latifolia*) and tule (*Schoenoplectus actus*). It has been documented in California mostly from the Sacramento–San Joaquin River delta. The closest and most northern documented location of woolly rose mallow in the CNDDB is in Butte County south of Chico, although CalFlora shows a single (unvouchered) report from Woodson Bridge State Recreation Area, which is considerably closer to the project area. Aside from the northern California occurrences, the next nearest occurrences are in northwestern Mexico and New Mexico. Due to the inconclusive results of the rare plant survey (i.e., a single seedling that may have been rose mallow), it is not possible to say that woolly rose mallow does not occur in the survey area. However, it is possible to say that mature individuals were not observed during extensive plant surveys in April and July 2018. Therefore, additional surveys for woolly rose mallow are recommended for those specific locations where heavy equipment and other disturbance-related project activities will occur on moist streambanks and inundated marshes.

Within the four survey areas, 39 shield-bracted monkeyflower plants (*Erythranthe glaucescens*) were encountered (Figure 7, Figure 8, Appendix E). Shield-bracted monkeyflower has a California Rare Plant Rank 4.3 (Appendix B) and is recommended by CNPS for protection under CEQA (CNPS 2018). In the survey areas, shield-bracted monkeyflower occurred within the active channel, on cobble bars and streambanks, and in sand deposits near slow-moving or ponded backwater areas. Many plants occurred singly or in small groups, and it was possible to count all individuals encountered.

The locations where shield-bracted monkeyflower occurred in the survey areas were close to the summer low-flow channel edge. Proposed heavy equipment activities, such as levee

setbacks, bank protection, and levee improvements/new construction, are located beyond the active bankfull channel and therefore should be able to avoid shield-bracted monkeyflower locations. Additionally, if any disturbance was required at a shield-bracted monkeyflower location, impacts to this annual species could be reduced by waiting until the species completed its life cycle and set seeds.

*Figure 7. Locations within the four survey areas where rare and noxious weed species were encountered during rare plant and sensitive natural community surveys on Deer Creek in 2018. One potential rose mallow (*Hibiscus lasiocarpos *var.* occidentalis*) seedling was encountered downstream of the Union Pacific Railroad. Shield-bracted monkeyflower (*Erythranthe glaucescens*) was encountered as mostly scattered individuals throughout the survey areas downstream of Red Bridge.*

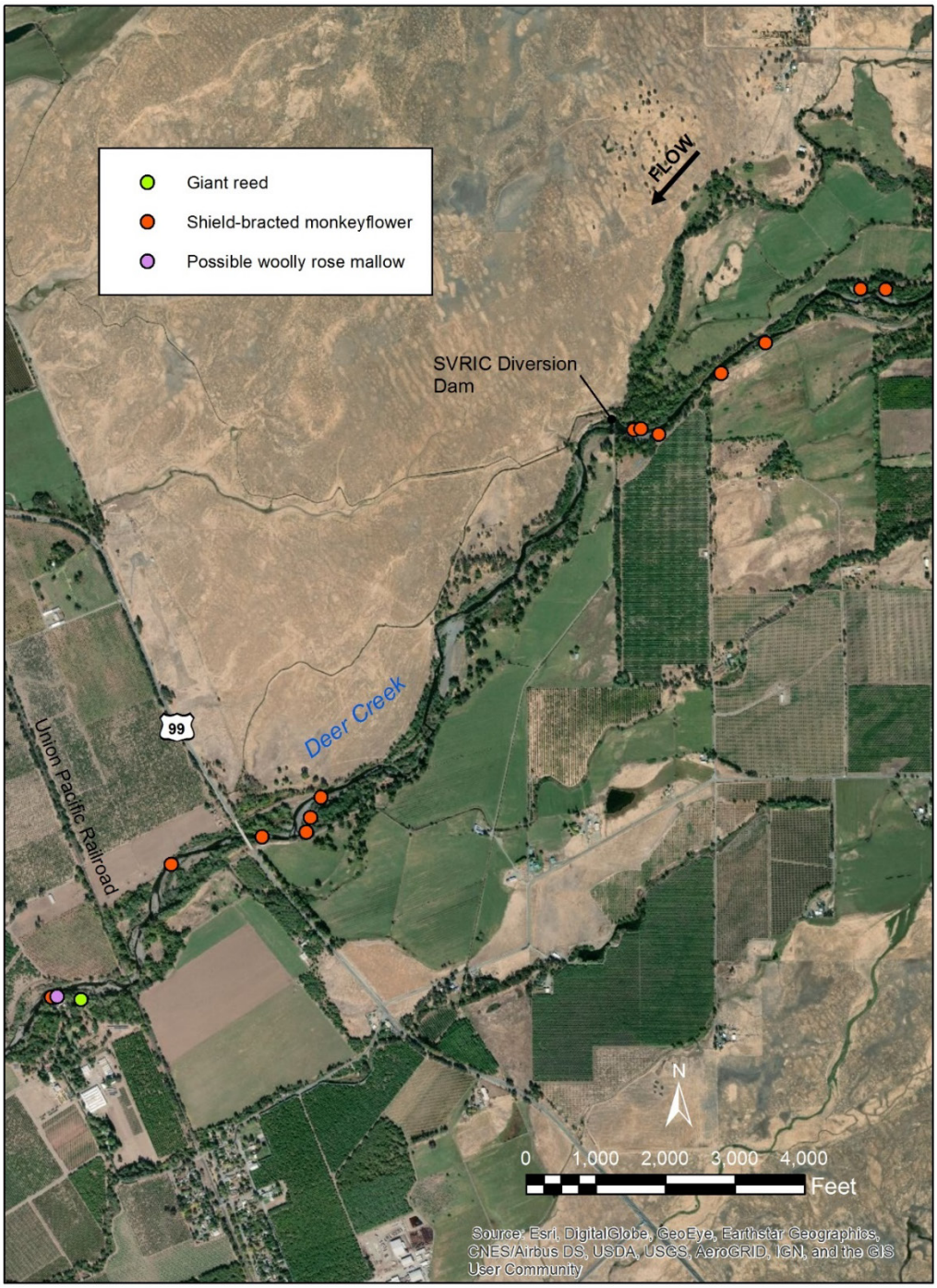


Figure 8. Shield-bracted monkeyflower (Erythranthe glaucescens) found on Deer Creek July 1–3, 2018. Note fused bracts below inflorescence. Shield-bracted monkeyflower has a California Rare Plant Rank of 4.3 (see Appendix B).

The spring survey on April 9–12 occurred two days after a spring rainstorm that caused Deer Creek flows to increase from approximately 500 cfs to over 3,000 cfs at the Deer Creek near Vina USGS gage. Flows had decreased to approximately 1,000 cfs at the start of the spring surveys and continued to decrease to around 700 cfs by April 12. During the April survey, much of the active channel showed very recent silt deposits and scour (Figure 9). Additionally, a large proportion of the riparian areas within each survey area was either under water or isolated by deep channels of flowing water and therefore inaccessible. Streamflows continued to recede gradually throughout the summer. The timing of the spring survey coupled with the timing of spring runoff may have reduced the ability to detect silky cryptantha (*Cryptantha crinita*), which blooms from April to May, and typically grows on gravelly streambanks (Table 3). Habitat for silky cryptantha was under water during the April survey, and silky cryptantha was no longer blooming during the July survey; therefore, it may not have been detected even if it was present.

Blue elderberry (*Sambucus nigra* ssp. *caerulea*) was widespread and abundant within the survey areas. Elderberry species are obligate larval hosts of the federally endangered valley elderberry longhorn beetle (VELB, *Desmocerus californicus dimorphus*), which spends several larval stages within a single elderberry plant. Any proposed impacts to elderberry shrubs may also impact VELB. Larval exit holes were casually observed during rare plant

surveys, although no attempt was made to determine how recently the holes may have been made. Detailed surveys of blue elderberry locations within each survey area following the USFWS framework will be necessary to determine whether there are likely to be impacts to VELB populations (USFWS 2017).

Figure 9. A high flow channel showing recent scour and deposition resulting from April 7, 2018, rainfall event. Photo taken April 10, 2018, when flows in the main channel of Deer Creek were approximately 1,000 cfs.

A single patch of giant reed (*Arundo donax*) was observed within the four survey areas (Figure 7). Giant reed is a non-native species designated as a noxious weed that threatens riparian areas by outcompeting native hardwoods, such as willows and cottonwoods (Cal-IPC 2009). It often forms dense monocultures and is extremely difficult to remove once established (DiTomaso et al. 2013). The giant reed patch was located near the proposed ring levee location on Monastery property. During any proposed heavy equipment activities, the patch of giant reed should be carefully removed and disposed of following the control method most likely to succeed under project-specific conditions (DiTomaso et al. 2013). A non-native plant management plan for the Deer Creek Flood and Ecosystem Improvement Project would help to improve the project outcome by reducing the risk of non-native plant invasion.

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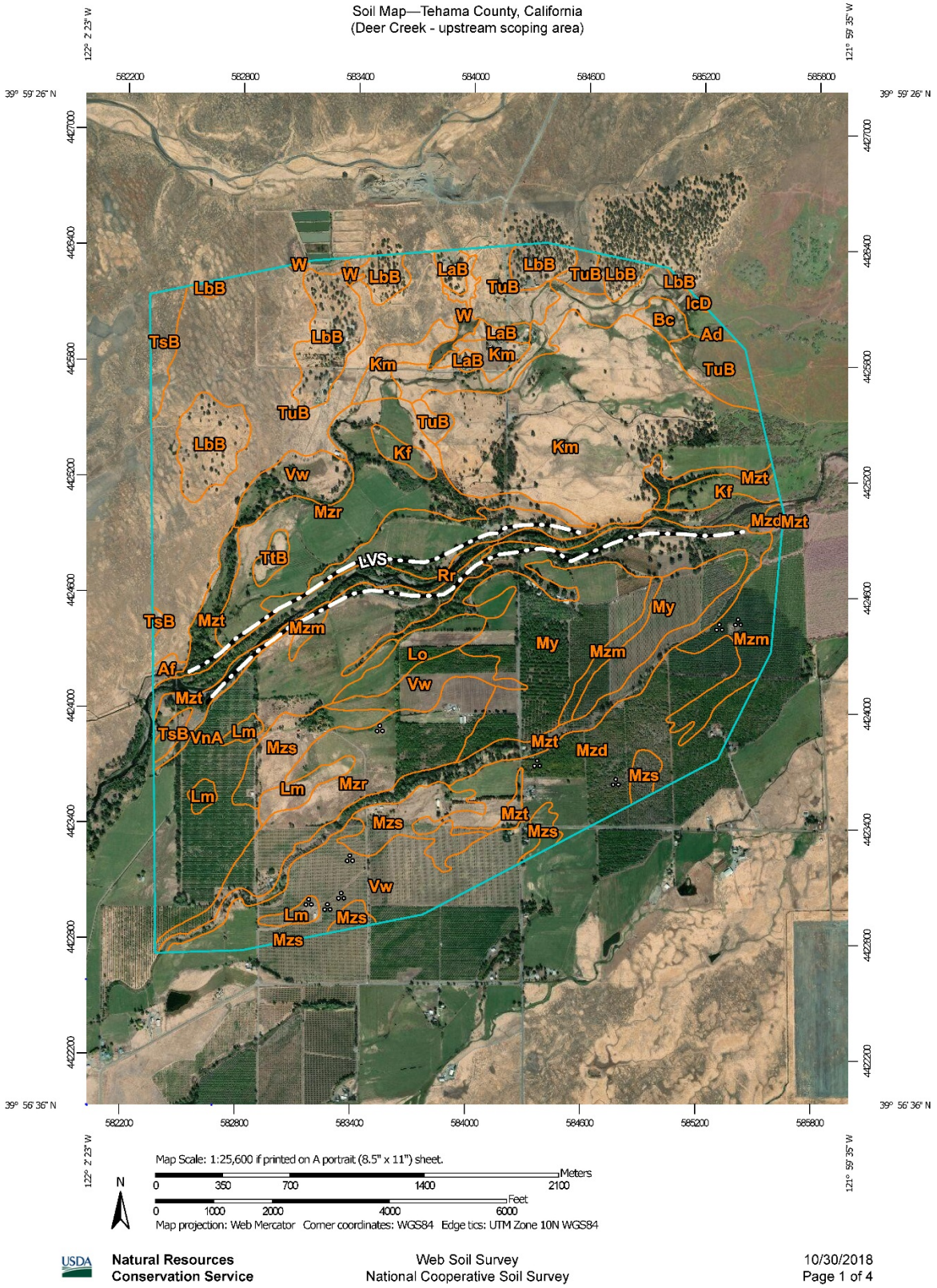
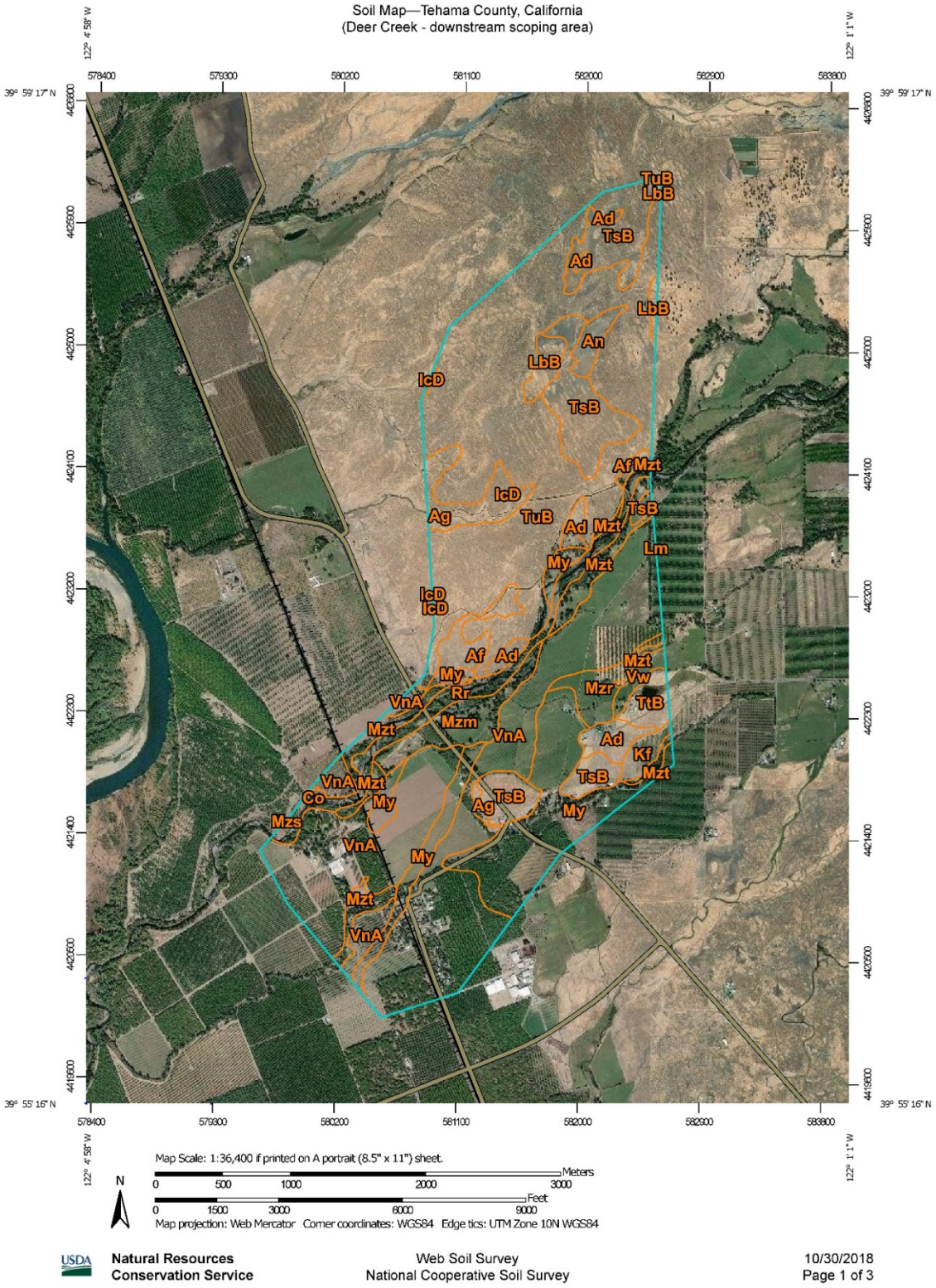
6 APPENDIX A: SOILS IN THE SCOPING AREA

Soil map of the upstream scoping area on Deer Creek. Map codes can be found in Table 2.



Soil map of the downstream scoping area on Deer Creek. Map codes can be found in Table 2.



7 APPENDIX B: RARITY STATUS DESCRIPTIONS

There are federal and state laws enacted to protect some native plants, especially those whose populations or overall abundance has declined. The Federal Endangered Species Act (ESA) of 1974 was the first national legislation that protected plants native to the United States that were in decline due to habitat loss (i.e., human development and/or exploitation). The U.S. Fish and Wildlife Service is responsible for administering provisions of the Federal ESA. The California Endangered Species Act of 1984 supplements the federal ESA and is administered by the California Department of Fish and Wildlife. Both the federal and state ESAs designated plants as "Endangered" or "Threatened" (Table 5).

Table 5. Rarity definitions for Endangered and Threatened plant species listed under federal and California Endangered Species Acts, and other laws protecting species with these designations.

Rarity Designation	Definition	Law(s) Pertaining to Protection	Administering Agency
Endangered	Any species that is in danger of extinction throughout all or a significant portion of its range	Federal ESA, California ESA	U.S. Fish and Wildlife Service, California Department of Fish and Wildlife
Threatened	Any species that is likely to become an endangered species throughout all or a significant portion of its range	Federal ESA, California ESA	U.S. Fish and Wildlife Service California, Department of Fish and Wildlife

Rare	1. Although not presently threatened with extinction, existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or 2. Likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the federal ESA	California Environmental Quality Act, Native Plant Protection Act	California Department of Fish and Wildlife

Additional protections have been established for plant species that are not listed under the federal or state ESA but may still meet the definition of rare or endangered. CDFW, in conjunction with CNPS and botanical experts, maintains a list of rare, threatened, and endangered plants in California (CNPS 2018a, CDFW 2018b) that may warrant protection under the California Environmental Quality Act (CEQA) of 1970. The California Rare Plant Rank represents the degree of rarity of California plant species not formally listed but that meet rarity definitions (Table 6). In addition to a rarity ranking, the California Rare Plant Rank includes a threat level description that ranges from seriously threatened in California to not at all threatened (Table 6). As an example, woolly rose mallow is not listed under the federal or state ESAs but has a California Rare Plant Rank of 1B.2, which means it is rare throughout its range and is somewhat threatened in California. It meets the definition of rare and must be considered during the environmental review process.

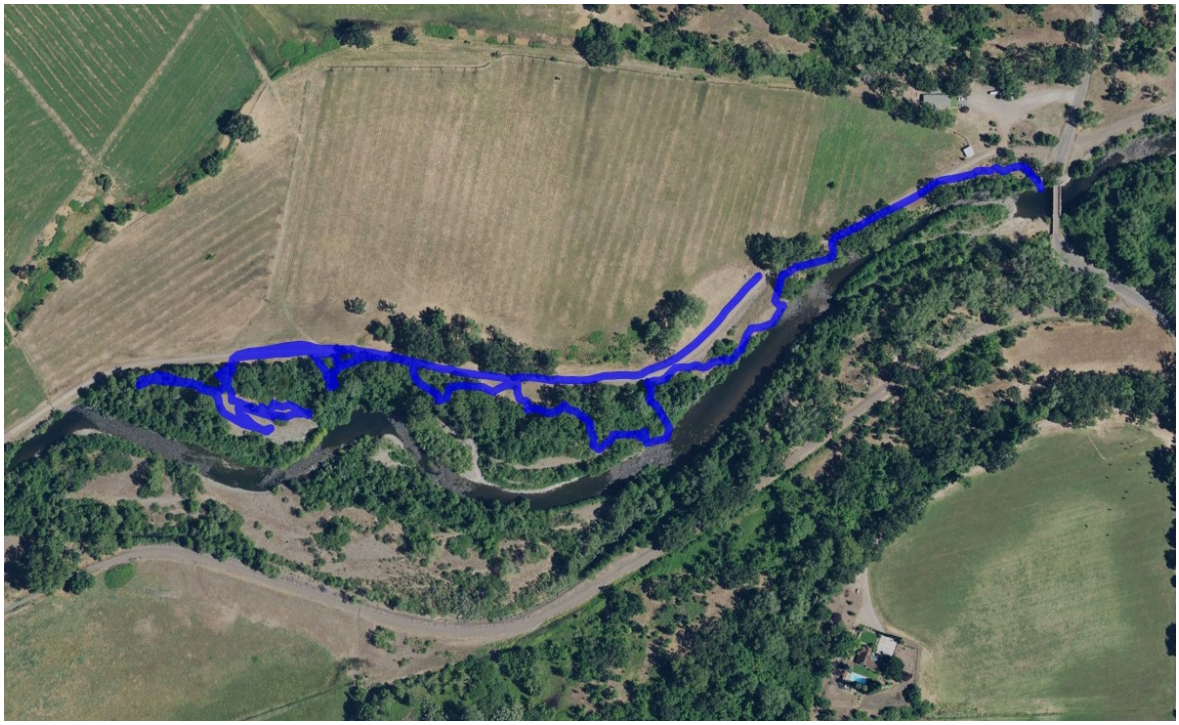
Table 6. California Rare Plant Rank listings and definitions for plant species that meet the definition of rare or endangered, even though they may not be listed under the federal or state ESAs.

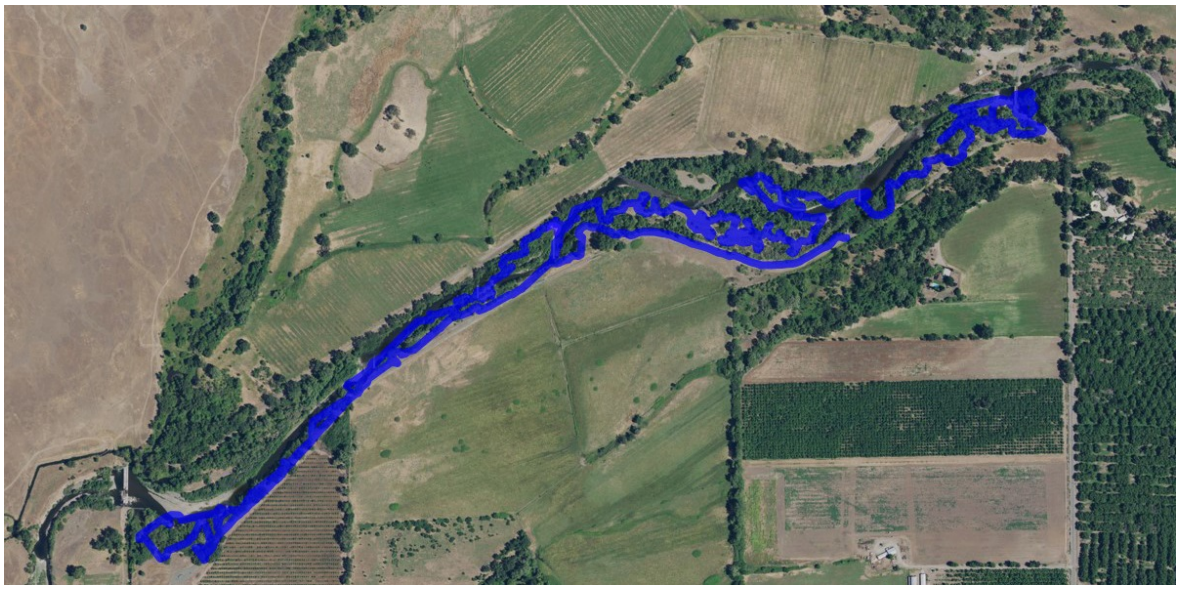
California Rare Plant Rank	Definition	Notes
List 1A	Plants presumed extirpated in California and either rare or extinct elsewhere	Has not been seen or documented in California in the wild for many years. Meets the definitions of CA ESA and is eligible for state listing. Should it be rediscovered, potential

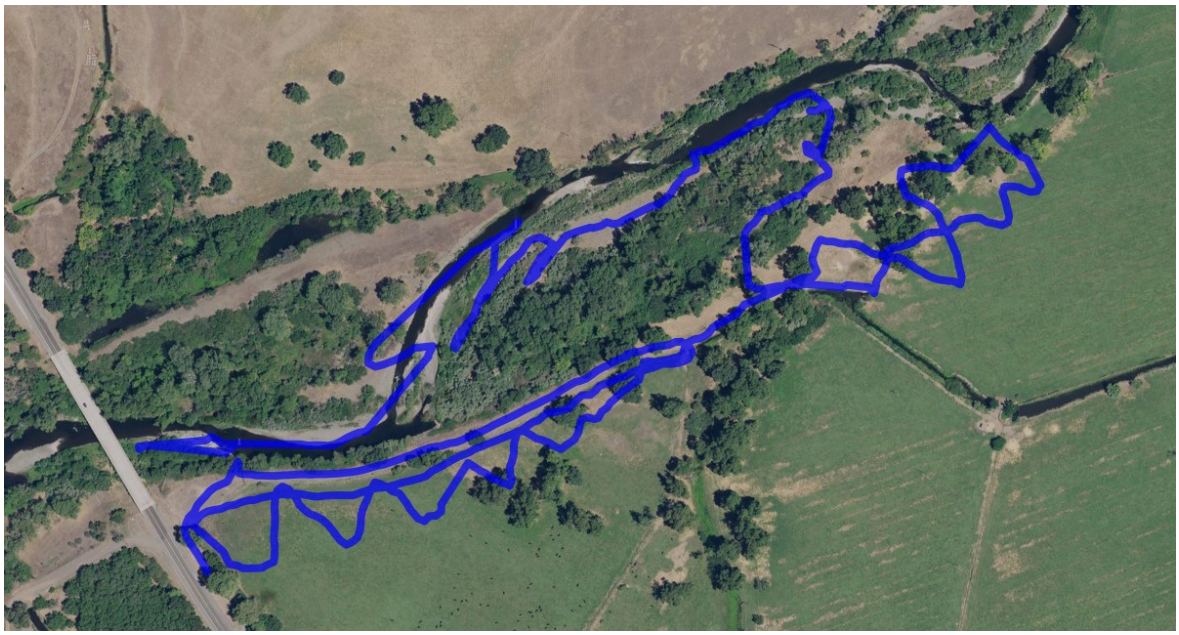
		impacts would need to be addressed under CEQA.
List 1B	Plants rare, threatened, or endangered in California and elsewhere	Has declined significantly over the last century. Meets the definitions of CA ESA and is eligible for state listing. Potential impacts must be addressed under CEQA.
List 2A	Plants presumed extirpated in California but common elsewhere	Has not been seen or documented in California in the wild for many years. Meets the definitions of CA ESA and is eligible for state listing. Should it be rediscovered, potential impacts would need to be addressed under CEQA.
List 2B	Plants rare, threatened, or endangered in California but common elsewhere	Differs from List 1B in that species are more common outside state boundaries. Intended to protect geographic range of widespread species and genetic diversity that occurs near the outer boundaries of a species' range. Meets the definitions of CA ESA and is eligible for state listing. Potential impacts must be addressed under CEQA.
List 3	Review list of species about which more information is needed	Lacking information necessary to assign species to one of the other ranks or reject them. Many species meet the definitions of CA ESA and are eligible for state listing. Potential impacts should be addressed under CEQA.
List 4	Plants of limited distribution	Of limited distribution or infrequent throughout a broader area in California. Some species meet the definitions of CA ESA though few are eligible for state listing. However, many are locally significant and potential impacts should be addressed under CEQA.
Threat Rank	**Definition**	**Notes**
0.1	Seriously threatened in California	Over 80% of occurrences threatened/high degree and immediacy of threat
0.2	Moderately threatened in California	20–80% of occurrences threatened/moderate degree and immediacy of threat
0.3	Not very threatened in California	Less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known

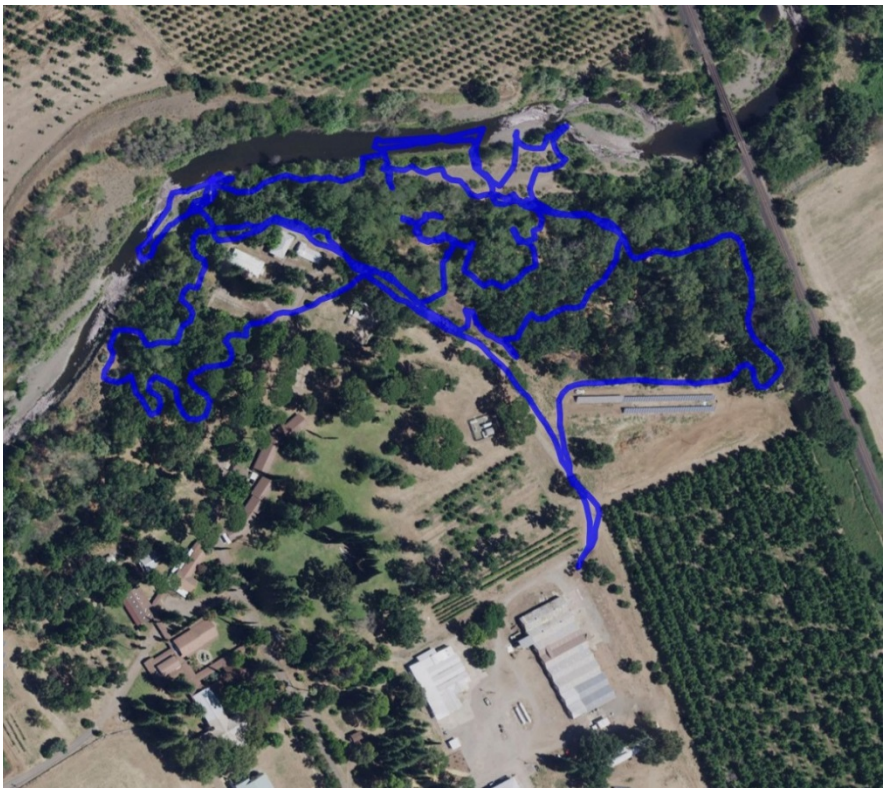
In addition to individual plant species, natural communities also warrant consideration during environmental review under CEQA. Natural communities (i.e., alliance-level classification, Sawyer et al. 2009) are given a global (G) and state (S) rarity ranking ranging from 1 (rare and threatened) to 5 (secure). Natural communities with state rankings of S1–S3 are considered sensitive and are mapped by the Vegetation Mapping and Classification Program (VegCAMP). During pre-project scoping (i.e., nine-quad search), sensitive natural communities with state rankings of S1–S3 are included with the list of rare plant species that have been documented in the scoping area.

APPENDIX C: SURVEY ROUTES FOR RARE PLANT AND SENSITIVE NATURAL COMMUNITY SURVEYS JULY 1–3, 2018









8 APPENDIX D: SPECIES LIST

Type	Botanical Name	Common Name	Family	Hydric Code	Native/ Exotic
Tree	*Acer macrophyllum*	bigleaf maple	Aceraceae	FACU	N
Tree	*Acer negundo*	California box-elder	Aceraceae	FAC	N
Tree	*Ailanthus altissima*	Tree of Heaven	Simaroubaceae	FACU	E
Tree	*Alnus rhombifolia*	white alder	Betulaceae	FACW	N
Tree	*Calocedrus decurrens*	incense cedar	Cupressaceae	UPL	N
Tree	*Eucalyptus camaldulensis*	river red gum	Myrtaceae	FAC	E
Tree	*Ficus carica*	edible fig	Moraceae	FACU	E
Tree	*Fraxinus latifolia*	Oregon ash	Oleaceae	FACW	N
Tree	*Hesperocyparis macrocarpa*	Monterey cypress	Cupressaceae	UPL	N
Tree	*Juglans hindsii*	Northern California black walnut	Juglandaceae	FAC	N
Tree	*Juglans ×paradox*	paradox hybrid walnut	Juglandaceae	UPL	E
Tree	*Juglans regia*	English walnut	Juglandaceae	UPL	E
Tree	*Melia azedarach*	Chinaberry	Meliaceae	FACU	E
Tree	*Morus alba*	white mulberry	Moraceae	FACU	E
Tree	*Olea europaea*	olive	Oleaceae	UPL	E
Tree	*Persea Americana*	avocado	Lauraceae	UPL	E
Tree	*Pinus sabiniana*	grey pine	Pinaceae	UPL	N
Tree	*Pinus* sp.	pine	Pinaceae		E
Tree	*Platanus racemosa*	California sycamore	Platanaceae	FACW	N

Tree	*Populus fremontii*	Fremont cottonwood	Salicaceae	FAC	N
Tree	*Prunus cerasifera*	cherry plum	Rosaceae	UPL	E
Tree	*Quercus chrysolepis*	canyon live oak	Fagaceae	UPL	N
Tree	*Quercus lobata*	valley oak	Fagaceae	FACU	N
Tree	*Quercus wislizenii* var. *wislizenii*	interior live oak	Fagaceae	UPL	N
Tree	*Robinia pseudoacacia*	black locust	Fabaceae	FACU	E
Tree	*Salix gooddingii*	black willow	Salicaceae	FACW	N
Tree	*Salix laevigata*	red willow	Salicaceae	FACW	N
Tree	*Sequoia sempervirens*	coast redwood	Cupressaceae	UPL	N
Tree	*Thuja plicata*	western redcedar	Cupressaceae	FAC	N
Tree	*Umbellularia californica*	California bay-laurel	Lauraceae	FAC	N
Shrub	*Aesculus californica*	California buckeye	Hippocastanaceae	UPL	N
Shrub	*Baccharis pilularis*	coyote brush	Asteraceae	UPL	N
Shrub	*Baccharis salicifolius* ssp. *salicifolius*	mulefat	Asteraceae	FACW	N
Shrub	*Brickellia californica*	California brickellbush	Asteraceae	FACU	N
Shrub	*Buddleia davidii*	butterfly bush	Scrophulariaceae	FACU	E
Shrub	*Calycanthus occidentalis*	spicebush	Calycanthaceae	FAC	N
Shrub	*Ceanothus cuneatus*	wedgeleaf ceanothus	Rhamnaceae	UPL	N
Shrub	*Cephalanthus occidentalis*	button-willow	Rubiaceae	OBL	N
Shrub	*Cercis occidentalis*	redbud	Fabaceae	UPL	N

Shrub	*Frangula californica* ssp. *tomentella*	California buckthorn	Rhamnaceae	UPL	N
Shrub	*Frangula purshiana*	cascara buckthorn	Rhamnaceae	FAC	N
Shrub	*Genista monspessulana*	French broom	Fabaceae	UPL	E
Shrub	*Juniper* sp.	ornamental juniper	Cupressaceae		E
Shrub	*Nerium oleander*	common oleander	Apocynaceae	UPL	E
Shrub	*Prunus dulcis*	almond	Rosaceae	UPL	E
Shrub	*Rosa californica*	California rose	Rosaceae	FAC	N
Shrub	*Rosa nutkana* ssp. *macdougalii*	wild rose	Rosaceae	FAC	N
Shrub	*Rosa* sp.	rose	Rosaceae		E
Shrub	*Salix exigua*	sandbar willow	Salicaceae	FACW	N
Shrub	*Salix lasiolepis*	arroyo willow	Salicaceae	FACW	N
Shrub	*Salix melanopsis*	dusky willow	Salicaceae	OBL	N
Shrub	*Sambucus nigra* ssp. *caerulea*	valley elderberry	Caprifoliaceae	FAC	N
Shrub	*Toxicodendron diversilobum*	poison-oak	Anacardiaceae	FAC	N
Vine	*Aristolochia californica*	California pipevine	Aristolochiaceae	UPL	N
Vine	*Convolvulus arvensis*	bindweed	Convolvulaceae	UPL	E
Vine	*Hedera helix*	English ivy	Araliaceae	FACU	E
Vine	*Rubus armeniacus*	Himalaya berry	Rosaceae	FAC	E
Vine	*Rubus leucodermis*	blackcap raspberry	Rosaceae	FACU	N
Vine	*Rubus ursinus*	California blackberry	Rosaceae	FACU	N

Vine	*Vinca major*	greater periwinkle	Apocynaceae	UPL	E
Vine	*Vitis californica*	California grape	Vitaceae	FACU	N
Vine	*Vitis vinifera*	wine grape	Vitaceae	UPL	E
Herb	*Achyrachaena mollis*	blow-wives	Asteraceae	FAC	N
Herb	*Acmispon americanus* var. *americanus*	pink lotus	Fabaceae	FACU	N
Herb	*Acmispon strigosus*	strigose bird's-foot trefoil	Fabaceae	UPL	N
Herb	*Amaranthus albus*	prostrate pigweed	Amaranthaceae	FACU	E
Herb	*Ambrosia acanthicarpa*	flatspine bur ragweed	Asteraceae	UPL	N
Herb	*Ambrosia artemisiifolia*	annual ragweed	Asteraceae	FACU	E
Herb	*Ammannia robusta*	grand redstem	Lythraceae	OBL	N
Herb	*Amsinckia menziesii*	small-flowered fiddleneck	Boraginaceae	UPL	N
Herb	*Anagalis arvensis*	scarlet pimpernel	Mysinaceae	UPL	E
Herb	*Anaphalis margaritacea*	pearly everlasting	Asteraceae	FACU	N
Herb	*Anthriscus caulcalis*	bur-chervil	Apiaceae	UPL	E
Herb	*Antirrhinum cornutum*	spurred snapdragon	Plantaginaceae	UPL	N
Herb	*Artemisia douglasiana*	mugwort	Asteraceae	FACW	N
Herb	*Arum italicum*	Italian arum	Araceae		E
Herb	*Asclepias fascicularis*	narrow-leaved milkweed	Asclepiadaceae	FAC	N
Herb	*Brassica nigra*	black mustard	Brassicaceae	UPL	E
Herb	*Brassica rapa*	field mustard	Brassicaceae	FACU	E

Herb	*Calandrinia menziesii*	red maids	Montiaceae	UPL	N
Herb	*Calycadenia truncata*	Oregon western rosinweed	Asteraceae	UPL	N
Herb	*Capsella bursa-pastoris*	shepherd's purse	Brassicaceae	FACU	E
Herb	*Cardamine oligosperma*	bitter-cress	Brassicaceae	FAC	N
Herb	*Castilleja attenuata*	valley tassels	Orobanchaceae	UPL	N
Herb	*Centromadia fitchii*	Fitch's tarweed	Asteraceae	FACU	N
Herb	*Centaurea solstitialis*	yellow star-thistle	Asteraceae	UPL	E
Herb	*Cerastium fontanum* ssp. *vulgare*	common mouse-ear chickweed	Caryophyllaceae	FACU	E
Herb	*Cerastium glomeratum*	sticky mouse-ear chickweed	Caryophyllaceae	FACU	E
Herb	*Cirsium vulgare*	bull thistle	Asteraceae	FACU	E
Herb	*Claytonia perfoliata* ssp. *perfoliata*	miner's lettuce	Montiaceae	FAC	N
Herb	*Conium maculatum*	poison hemlock	Apiaceae	FAC	E
Herb	*Croton setiger*	turkey mullein	Euphorbiaceae	UPL	N
Herb	*Cuscuta* sp.	dodder	Caryophyllaceae		N
Herb	*Datisca glomerata*	Durango root	Datiscaceae	FACW	N
Herb	*Datura wrightii*	jimson weed	Solanaceae	UPL	E
Herb	*Daucus carota*	Queen Anne's lace	Apiaceae	FACU	E
Herb	*Dichelostemma capitata*	blue dicks	Themidaceae	FACU	N
Herb	*Diplacus constrictus*	sticky monkeyflower	Phyrmaceae	UPL	N
Herb	*Dysphania botrys*	Jerusalem oak	Chenopodiaceae	FACU	E

Herb	*Epilobium ciliatum*	willow-herb	Onagraceae	FACW	N
Herb	*Epipactus gigantea*	stream orchid	Orchidaceae	OBL	N
Herb	*Erigeron canadensis*	Canadian horseweed	Asteraceae	FACU	N
Herb	*Erigeron petrophilus*	rock-loving fleabane	Asteraceae	UPL	N
Herb	*Erigeron philadelphicus*	fleabane daisy	Asteraceae	FACU	N
Herb	*Eriogonum vimineum*	wickerstem buckwheat	Polygonaceae	UPL	N
Herb	*Eriogonum* sp.	buckwheat	Polygonaceae		N
Herb	*Eriophyllum lanatum*	woolly sunflower	Asteraceae	UPL	N
Herb	*Erodium botrys*	broadleaf filaree	Geraniaceae	FACU	E
Herb	*Erodium cicutarium*	redstem filaree	Geraniaceae	UPL	E
Herb	*Erodium moschatum*	greenstem filaree	Geraniaceae	UPL	E
Herb	*Erythranthe cardinalis*	scarlet monkeyflower	Phyrmaceae	FACW	N
Herb	*Erythranthe floribunda*	many-flowered monkeyflower	Phyrmaceae	OBL	N
Herb	*Erythranthe glaucescens*	shield-bracted monkeyflower	Phyrmaceae	OBL	N
Herb	*Erythranthe guttata*	stream monkeyflower	Phyrmaceae	OBL	N
Herb	*Eschscholzia californica*	California poppy	Papaveraceae	UPL	N
Herb	*Euphorbia glyptosperma*	ridge-seeded spurge	Euphorbiaceae	UPL	N
Herb	*Euphorbia lathyris*	gopher spurge	Euphorbiaceae	UPL	E
Herb	*Euphorbia maculata*	spotted sandmat	Euphorbiaceae	UPL	E
Herb	*Galium aparine*	goosegrass	Rubiaceae	FACU	N

Herb	*Galium divaricatum*	Lamarck's bedstraw	Rubiaceae	UPL	E
Herb	*Geranium carolinianum*	Carolina crane's bill	Geraniaceae	UPL	N
Herb	*Geranium dissectum*	cutleaf geranium	Geraniaceae	UPL	E
Herb	*Geranium molle*	dovefoot geranium	Geraniaceae	UPL	E
Herb	*Grindelia camporum*	Great Valley gumweed	Asteraceae	FACW	N
Herb	*Helianthus annus*	sunflower	Asteraceae	FACU	E
Herb	*Heterotheca grandiflora*	telegraph weed	Asteraceae	UPL	N
Herb	*Heterotheca oregona*	Oregon golden-aster	Asteraceae	FACU	N
Herb	*Hirschfeldia incana*	tumblemustard	Brassicaceae	UPL	E
Herb	*Hypericum anagalloides*	tinker's penny	Hypericaceae	OBL	N
Herb	*Hypericum perforatum*	St. John's wort	Hypericaceae	FACU	E
Herb	*Hypochaeris glabra*	smooth cat's-ear	Asteraceae	UPL	E
Herb	*Hypochaeris radicata*	rough cat's-ear	Asteraceae	FACU	E
Herb	*Lactuca serriola*	prickly lettuce	Asteraceae	FACU	E
Herb	*Lagophylla ramosissima*	slender hareleaf	Asteraceae	UPL	N
Herb	*Lamium amplexicaule*	henbit	Lamiaceae	UPL	E
Herb	*Lasthenia californica* ssp. *californica*	California goldfields	Asteraceae	UPL	N
Herb	*Layia fremontii*	Fremont's tidy tips	Asteraceae	UPL	N
Herb	*Leontodon saxatilis*	hairy hawkbit	Asteraceae	FACU	E

Herb	*Lepidium latifolium*	perennial pepperweed	Brassicaceae	FACU	E
Herb	*Lepidium nitidum*	shining pepperweed	Brassicaceae	FAC	N
Herb	*Leptosiphon bicolor*	true babystars	Polemoniaceae	FACU	N
Herb	*Leucanthemum vulgare*	ox-eye daisy	Asteraceae	FACU	E
Herb	*Lindernia dubia*	yellowseed false pimpernel	Scrophulariaceae	OBL	N
Herb	*Lithophragma campanulatum*	Siskiyou mountain woodland star	Saxifragaceae	UPL	N
Herb	*Lotus corniculatus*	bird's-foot trefoil	Fabaceae	FAC	E
Herb	*Lupinus bicolor*	miniature lupine	Fabaceae	UPL	N
Herb	*Lupinus pachylobus ×bicolor*	hybrid between bigpod lupine and miniature lupine?	Fabaceae		N
Herb	*Lupinus succulentus*	arroyo lupine	Fabaceae	UPL	N
Herb	*Lycopus americanus*	bugleweed	Lamiaceae	UPL	N
Herb	*Madia citriodora*	lemon-scented madia	Asteraceae	UPL	N
Herb	*Malva parviflora*	cheeseweed	Malvaceae	UPL	E
Herb	*Marah fabacea*	California man-root	Cucurbitaceae	UPL	N
Herb	*Marrubium vulgare*	horehound	Lamiaceae	FACU	E
Herb	*Matricaria discoidea*	pineapple weed	Asteraceae	FACU	E
Herb	*Medicago polymorpha*	burclover	Fabaceae	FACU	E

Herb	*Medicago praecox*	Mediterranean medick	Fabaceae	UPL	E
Herb	*Medicago sativa*	alfalfa	Fabaceae	UPL	E
Herb	*Mentha arvensis*	wild mint	Lamiaceae	FACW	N
Herb	*Mentha ×piperita*	peppermint	Lamiaceae	FACW	E
Herb	*Mentha pulegium*	pennyroyal	Lamiaceae	OBL	E
Herb	*Mentha spicata*	spearmint	Lamiaceae	FACW	E
Herb	*Minuartia californica*	California sandwort	Caryophyllaceae	FACU	N
Herb	*Mollugo verticillata*	green carpetweed	Molluginaceae	FAC	N
Herb	*Myostis laxa*	bay forget-me-not	Boraginaceae	OBL	N
Herb	*Nemophila menziesii*	baby blue-eyes	Boraginaceae	UPL	N
Herb	*Oenothera elata* ssp. *hirsutissima*	Hooker's evening primrose	Onagraceae	FACW	N
Herb	*Opuntia* sp.	ornamental cactus	Cactaceae		
Herb	*Oxalis articulata* ssp. *rubra*	windowbox wood-sorrel	Oxalidaceae	UPL	E
Herb	*Persicaria lapathifolia*	willow weed	Polygonaceae	FACW	N
Herb	*Petrorrhagia dubia*	hairypink	Caryophyllaceae	UPL	E
Herb	*Phaseolus vulgaris*	common bean	Fabaceae		E
Herb	*Phoradendron leucarpum* ssp. *macrophyllum*	bigleaf mistletoe	Viscaceae		N
Herb	*Phoradendrom leucarpum* ssp. *tomentosum*	oak mistletoe	Viscaceae		N

Herb	*Phytolacca americana*	pokeweed	Phytolaccaceae	FACU	E
Herb	*Plagiobothrys bracteatus*	bracted popcornflower	Boraginaceae	FACW	N
Herb	*Plagiobothrys canescens* var. *canescens*	valley popcornflower	Boraginaceae	UPL	N
Herb	*Plagiobothrys fulvus* var. *campestris*	field popcornflower	Boraginaceae	UPL	N
Herb	*Plagiobothrys hystriculus*	bearded popcornflower	Boraginaceae	UPL	N
Herb	*Plagiobothrys stipitatus* var. *micranthus*	Great Valley popcornflower	Boraginaceae	FACW	N
Herb	*Plantago lanceolata*	English plantain	Plantaginaceae	FACU	E
Herb	*Polygonum aviculare*	prostrate knotweed	Polygonaceae	FAC	E
Herb	*Polygonum ramosissimum* ssp. *prolificum*	bushy knotweed	Polygonaceae	FAC	N
Herb	*Polygonum ramosissimum* ssp. *ramosissimum*	bushy knotweed	Polygonaceae	FAC	N
Herb	*Ranunculus muricatus*	spinyfruit buttercup	Ranunculaceae	FACW	E
Herb	*Raphanus raphanistrum*	jointed charlock	Brassicaceae	UPL	E
Herb	*Rotala ramosior*	lowland rotala	Lythraceae	OBL	N
Herb	*Rumex acetosella*	sheep-sorrel	Polygonaceae	FACU	E
Herb	*Rumex crispus*	yellow dock	Polygonaceae	FAC	E
Herb	*Rumex hymenosepalus*	wild-rhubarb	Polygonaceae	UPL	N
Herb	*Rumex transitorius*	willow dock	Polygonaceae	FACW	N
Herb	*Sanicula bipinnata*	poison sanicle	Apiaceae	UPL	N

Herb	*Saponaria officinalis*	soapwort	Caryophyllaceae	UPL	E
Herb	*Scleranthus annuus* ssp. *annuus*	knawel	Caryophyllaceae	UPL	E
Herb	*Senecio fremontii* var. *occidentalis*	western dwarf mountain ragwort	Asteraceae	UPL	N
Herb	*Senecio vulgaris*	common groundsel	Asteraceae	FACU	E
Herb	*Sherardia arvensis*	field madder	Rubiaceae	UPL	E
Herb	*Silene gallica*	windmill pink	Caryophyllaceae	UPL	E
Herb	*Silybum marianum*	milk thistle	Asteraceae	UPL	E
Herb	*Solanum* sp.	nightshade	Solanaceae		
Herb	*Solidago velutina* ssp. *californica*	three-nerve goldenrod	Asteraceae	UPL	N
Herb	*Sonchus asper*	prickly sow thistle	Asteraceae	FACU	E
Herb	*Sonchus oleraceus*	common sow thistle	Asteraceae	UPL	E
Herb	*Spergularia rubra*	red sand-spurrey	Caryophyllaceae	FAC	E
Herb	*Stachys* sp.	hedge nettle	Lamiaceae		N
Herb	*Stellaria media*	chickweed	Caryophyllaceae	FACU	N
Herb	*Taraxacum officinale*	dandelion	Asteraceae	FACU	E
Herb	*Thysanocarpus curvipes*	lacepod	Brassicaceae	UPL	N
Herb	*Tonella tenella*	lesser baby innocence	Scrophulariaceae	UPL	N
Herb	*Torilis arvensis*	Torilis	Apiaceae	UPL	E
Herb	*Tribulus terrestris*	puncture vine	Zygophyllaceae	UPL	N
Herb	*Trifolium dubium*	little hop clover	Fabaceae	FACU	E

Herb	*Trifolium glomeratum*	clustered clover	Fabaceae	UPL	E
Herb	*Trifolium hirtum*	rose clover	Fabaceae	UPL	E
Herb	*Trifolium repens*	white clover	Fabaceae	FAC	E
Herb	*Triphysaria eriantha*	butter-and-eggs	Orobanchaceae	UPL	N
Herb	*Triteleia hyacintha*	white hyacinth	Themidaceae	FAC	N
Herb	*Triteleia laxa*	wally baskets	Themidaceae	UPL	N
Herb	*Urtica dioica*	stinging nettles	Urticaceae	FAC	N
Herb	*Veratrum californicum* var. *californicum*	California false hellebore	Melanthiaceae	FAC	N
Herb	*Verbascum blattaria*	moth mullein	Scrophulariaceae	UPL	E
Herb	*Verbascum thapsus*	woolly mullein	Scrophulariaceae	FACU	E
Herb	*Veronica americana*	American speedwell	Plantaginaceae	OBL	N
Herb	*Veronica peregrina* ssp. *xalapensis*	purslane speedwell	Plantaginaceae	FACW	N
Herb	*Veronica persica*	Persian speedwell	Plantaginaceae	UPL	N
Herb	*Vicia sativa* ssp. *nigra*	narrow-leaved vetch	Fabaceae	UPL	E
Herb	*Vicia villosa* ssp. *varia*	hairy vetch	Fabaceae	UPL	E
Herb	*Viola glabella*	stream violet	Violaceae	FACW	N
Herb	*Xanthium strumarium*	cocklebur	Asteraceae	FAC	N
Grass	*Agrostis stolonifera*	creeping bentgrass	Poaceae	GAC	E
Grass	*Aira caryophyllea*	European hairgrass	Poaceae	FACU	E
Grass	*Arundo donax*	giant reed	Poaceae	FACW	E

Grass	*Avena barbata*	slender oat	Poaceae	UPL	E
Grass	*Avena fatua*	wild oat	Poaceae	UPL	E
Grass	*Brachypodium distachyon*	purple false brome	Poaceae	UPL	E
Grass	*Briza minor*	small quaking grass	Poaceae	FAC	E
Grass	*Bromus catharticus* var. *elatus*	Chilean brome	Poaceae	UPL	E
Grass	*Bromus diandrus*	ripgut brome	Poaceae	UPL	E
Grass	*Bromus hordeaceus*	soft chess	Poaceae	FACU	E
Grass	*Bromus madritensis* ssp. *madritensis*	foxtail chess	Poaceae	FACU	E
Grass	*Bromus madritensis* ssp. *rubens*	red brome	Poaceae	FACU	E
Grass	*Bromus secalinus*	brome	Poaceae	UPL	E
Grass	*Bromus tectorum*	cheat grass	Poaceae	UPL	E
Grass	*Cynodon dactylon*	Bermuda grass	Poaceae	FACU	N
Grass	*Cynosurus echinatus*	hedgehog dogtail	Poaceae	UPL	E
Grass	*Dactylis glomerata*	orchard grass	Poaceae	FACU	E
Grass	*Echinochloa crus-galli*	barnyard grass	Poaceae	FAC	E
Grass	*Elymus caput-medusae*	Medusa-head	Poaceae	UPL	E
Grass	*Elymus repens*	quack grass	Poaceae	FAC	E
Grass	*Elymus triticoides*	beardless wildrye	Poaceae	UPL	N
Grass	*Eragrostis mexicana* ssp. *virescens*	Mexican lovegrass	Poaceae	FAC	N

Grass	*Festuca arundinacea*	tall fescur	Poaceae	UPL	E
Grass	*Festuca microstachys*	Pacific fescue	Poaceae	UPL	N
Grass	*Festuca myuros*	rattail sixweeks grass	Poaceae	UPL	E
Grass	*Festuca perennis*	ryegrass	Poaceae	UPL	E
Grass	*Holcus lanatus*	velvet grass	Poaceae	FAC	E
Grass	*Hordeum brachyantherum*	California barley	Poaceae	FACW	N
Grass	*Hordeum murinum* ssp. *glaucum*	smooth barley	Poaceae	FAC	E
Grass	*Hordeum murinum* ssp. *murinum*	wall barley	Poaceae	FAC	E
Grass	*Leersia oryzoides*	rice cutgrass	Poaceae	OBL	N
Grass	*Muhlenbergia rigens*	deer grass	Poaceae	UPL	N
Grass	*Panicum capillare*	witchgrass	Poaceae	FAC	N
Grass	*Paspalum dilatatum*	Dallis grass	Poaceae	FAC	E
Grass	*Poa annua*	annual bluegrass	Poaceae	FAC	E
Grass	*Poa bulbosa*	bulbous bluegrass	Poaceae	FACU	E
Grass	*Poa pratensis* ssp. *pratensis*	Kentucky bluegrass	Poaceae	FAC	E
Grass	*Polypogon maritimus*	Mediterranean rabbitfoot grass	Poaceae	OBL	E
Grass	*Polypogon monspeliensis*	rabbitfoot grass	Poaceae	FACW	E
Grass	*Setaria pumila* ssp. *pumila*	yellow foxtail	Poaceae	FAC	E
Grass	*Sorghum halapense*	Johnsongrass	Poaceae	FACU	E

Grass	*Sporobolus airoides*	alkali sacaton	Poaceae	FAC	N
Graminoids and Emergent Aquatics	*Azolla* sp.	mosquito fern	Azollaceae	OBL	N
Graminoids and Emergent Aquatics	*Carex* sp.	sedge	Cyperaceae		
Graminoids and Emergent Aquatics	*Carex barbarae*	whiteroot	Cyperaceae	FAC	N
Graminoids and Emergent Aquatics	*Carex gracilior?*	slender sedge	Cyperaceae	UPL	N
Graminoids and Emergent Aquatics	*Carex nudata*	river sedge	Cyperaceae	OBL	N
Graminoids and Emergent Aquatics	*Cyperus eragrostis*	nutsedge	Cyperaceae	FACW	N
Graminoids and Emergent Aquatics	*Cyperus flavescens*	yellow flatsedge	Cyperaceae	OBL	N
Graminoids and Emergent Aquatics	*Darmera peltata*	Indian rhubarb	Saxifragaceae	OBL	N
Graminoids and Emergent Aquatics	*Eleocharis macrostachya*	pale spikerush	Cyperaceae		N
Graminoids and Emergent Aquatics	*Elodea canadensis*	common waterweed	Hydrocharitaceae	OBL	N
Graminoids and Emergent Aquatics	*Equisetum hyemale*	scouring rush	Equisetaceae	FACW	N

Graminoids and Emergent Aquatics	*Equisetum laevigatum*	smooth scouring rush	Equisetaceae	FACW	N
Graminoids and Emergent Aquatics	*Equisetum palustre*	marsh horsetail	Equisetaceae	FACW	N
Graminoids and Emergent Aquatics	*Iris pseudacorus*	yellow flag iris	Iridaceae	OBL	E
Graminoids and Emergent Aquatics	*Juncus articulatus* ssp. *articulatus*	jointleaf rush	Juncaceae	OBL	N
Graminoids and Emergent Aquatics	*Juncus bufonius*	toad rush	Juncaceae	FACW	N
Graminoids and Emergent Aquatics	*Juncus ensifolius*	swordleaf rush	Juncaceae	FACW	N
Graminoids and Emergent Aquatics	*Juncus patens*	spreading rush	Juncaceae	FACW	N
Graminoids and Emergent Aquatics	*Lemna* sp.	duckweed	Lemnaceae	OBL	N
Graminoids and Emergent Aquatics	*Nasturtium officinale*	water cress	Brassicaceae	OBL	N
Graminoids and Emergent Aquatics	*Persicaria amphibia*	water smartweed	Polygonaceae	OBL	N
Graminoids and Emergent Aquatics	*Sagittaria latifolia*	broadleaf arrowhead	Alismataceae	OBL	N
Graminoids and Emergent Aquatics	*Schoenoplectus acutus* var. *occidentalis*	tule	Cyperaceae	OBL	N
Graminoids and Emergent Aquatics	*Typha latifolia*	cattail	Typhaceae	OBL	N

Shield-bracted monkeyflower (Erythranthe glaucescens) *found on Deer Creek July 1–3, 2018. Note fused, glaucous bracts below inflorescence and asymmetric calyces.*

Shield-bracted monkeyflower (Erythranthe glaucescens) *found on Deer Creek July 1–3, 2018. Approximately 20 plants growing on moist sand deposit on mostly open cobble bar.*

Shield-bracted monkeyflower (Erythranthe glaucescens) *found on Deer Creek July 1–3, 2018. Two plants growing on cobbly edge of streambank within the active channel.*

Shield-bracted monkeyflower (Erythranthe glaucescens) *found on Deer Creek July 1–3, 2018. Growing on sparsely vegetated, moist sand deposit between large cobbles and boulders within the active channel.*

Shield-bracted monkeyflower (Erythranthe glaucescens) *found on Deer Creek July 1–3, 2018. Growing on coarse organic material between large cobbles and boulders within the active channel.*