Chapter 2
Existing Ecological Conditions

2.1 Introduction

This chapter describes the existing and historical physical and biological conditions in the Plan Area, including conditions related to the agricultural landscape, local ecological communities, and covered species. Information on the current environmental conditions and other data presented in this chapter address specific requirements of the Federal Endangered Species Act (FESA) and the Natural Community Conservation Planning Act (NCCPA). The Yolo Habitat Conservancy (Conservancy) used the ecological information presented in this chapter to identify the potential effects of covered activities on covered species and natural communities and develop measures to address effects on and conservation of covered species and natural communities.[1]

Section 2.2, *Physical Characteristics*, describes the climatic, hydrologic, topographic, and edaphic characteristics of the Plan Area; Section 2.3, *Land Cover Mapping*, describes the methods, data sources, and classification system for mapping natural communities and covered species' habitats; Section 2.4, *Natural Communities and Associated Plant and Wildlife Species*, describes the composition and extent of natural communities in the Plan Area; Section 2.5, *Other Land Cover Types*, describes the composition and extent of other land covers that provide habitat for covered species; and Section 2.6, *Covered Species,* describes the process used to select species for coverage under this HCP/NCCP. This chapter is supported by Appendix A, *Covered Species Accounts*, which provides summaries of the status and attributes of the covered species, and Appendix C, *Evaluation of Species Considered for Coverage,* which provides more detail on the selection process for covered species. Appendix B, *Common and Scientific Names of Species Mentioned in the Text,* provides the scientific names for each species mentioned in this HCP/NCCP.

2.2 Physical Characteristics

Climate, topography, hydrology, geology, and soils determine the conditions that support plant and wildlife species and the potential for protection, restoration, and enhancement of habitat for covered species.

2.2.1 Data Sources

The following data sources were used to describe the physical environment of the Plan Area:

- Soil Survey of Yolo County, California (U.S. Department of Agriculture, Natural Resources Conservation Service [USDA-NRCS] 2007).
- PRISM climate data (PRISM Climate Group 2004).

[1] This chapter uses the term *natural community* to include both natural and seminatural (cultivated lands) land cover types.

- State Soil Geographic (STATSGO) database for California (U.S. Department of Agriculture Soil Conservation Service [USDA-SCS] 1994).
- National Hydrographic Dataset (U.S. Geological Survey [USGS] 2011).
- Other relevant technical reports and literature.

2.2.2 Climate

The Plan Area has a Mediterranean-type climate, with cool, wet winters and warm, dry summers. Cyclical climatic events can cause large annual fluctuations in precipitation levels (Minnich 2007; Reever-Morghan et al. 2007). Precipitation occurs primarily in the form of rain from October through April, with very little precipitation during the hot, dry summers. Figure 2-1 shows average annual distribution of precipitation for the Plan Area.

Average annual precipitation is lowest in areas near the Sacramento River (18 inches annually) and greatest in the Little Blue Ridge and Blue Ridge mountains (21 to 30 inches annually) (Rantz 1969). These mountains are in the inner Coast Range, which, elsewhere in California, is in a rain shadow; consequently, the amount of rainfall is quite low. The inner Coast Range in Solano and Yolo Counties, however, is exposed to storms that move through a gap in the Coast Range provided by the San Francisco Bay estuary. Consequently, the inner Coast Range in these counties has ecological conditions that are found elsewhere only in the outer Coast Range. Average daily temperatures in the Plan Area range from a high and low of 59 degrees Fahrenheit (°F) and 35°F in January to a high and low of 96°F and 59°F in July.

2.2.3 Topography

The Plan Area lies within the California's Great Central Valley and Coast Ranges geomorphic provinces (Norris and Webb 1990), and its topography is characterized by valley, foothill, and mountain range components. The Little Blue Ridge and Blue Ridge occupy the west side of the Plan Area, with the highest elevations in the county (approximately 3,100 feet above mean sea level) in the northwestern corner of the Plan Area. The eastern side of the Plan Area is located on the valley floor, with elevations typically less than 100 feet above mean sea level. The Capay Hills, a parallel satellite range of the Coast Range, lie east of the northern half of the Blue Ridge and are separated from it by the Capay Valley. The Capay Hills connect with the Blue Ridge at the Capay Valley's closed northern end. East of the Capay Hills, a much lower and more subdued Coast Range satellite, the Dunnigan Hills/Plainfield Ridge, connects to the Capay Hills at its northern end.

The uplifting of the Coast Ranges by tectonic processes created north/northwest-trending faults, such as those that underlie the eastern edge of Capay Valley, and folds such as the Dunnigan Hills/Plainfield Ridge anticline that runs from the Capay Hills to Putah Creek. Tectonic processes also created the companion Madison syncline, forming the Hungry Hollow Basin between the Capay Hills and the Dunnigan Hills north of Cache Creek and the Cache/Putah Basin at the base of the Blue Ridge between Cache and Putah Creeks (State of California 1987; Jones & Stokes 1996; Graymer et al. 2002; Luhdorff and Scalmanini 2004; WRIME 2006). The low-lying areas of the Plan Area consist of a broad, flat alluvial plain on the Central Valley floor that slopes downward from the Coast Range east to the Colusa and Yolo Basins, which parallel the Sacramento River (WRIME 2006). The elevations in the southern end of the Yolo Basin are slightly below sea level.

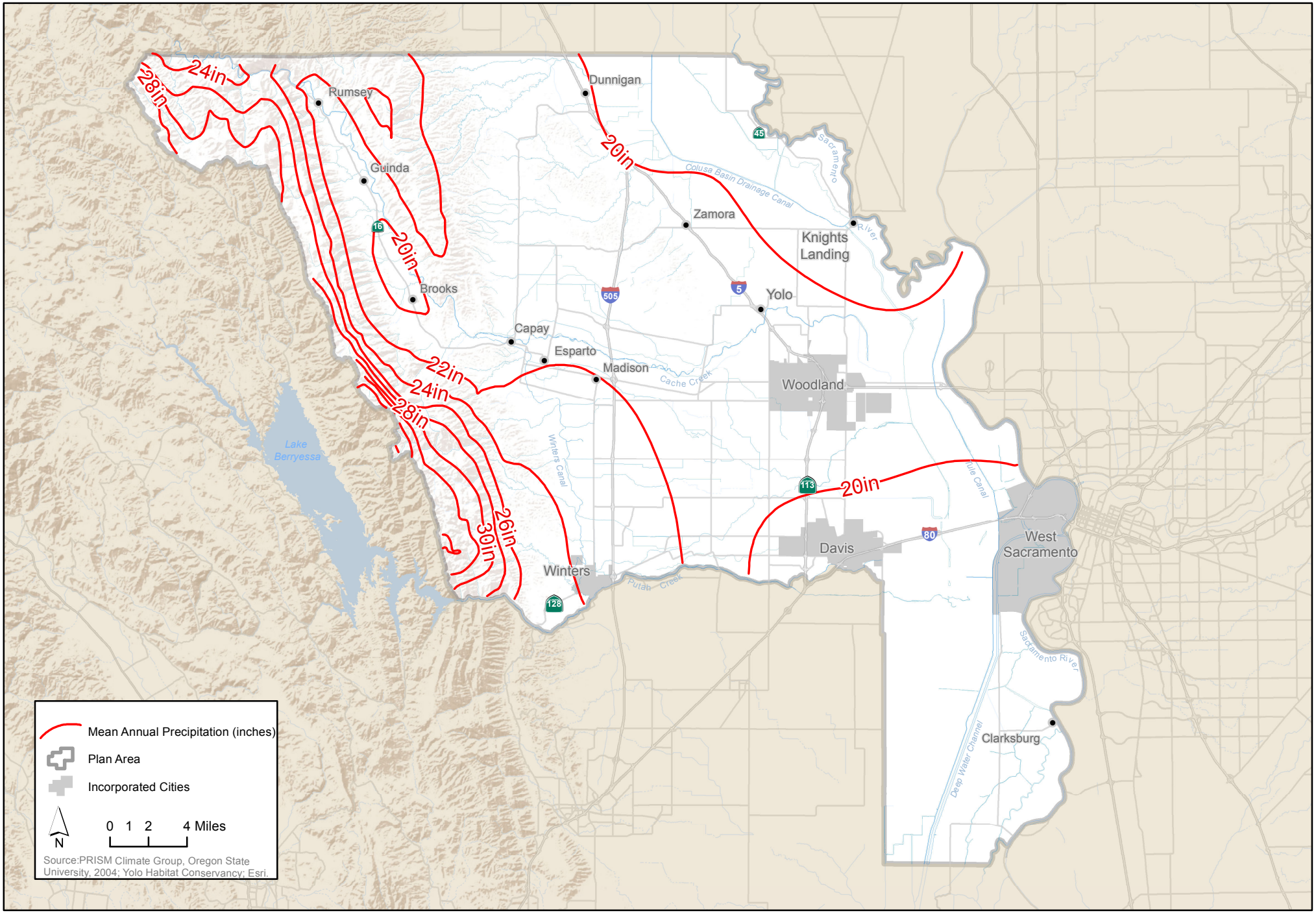

Figure 2-1. Mean Annual Precipitation

2.2.4 Hydrology

The surface hydrologic features in the Plan Area are dominated by the Sacramento River and Cache and Putah Creeks (Figure 2-2), which originate upstream of Yolo County (WRIME 2006). Both Cache Creek and Putah Creek are antecedent streams that are older than the Coast Range and have maintained a relatively constant elevation as the Coast Range was tectonically uplifted about 1 million years ago. Consequently, both streams have eroded deep canyons through Blue Ridge. Other surface waters, originating from local precipitation, springs, and irrigation tailwater, contribute to the numerous small creeks that drain the Blue Ridge, Capay Hills, Dunnigan Hills/Plainfield Ridge, and the Central Valley floor. Irrigation water is distributed through a network of natural and modified sloughs and constructed drainages that ultimately drain to the Colusa and Yolo Basins, which run along the west bank of the Sacramento River. Figure 2-2 shows the watersheds in the Plan Area.

Cache Creek flows are regulated in Lake County by the Cache Creek Dam at the outlet of Clear Lake and the Indian Valley Dam on the North Fork of Cache Creek. In Yolo County, flows are regulated by the Capay Diversion Dam. Flows in Putah Creek are regulated by the Monticello Dam, situated on Blue Ridge at the western edge of Yolo County, and by the Putah Diversion Dam, located west of the city of Winters (WRIME 2006). The flows in the Sacramento River and in the adjacent Colusa and Yolo Basins are controlled by the State Water Project and Central Valley Project and contained by levees constructed by the Sacramento River Flood Control Project. As part of the Sacramento River Flood Control Project, high flows that pass over the Fremont and Sacramento Weirs are diverted through the Yolo Bypass located in the Yolo Basin. The four main drainages in the Plan Area are described below.

2.2.4.1 Cache Creek

Cache Creek enters northwestern Yolo County through deep gorges in the Coast Range and then flows southeastward down the narrow Capay Valley. Near that valley's southern end, it flows through the Capay Hills in another deep gorge and then eastward across the Central Valley floor to the Yolo Bypass. Flows are diverted at the Capay Diversion Dam, just west of Capay, to the Winters and West Adams irrigation canals. The reach below this dam, known as Lower Cache Creek, historically flowed between raised natural levees. Overflows would drain away from the creek into the Hungry Hollow and Cache/Putah Basin. Lower Cache Creek between the Capay Hills and Dunnigan Hills/Plainfield Ridge is characterized as a "losing reach" because it loses a substantial amount of its flow to groundwater recharge where it flows across coarse sediments that have been deposited in the Madison syncline basin (WRIME 2006). This reach cannot support typical riparian vegetation because it loses so much water; instead, it supports distinctive riparian chaparral (Holstein 2013). The section of Lower Cache Creek, however, is a "gaining reach" where it crosses the Dunnigan Hills/Plainfield Ridge anticline, causing flows to increase due to groundwater contributions. Cache Creek terminates at the Cache Creek Settling Basin, an artificial basin that was constructed to trap sediment that otherwise would flow into the Yolo Bypass. The Cache Creek Settling Basin is separated from the Yolo Bypass by an outlet weir that overtops during high flows, sending Cache Creek waters through the Yolo Bypass to the Sacramento-San Joaquin River Delta.

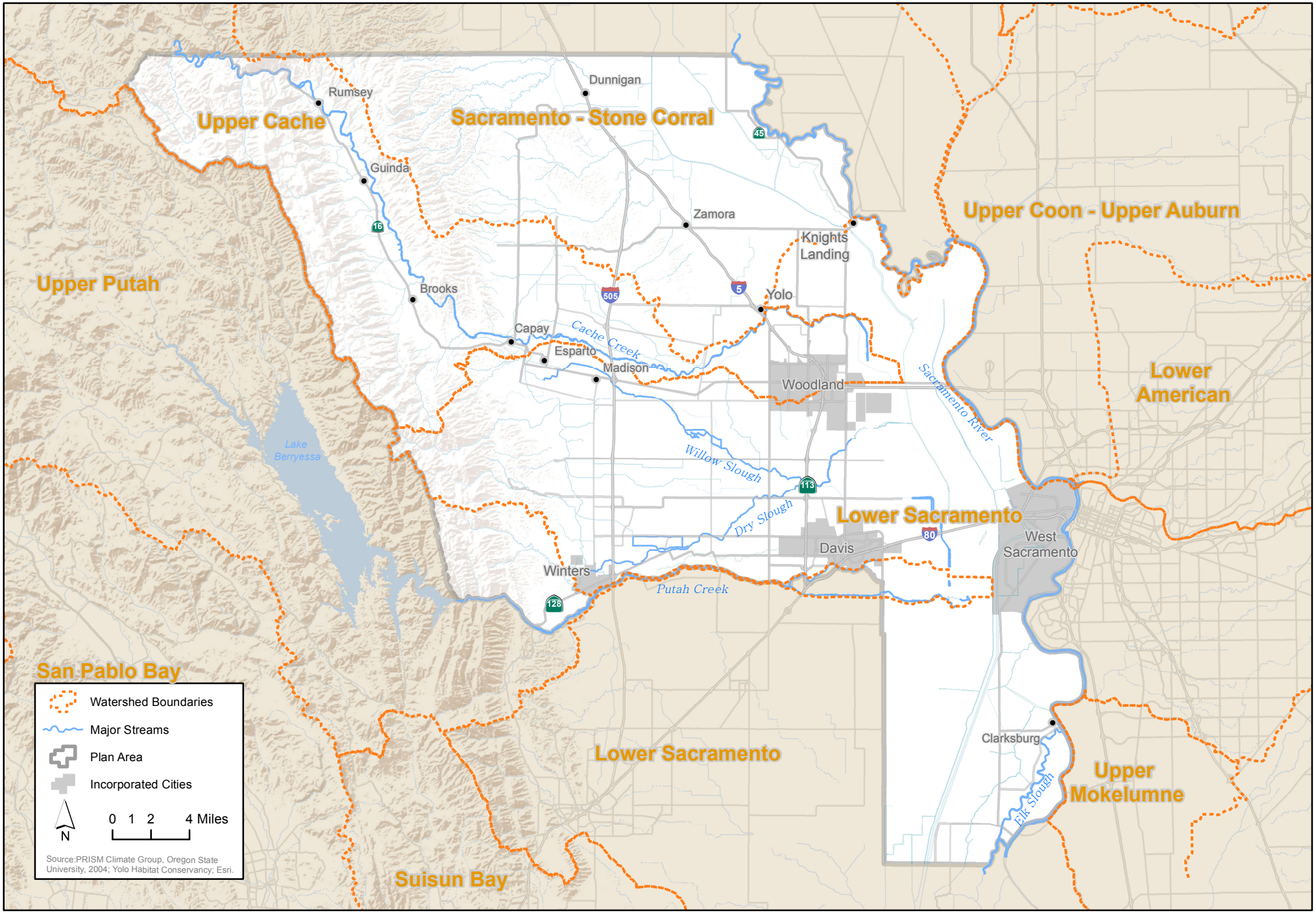

Figure 2-2. Watersheds and Major Streams of the Plan Area

2.2.4.2 Putah Creek

Putah Creek enters Yolo County at the base of Monticello Dam and runs eastward through a narrow canyon to the Putah Creek Diversion Dam, which supplies the Putah South Canal. Lake Solano is upstream of, and created by, the Putah Creek Diversion Dam. Below the dam, Putah Creek flows across its alluvial fan, creating a groundwater basin. Between Monticello Dam and the beginning of Yolo County's southeastern panhandle, the creek is the southern boundary of Yolo County and the Plan Area. Lower Putah Creek historically flowed between raised natural levees. Overflows would drain away from the creek and northward into the Cache/Putah Basin and southward through minor channels into Solano County.

The lower section of Putah Creek is a losing reach until it crosses the Dunnigan Hills/Plainfield Ridge anticline where it briefly becomes a gaining reach (Thomasson et al. 1960; California Division of Water Resources 1955). The creek continues eastward until it reaches Davis and eventually drains into the Yolo Basin. Beginning in 1870, a series of flood control projects deepened a minor fork of Putah Creek that ran south of Davis. A levee system was constructed across the North Fork of Putah Creek that directed most flows into the South Fork and dewatered the North Fork downstream of the levees (Anonymous 1870). Putah Creek terminates at the Putah Sinks within the Yolo Bypass. Drainage modifications and agricultural conversion in the sinks, beginning in the late 1800s, have completely modified the Putah Sinks from historical conditions (Vaught 2006).

2.2.4.3 Willow Slough

Willow Slough drains a 164-square-mile watershed between Cache Creek and Putah Creek (Water Resources Association of Yolo County 2005). The Willow Slough watershed, which includes numerous small drainages that flow into Willow Slough, is divided into five major landform units: the eastern slope of the inner Coast Range, the low hills at the foot of the range, the alluvial plains of the Madison syncline, a band of undulating hills known as the Plainfield Ridge, and the low-lying basin east of the ridge (Jones and Stokes 1996). Historically, after floodwaters receded each year, several large alkaline playa-type pools would remain on the edges of alluvial deposits in the plains around Willow Slough.

In the late 1800s, Willow Slough was generally perennial (Schuyler 1879, in Jones and Stokes 1996). Decreases in base flows may have resulted from cattle grazing in the foothills (which tends to increase direct runoff and decrease infiltration and base flow) and groundwater pumping (which tends to lower groundwater levels and shorten or eliminate reaches where groundwater seeps into slough channels) (Jones and Stokes 1996). Downcutting of the nearby Cache Creek channel at Dunnigan Hills/Plainfield Ridge most likely captured groundwater that formerly fed springs that kept Willow Slough perennial.

In the 1960s, the U.S. Army Corps of Engineers constructed the Willow Slough Bypass, approximately one-quarter mile east of Highway 113, north of the city of Davis. The bypass diverts all floodflows in downstream Willow Slough to a lower elevation of the Yolo Bypass. Creation of the bypass increased the draining velocity of floodflows through improved gravity flow (Water Resources Association of Yolo County 2005).

Willow Slough has been ditched and modified from its natural conditions, creating a dense rectilinear network that supplies irrigation water and drains floodwaters (Jones & Stokes 1996) (Figure 2-2). In some localized areas, these ditches are lined with narrow bands of riparian vegetation. In other areas, they abut cultivated agricultural fields, and their banks are maintained as bare soil. Portions of Willow Slough, however, still retain their natural sinuosity and are lined with dense riparian forests (Holstein 2013). The original remnant of Willow Slough continues northeast and enters the Yolo Bypass at Conaway Ranch (Water Resources Association of Yolo County 2005).

2.2.4.4 Sacramento River, Bypasses, and Basins

The Sacramento River forms the eastern edge of the Plan Area. Prior to 1850, the Sacramento River periodically overflowed its natural levees, filling the adjacent lowland Colusa and Yolo Basins (Kelley 1985; Mount 1995). These two major lowlands were separated by a large deposit of alluvium known as the Knights Landing Ridge. Overflows in both basins eventually drained back into the Sacramento River at the southern end of the Plan Area. Gold mining in the Sierra Nevada significantly altered the hydrologic function of the Sacramento River during the hydraulic mining period (1850 to 1884), producing large amounts of sediment that choked the channels of the Sacramento River. This sediment influx raised portions of the riverbed that ran along the Yolo County boundary. The sediments were flushed into the Yolo and Colusa Basins during flood events. The sediments were gradually purged from the lower sections of the Sacramento River in the early 1900s, by the time the Sacramento River Flood Control Project began (Kelley 1985). The lower Sacramento River is now largely sediment-starved as a result of sediment retention behind dams and the leveeing of the historical Sacramento River floodplain.

The Yolo Bypass was constructed in the 1930s as part of the Sacramento River Flood Control Project to shunt floodwaters out of the Sacramento River and reduce the potential for large-scale flooding. Under normal conditions, water flows from the Colusa Bypass into the Yolo Bypass through a cut in the Knights Landing Ridge, known as the Knights Landing Ridge Cut Canal. During flood conditions, flows from the Sacramento River enter the 57,000-acre Yolo Bypass over the fixed Fremont Weir at its northern end. Floodflows also enter the Yolo Bypass through the gated Sacramento Weir, which is just upstream of the confluence with the American River. The Yolo Bypass can convey up to 80 percent of the system's floodwaters, which drain back into the Sacramento River a few miles upstream of Rio Vista in Solano County. During summer, the Toe Drain/Tule Canal on the east side of the Yolo Bypass carries perennial flows southward (Schemel et al. 2002). Numerous tidal sloughs dominate the southern end of the Yolo Basin. The Sacramento Deep Water Ship Channel, a navigation canal, was constructed in the early 1960s adjacent to the east side of the lower Yolo Basin to give larger ships access to the Port of Sacramento (now the Port of West Sacramento) in West Sacramento.

2.2.5 Soils and Geology

Most of the Coast Range in Yolo County is underlain by the Great Valley sequence of marine sediments, which were deposited between 70 and 190 million years ago on a shallow sea floor when the coastline of the Pacific Ocean was located where the Sierra Nevada foothills are now found. An exception occurs at Little Blue Ridge, in the county's northwestern corner, where a serpentine deposit was squeezed upward by tectonic forces from deep in the earth's mantle. This occurs in association with a small amount of Franciscan Formation, a melange of seafloor sediments that were scraped off an oceanic plate that was being tectonically subducted into a marine trench at about the same time the Great Valley sequence was forming. Uplift eventually caused Great Valley sequence

deposition to end and the ocean to withdraw from what are now the Coast Range and Central Valley. About 1 million years ago, the Coast Range achieved its present elevation in an uplift that turned beds of the Great Valley sequence sediments on their edge. Putah and Cache Creeks are older than this uplift, however, because they were able to maintain their location and elevation by eroding deep canyons in the Coast Range and Capay Hills as they uplifted.

Meanwhile, as the Coast Range was uplifting, the area that is now the Central Valley was continually subsiding into a vast basin in which sediments that eroded from surrounding mountains were deposited. Consequently, early marine sediments and even vast volcanic plains were buried beneath thousands of feet of non-marine sediments, which are youngest at the surface and progressively older at depth. The volcanic plain outcrops, known as Lovejoy basalt, reside along the base of the Coast Range. The Capay Hills have a Great Valley sequence core but are largely mantled by uplifted, more-recent non- marine sediments, while Dunnigan Hills/Plainfield Ridge consists entirely of uplifted and eroded non-marine sediments, similar to those on the Central Valley floor. The majority of these non-marine sediments were laid down as the 2- to 5-million-year-old Tehama Formation.

Soils form when parent material (Figure 2-3), either bedrock or alluvium, is altered by physical and chemical processes. In Yolo County's Coast Range, soils closely mirror the underlying bedrock of the Great Valley sequence and serpentine, while more-recent non-marine sediments, such as the Tehama and Red Bluff Formations, mantle the base of Blue Ridge, most of the Capay Hills, and all of the Dunnigan Hills/Plainfield Ridge. In the lowlands of the Central Valley floor, the diversity of soil types reflects ongoing exposure to the forces of streamflow, persistent drainage overflows, the deposition of salts, and uneven the rates of particle settling. In many cases, vegetation patterns are closely associated with particular soil types.

Soil associations of the Plan Area are shown in Figure 2-4. A soil association is a landscape-level classification system, which is based on the distinctive spatial distributions of combinations of soil series. Soils in each series have similar physical and chemical characteristics. As a result of their broad geographical extent, soil associations represent a relatively persistent historical record of landscape-level physical and chemical processes. In Yolo County, the processes have resulted in 12 soil associations, consisting of an uplands group, a lowland alluvial fan group, and a lowland Colusa/Yolo Basin group, as described below.

2.2.5.1 Uplands Soils Group

The uplands soils group consists of five soils associations: Rock Land, Dibble-Millsholm, Positas, Sehorn-Balcorn, and Corning-Hillgate (Figure 2-4). The Rock Land association is located on sandstone of Franciscan complex and Great Valley sequence materials along the highest ridges of Little Blue Ridge and Blue Ridge (Andrews 1970). Serpentine ultramafic parent material (Figure 2-3) is the source of soils that cause the unique natural communities and endemic plants in the northwestern corner of the Plan Area. Typically, 50 to 90 percent of the land surface of Rock Land is exposed sandstone, shale, or serpentinized bedrock; the remainder is covered by a thin layer of sandy loam (Andrews 1970). The most typical vegetation on Rock Land is chaparral. Immediately below the Rock Land association on Blue Ridge and along the flanks of the Capay Hills is the Dibble-Millsholm association, which formed from Great Valley sequence materials (Andrews 1970). Exposed bedrock covers less than 10 percent of the surface of the Dibble-Millsholm association, which consequently has more soil development. The most typical vegetation of this association is woodland dominated by blue oaks, interior live oaks, and foothill pine. Although it

lacks similar parent material, an outlier of this association has been mapped on the highest areas of the northern Dunnigan Hills.

The patchy Positas association formed on terraces over the Red Bluff Formation in the southern end of the Blue Ridge and along the western and northern slopes of the Capay Hills. Its soils are gravelly loams. The Sehorn-Balcom association formed over the Tehama Formation, along the eastern toes of the Blue Ridge and Capay Hills, and along most of the Dunnigan Hills. The soils of this association consist of silty clays and clays. Adjacent terraces of the Red Bluff and Tehama Formations support the Corning-Hillgate association, which also extends along the Plainfield Ridge. The soils of this association are gravelly loams or loams. One outlier of this association has been mapped across the entire Cache Creek Settling Basin. Vegetation in the settling basin is riparian, but vegetation of the Positas, Sehorn-Balcom, and Corning-Hillgate associations is typically prairie/grassland, with some blue oak woodland.

2.2.5.2 Lowland Alluvial Fan Group

The lowland alluvial fan group consists of four soils associations: Yolo-Brentwood, Capay-Clear Lake, Rincon-Marvin-Tehama, and Willows-Pescadero (Figure 2-4). The Yolo-Brentwood association is most closely associated with alluvial floodplains and fans of Cache and Putah Creeks. In the Cache/Putah Basin, it forms the highest proportions of the basin rim at the mouths of the streams from the Blue Ridge and along the natural levee of Putah Creek. Its soils are deep and well drained, and their textures range from silty loams to silty clay loams. Its historic vegetation was valley oak forest and woodland. The soils of the Capay-Clear Lake association line the bottoms of the Hungry Hollow and Cache/Putah Basin in the Madison syncline. These soils are generally poorly drained silty clays to clays. Their historic vegetation was primarily prairie/grassland, with some localized seasonal freshwater marsh. The Rincon-Marvin-Tehama association is found on the rim of the Cache/Putah Basin between the Yolo-Brentwood association and the Capay-Clear Lake association. Its historic vegetation was also prairie/grassland. On the eastern side of the Cache/Putah basin is a patch of the Willows-Pescadero association that formed where groundwater was forced to the surface by the Dunnigan Hills/Plainfield anticline. The soils of this association are saline-alkaline silty clay loams to clays. These soil associations are also found east of the Dunnigan Hills/Plainfield Ridge anticline where salts that were transported eastward across the Putah/Cache alluvial fans accumulated at the basin rim interface between the alluvial fans and the Yolo and Colusa Basins. The historic vegetation on Willows-Pescadero soils was alkaline prairie.

2.2.5.3 Lowland Colusa/Yolo Basin and Sacramento River Natural Levee Group

The lowland Colusa/Yolo Basin and Sacramento River natural levee group consists of three soil associations: Sycamore-Tyndall, Sacramento, and Capay-Sacramento (Figure 2-4). The Sycamore-Tyndall association is found on the natural levees of the Sacramento River. Its soils are somewhat poorly drained very fine sandy loams to clay loams. Their historic vegetation was valley oak woodland, with some riparian vegetation along the Sacramento River. Below the Sycamore-Tyndall association, in the rice lands of the Colusa Basin, is the Sacramento association. Its soils are poorly drained silty clay loams and clays. Finally, because of their artificial drainage systems, the Yolo Bypass and parts of the Colusa Basin contain the Capay-Sacramento association, with its moderately well-drained to poorly drained silty clay loams to clays. The historic vegetation of the Sacramento and Capay-Sacramento associations was perennial freshwater marsh dominated by tules.

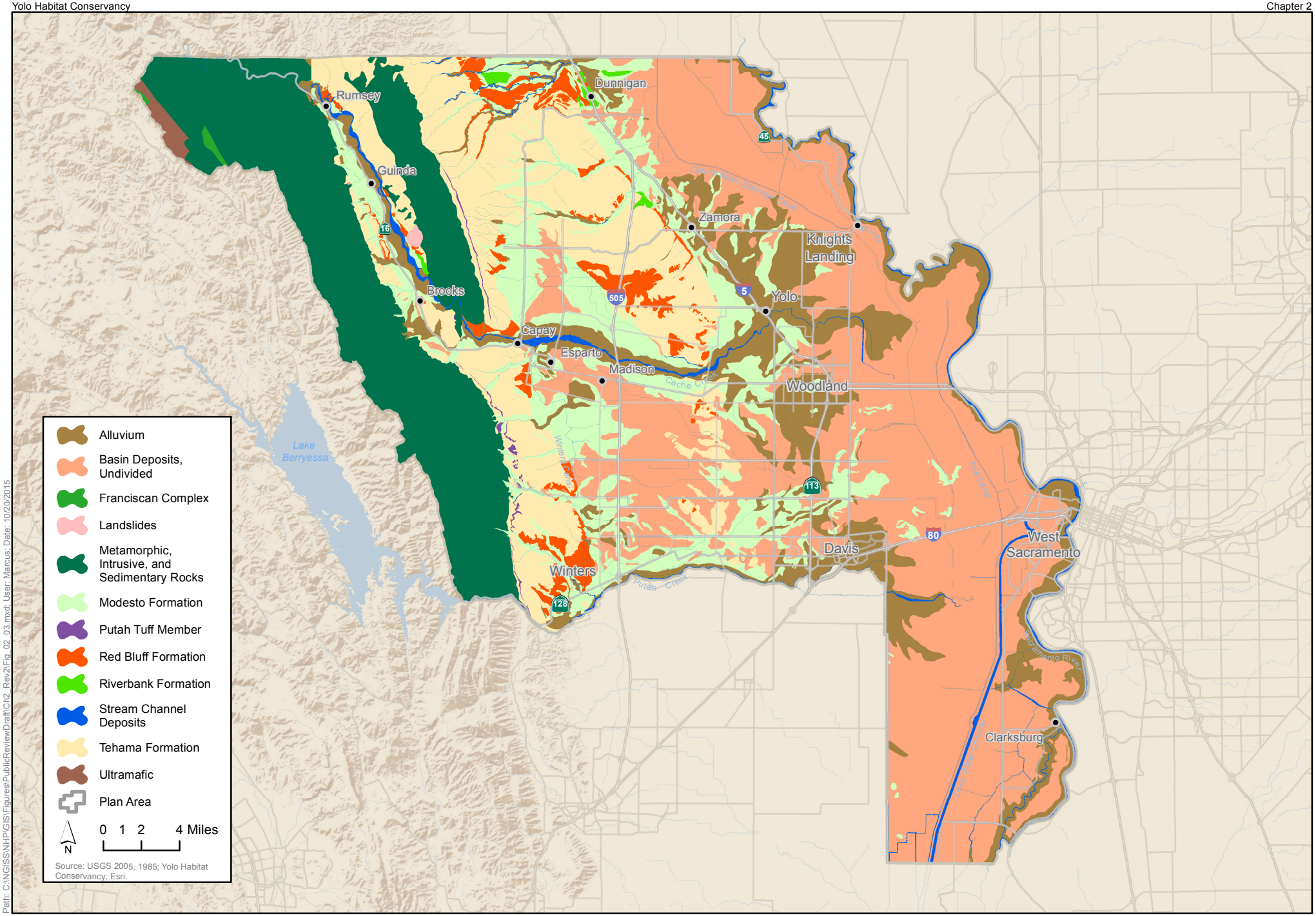

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Figure 2-3. Soil Parent Material in the Plan Area

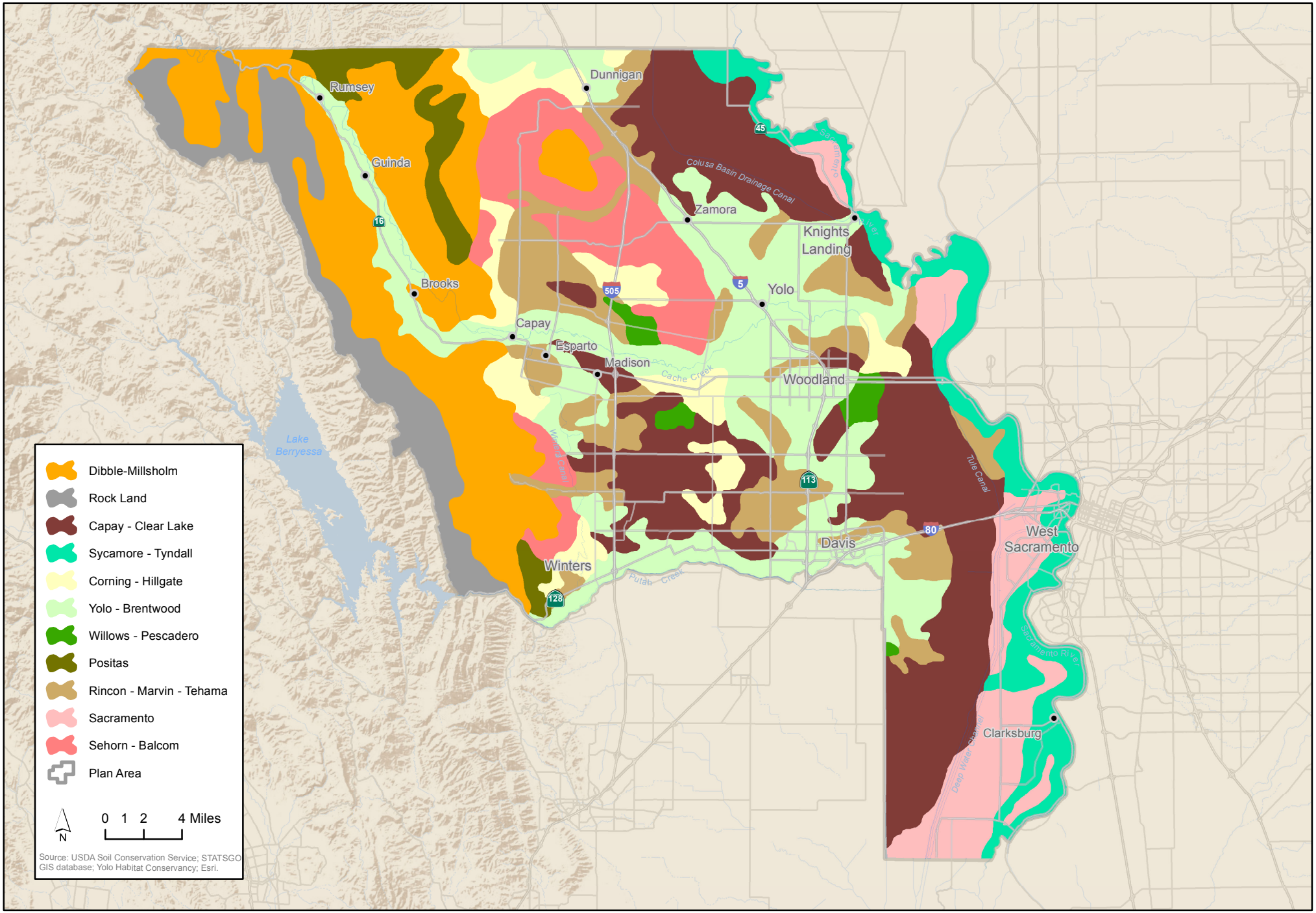

Figure 2-4. Soil Associations in the Plan Area

2.3 Land Cover Mapping

A land cover dataset was created for use in assessing effects of covered activities and developing the conservation strategy (Chapter 5, *Effects on Covered Species and Natural Communities;* Chapter 6, *Conservation Strategy*). Land cover consists of naturally occurring and anthropogenic vegetation, human-made structures, and other unvegetated land cover types (e.g., barren lands, other lands incidental to agriculture).

This section describes the land cover classification system and the methods used to map the land cover types in the Plan Area. The land cover dataset was generated at a scale and level of resolution appropriate for regional resources planning; it was not developed for use in project-level planning. That is, land cover will be verified at the project-level during implementation for tracking and compliance purposes. Although updates to this dataset have been made at a much finer scale to reflect the smaller areas of essential land covers, much of the data set was digitized at a more coarse scale, reflecting an alliance level of vegetation types. A total of 79 land cover types were identified and mapped. As described in the following subsections, the land cover type map represents point-in-time data and was developed at a resolution that is adequate for HCP/NCCP planning and development (Section 2.3.1, *Data Sources,* provides a description of baseline data dates). The land cover type mapping will be periodically updated during implementation (Section 6.5, *Monitoring and Adaptive Management*) and will continue to be used as a planning tool (e.g., during preparation of annual work plans, initial identification of candidate conservation lands).

2.3.1 Natural Community, Vegetation, and Other Land Cover Classification

A comprehensive, multilevel land cover classification and mapping system has been developed for the HCP/NCCP planning process. The land cover classification system achieves the following goals:

- Integrates existing, commonly used and emerging vegetation classification systems.
- Represents the natural and anthropogenic communities, vegetation types, and other land cover types in the Plan Area under existing conditions.
- Provides the basis for characterizing current and future wildlife habitat uses through wildlife habitat relationships models (Section 2.6.3, *Covered Species Habitat Models,* and Chapter 6, *Conservation Strategy*).
- Provides a foundation for future mapping efforts where more detailed site-specific mapping could be integrated.

The classification system uses a two-level hierarchy that establishes 15 natural communities and 79 floristic-based vegetation types and other unvegetated land cover types (Table 2-1, *Natural Communities and Other Land Cover Types*). The vegetation types were derived primarily from the hierarchical structure of *A Manual of California Vegetation* (MCV) (Sawyer and Keeler-Wolf 1995), as adopted and modified by the California Vegetation Classification and Mapping Program and the Napa County Vegetation Map (NCVM) (Thorne et al. 2004). Modifications to the MCV vegetation types were applied from the NCVM to describe the relatively unique vegetation in the western part of the Plan Area. This HCP/NCCP uses the terms *alliances* and *super alliance*s as they were used in

the NCVM program. *Super alliances* are general designations that have been applied to areas that include vegetation that supports alliances or groups of related alliances that could not be identified from aerial photograph interpretation to the alliance level.

Fifteen natural communities were classified in a manner consistent with the California Wildlife Habitat Relationship classification system (Mayer and Laudenslayer 1988). These include land cover categories for characterizing cultivated lands; non-natural areas, including vacant or urban parcels; and open water (see natural community descriptions below). The natural communities and corresponding land cover designations from other classification systems are presented in Table 2-2.

Vegetation and other land cover types were used to describe in detail the known and potential distribution of covered species under existing conditions and under future conditions with HCP/NCCP implementation, as described in Section 2.6.3, *Covered Species Habitat Models.*

Neither the MCV nor the NCVM classification systems provide a structure for classifying different types of agricultural cropping systems, which, while not natural vegetation types, provide vital habitat for wildlife. To address this limitation, the California Department of Water Resources (DWR) land use classification was used to draw these distinctions among cultivated land uses (called *seminatural* vegetation).

2.3.2 Data Sources

HCP/NCCP land cover mapping represents several baseline dates and was developed using the following sources:

- Mapping of the Blue Ridge and Little Blue Ridge regions of the Plan Area (Figure 1-2) on 1993 USGS digital orthophotographs prepared by the University of California, Davis (UC Davis), California Department of Fish and Wildlife (CDFW), and Aerial Information Systems (AIS).
- Riparian land cover mapping prepared by Jones & Stokes (1989, 1990).
- Riparian land cover mapping of the Sacramento River (1996), Cache Creek (1996), and Putah Creek (1998) prepared by California State University, Chico, as adjusted in 2004.
- CDFW Bay-Delta vegetation mapping dataset (2005 data).
- DWR 2008 land cover data set.
- National Agriculture Imagery Program (NAIP) 2012 aerial imagery.
- U.S. Fish and Wildlife Service (USFWS) wetland easements data.
- 2013 Google Earth imagery.
- i-cubed Aerial Imagery Service.
- Yolo County Agricultural Commissioner's Field Level Pesticide data (2011, 2013).

Table 2-1. Natural Communities and Other Land Cover Types

Natural Community	Vegetation/Land Cover Detail	Crop Type	Total Extent in Plan Area (acres)[a]
Natural Communities			
Cultivated Land Category			
Cultivated Lands Seminatural Community[b]	Alfalfa	**Alfalfa**	**48,897**
	Rice	**Rice**	**35,724**
	Field Crops	Corn	8,017
		Dry Beans	229
		Grain Sorghum	163
		Safflower	15,512
		Sudan	1,536
		Sugar Beets	10
		Sunflowers	11,114
		Undifferentiated Field Crops	5,496
		Field crops subtotal	**42,131**
	Truck/Berry Crops	Asparagus	128
		Melons/Squash/Cucumbers	3,049
		Onions/Garlic	815
		Peppers	956
		Strawberries	18
		Tomatoes	36,666
		Undifferentiated Truck and Berry Crops	1,832
		Truck/berry crops subtotal	**43,464**
	Grain/Hay Crops	**Grain and Hay Crops**	**65,303**
	Pasture	Miscellaneous Grasses (grown for seed)	3,855
		Mixed Pasture	11,204

Natural Community	Vegetation/Land Cover Detail	Crop Type		Total Extent in Plan Area (acres)[a]
		Native Pasture		138
			Pasture subtotal	**15,197**
			Total Cultivated Lands	**250,662**
Grassland Category				
Grassland	California Annual Grasslands Alliance			70,942
	Lotus scoparius Alliance (post-burn)			172
	Sparse Bush Lupine/Annual Grasses/Rock Outcrop NFD[c] Alliance			39
	Upland Annual Grasslands and Forbs Formation			8,169
	Urban Ruderal			1,589
			Total	**80,911**
Serpentine	Serpentine Barren			10
	Serpentine Grasslands NFD Super Alliance			237
			Total	**247**
Shrubland and Scrub Category				
Chamise	Chamise-Wedgeleaf Ceanothus Alliance			9,257
	Chamise Alliance			20,930
			Total	**30,187**
Mixed Chaparral	California Bay-Leather Oak-(*Rhamnus* spp.) Mesic Serpentine NFD Super Alliance			173
	Evergreen Shrubland			404
	Leather Oak Chaparral Alliance			1,733
	Mixed Manzanita-(Interior Live Oak-California Bay-Chamise) NFD Alliance			4

Natural Community	Vegetation/Land Cover Detail	Crop Type		Total Extent in Plan Area (acres)[a]
	Scrub Oak Chaparral Alliance			11,415
	Toyon-(Foothill Pine/Chamise)/ Annual Grasses Savanna NFD Alliance			530
	White Leaf Manzanita-Leather Oak-(Chamise-*Ceanothus* spp.) Xeric Serpentine NFD Super Alliance			167
	Whiteleaf Manzanita Alliance			92
			Total	**14,518**
Woodland and Forest Category				
Oak-Foothill Pine	Blue Oak Alliance			33
	Foothill Pine Alliance			3,760
	Interior Live Oak-Blue Oak-(Foothill Pine) NFD Association			26,797
	Interior Live Oak Alliance			13,182
			Total	**43,772**
Blue Oak Woodland	Blue Oak Alliance		**Total**	**35,891**
Closed-Cone Pine-Cypress	Knobcone Pine Alliance			201
	MacNab Cypress Alliance			11
			Total	**212**
Montane Hardwood	Black Oak Alliance			98
	Canyon Live Oak Alliance			485
	Mixed Oak Alliance			2,442
	Sparse California Juniper-Canyon Live Oak-California Bay-California Buckeye/Steep Rock Outcrop NFD Alliance			62
			Total	**3,087**
Valley Oak Woodland	Valley Oak Alliance		**Total**	**181**
Riparian and Wetland Category				
Alkali prairie	Alkali Prairie		**Total**	**312**

Natural Community	Vegetation/Land Cover Detail	Crop Type		Total Extent in Plan Area (acres)[a]
Vernal pool complex	Vernal Pool Complex		**Total**	**299**
Fresh Emergent Wetland	Alkali Bulrush-Bulrush Brackish Marsh NFD Super Alliance			9
	Bullrush-Cattail Wetland Alliance			722
	Bulrush-Cattail Freshwater Marsh NFD Super Alliance			3,708
	Carex spp.-*Juncus* spp.-Wet Meadow Grasses NFD Super Alliance			718
	Crypsis spp.-Wetland Grasses-Wetland Forbs NFD Super Alliance			16,579
	Perennial Pepperweed (*Lepidium latifolium*) Alliance			216
	Saltgrass Alliance			3,987
	Undetermined Alliance-Managed			371
			Total	**26,310**
Valley Foothill Riparian	Blackberry NFD Super Alliance			226
	Coyote Brush			208
	Fremont Cottonwood-Valley Oak-Willow (Ash-Sycamore) Riparian Forest NFD Association			3,101
	Giant Reed Series			101
	Great Valley Oak Riparian Association			75
	Mixed Fremont Cottonwood-*Willow* spp. NFD Alliance			1,732
	Mixed Willow Super Alliance			2,988
	Tamarisk Alliance			507
	Undifferentiated Riparian Bramble and Other			17
	Undifferentiated Riparian Scrub			135

Natural Community	Vegetation/Land Cover Detail	Crop Type		Total Extent in Plan Area (acres)[a]
	Undifferentiated Riparian Woodland/Forest			278
	Valley Oak Alliance-Riparian			3,139
	White Alder (Mixed Willow) Riparian Forest NFD Association			57
			Total	**12,565**
Lacustrine and Riverine	Open Water		**Total**	**13,493**
Total Natural and Seminatural Communities				**512,646**
Other Land Cover Types				
Other Agriculture	Citrus/Subtropical	Dates		6
		Lemon		0
		Miscellaneous Subtropical Fruits		16
		Olives		948
		Oranges		189
			Citrus/subtropical subtotal	**1,159**
	Deciduous Fruits/Nuts	Almonds		22,619
		Apples		409
		Apricots		210
		Figs		41
		Peaches/Nectarines		150
		Pears		215
		Pistachios		731
		Prunes		2,071
		Undifferentiated Deciduous Fruits and Nuts		1,335
		Walnuts		15,810
	Vineyards	Vineyards		17,151
	Pasture	Turf Farm		141

Natural Community	Vegetation/Land Cover Detail	Crop Type		Total Extent in Plan Area (acres)[a]
	Truck/Nursery/Berry Crops	Flowers/Nursery/Tree Farms		122
			Deciduous fruits/nuts subtotal	**43,591**
			Other Agriculture Total	**62,164**
Semiagricultural/Incidental to Agriculture	Semiagricultural/Incidental to Agriculture		**Total**	**30,510**
Eucalyptus	Eucalyptus Alliance		**Total**	**369**
Barren	Barren-Anthropogenic (levees)			414
	Barren-Gravel and Sand Bars			1,373
	Rock Outcrop			335
			Barren subtotal	**2,122**
Developed	Urban or Built Up			40,666
	Urban Ruderal			7
	Vegetated Corridor			5,010
			Developed Subtotal	**45,683**
			Total Barren and Developed	**47,806**
Total Other Land Cover Types				**140,848**
Total Natural and Seminatural Communities and Other Land Cover Types				**653,494**[d]

a. Numbers may not precisely sum because of rounding. This table does not include the 1,174-acre expanded Plan Area for Putah Creek Conservation (Figure 1-1).

b. Cultivated land cover types typically change with changes in demand, price, and other factors related to the wide variety of food and fiber crops grown in Yolo County; therefore, the acreage estimates provided for cultivated land crop types in this table are based on the existing conditions at the time of data capture (i.e., 2008, with updates provided by member agencies' planning staff, as described in Section 2.3.3, *Mapping Methods*) for the land cover geographic information system (GIS) database.

c. NFD = not formally defined.

This acre amount differs from the total Plan Area acre amount due to small gaps in the land cover mapping, amounting to approximately 55 acres of unmapped land.

Table 2-2. Other Classification Systems

Yolo HCP/NCCP Natural Communities	California Wildlife Habitat Relationship Classification System	Yolo HCP/NCCP Vegetation	Napa County Vegetation Map[a]	Department of Water Resources Map
Grassland	Annual Grassland	California Annual Grasslands Alliance	California Annual Grasslands Alliance	Not mapped
		Lotus Scoparius Alliance (Post-Burn)	Lotus Scoparius Alliance (Post-Burn)	Not mapped
		Sparse Bush Lupine/Annual Grasses/Rock Outcrop NFD Alliance	Sparse Bush Lupine/Annual Grasses/Rock Outcrop NFD Alliance	Not mapped
		Upland Annual Grasslands and Forbs Formation	Upland Annual Grasslands and Forbs Formation	Not mapped
		Urban Ruderal	Not mapped	Urban, Urban Landscape, Industrial, Commercial, Residential, Semiagricultural, and Incidental to Agriculture
Serpentine	Not applicable	Serpentine Barren	Serpentine Barren	Not mapped
		Serpentine Grasslands NFD Super Alliance	Serpentine Grasslands NFD Super Alliance	Not mapped
Chamise	Chamise-Redshank Chaparral	Chamise-Wedgeleaf Ceanothus Alliance	Chamise-Wedgeleaf Ceanothus Alliance	Not mapped
		Chamise Alliance	Chamise Alliance	Not mapped
Mixed Chaparral	Mixed Chaparral	California Bay-Leather Oak (*Rhamnus* spp.)-Mesic Serpentine NFD Super Alliance	California Bay-Leather Oak (*Rhamnus* spp.)-Mesic Serpentine NFD Super Alliance	Not mapped
		Evergreen Shrubland	Evergreen Shrubland	Not mapped
		Leather Oak Chaparral Alliance	Leather Oak-California Bay (*Rhamnus* spp.)-Mesic Serpentine NFD Alliance; Leather Oak-Whiteleaf Manzanita-Chamise Xeric Serpentine NFD Super Alliance	Not mapped

Yolo HCP/NCCP Natural Communities	California Wildlife Habitat Relationship Classification System	Yolo HCP/NCCP Vegetation	Napa County Vegetation Map[a]	Department of Water Resources Map
Mixed Chaparral (Continued)	Mixed Chaparral (Continued)	Mixed Manzanita (Interior Live Oak-California Bay-Chamise) NFD Alliance	Mixed Manzanita (Interior Live Oak – California Bay-Chamise) NFD Alliance	Not mapped
		Scrub Oak Chaparral Alliance	Scrub Interior Live Oak-Scrub Oak (California Bay-Flowering Ash)	Not mapped
		Toyon-(Foothill Pine/Chamise)/ Annual Grasses Savanna NFD Alliance	Toyon-(Foothill Pine/Chamise)/ Annual Grasses Savanna NFD Alliance	Not mapped
		Whiteleaf Manzanita-Leather Oak (*Chamise-Ceanothus* spp.)-Xeric Serpentine NFD Super Alliance	Whiteleaf Manzanita-Leather Oak (*Chamise-Ceanothus* spp.)-Xeric Serpentine NFD Super Alliance	Not mapped
		Whiteleaf Manzanita Alliance	Whiteleaf Manzanita Alliance	Not mapped
Oak-Foothill Pine	Blue Oak-Foothill Pine	Foothill Pine Alliance	Foothill Pine Alliance; Foothill Pine/Mesic Non-serpentine Chaparral NFD Association	Not mapped
		Interior Live Oak-Blue Oak-(Foothill Pine) NFD Association	Interior Live Oak-Blue Oak-(Foothill Pine) NFD Association	Not mapped
		Interior Live Oak Alliance	Interior Live Oak Alliance	Not mapped
Blue Oak Woodland		Blue Oak Alliance	Blue Oak Alliance	Not mapped
Closed-Cone Pine-Cypress	Closed-Cone Pine-Cypress	Knobcone Pine Alliance	Knobcone Pine Alliance	Not mapped
		MacNab Cypress Alliance	MacNab Cypress Alliance	Not mapped
Eucalyptus	Eucalyptus	Eucalyptus Alliance	Eucalyptus Alliance	Not mapped
Montane Hardwood	Montane Hardwood	Black Oak Alliance	Black Oak Alliance	Not mapped
		Canyon Live Oak Alliance	Canyon Live Oak Alliance	Not mapped
		Mixed Oak Alliance	Mixed Oak Alliance	Not mapped

Yolo HCP/NCCP Natural Communities	California Wildlife Habitat Relationship Classification System	Yolo HCP/NCCP Vegetation	Napa County Vegetation Map[a]	Department of Water Resources Map
		Sparse California Juniper-Canyon Live Oak-California Bay-California Buckeye/Steep Rock Outcrop NFD Alliance	Sparse California Juniper-Canyon Live Oak-California Bay-California Buckeye/Steep Rock Outcrop NFD Alliance	Not mapped
Valley Oak Woodland	Valley Oak Woodland	Valley Oak Alliance (Dry)	Valley Oak Alliance	Not mapped
Alkali prairie	Saline Emergent Wetland	Alkali prairie	Not mapped	Not mapped
Fresh Emergent Wetland	Fresh Emergent Wetland	(Alkali Bulrush-Bulrush) Brackish Marsh NFD Super Alliance	(Alkali Bulrush-Bulrush) Brackish Marsh NFD Super Alliance	Not mapped
		Bulrush-Cattail Wetland Alliance	(Bulrush-Cattail) Freshwater Marsh NFD Super Alliance	Not mapped
		(Bulrush-Cattail) Freshwater Marsh NFD Super Alliance	(Bulrush-Cattail) Freshwater Marsh NFD Super Alliance	Not mapped
		(*Carex* spp.-*Juncus* spp.-Wet Meadow Grasses) NFD Super Alliance	(*Carex* spp.-*Juncus* spp.-Wet Meadow Grasses) NFD Super Alliance	Not mapped
		Crypsis spp.-Wetland Grasses-Wetland Forbs NFD Super Alliance	Not mapped	Not mapped
		Perennial Pepperweed (*Lepidium latifolium*) Alliance	Not mapped	Not mapped
		Saltgrass Alliance	Saltgrass-Pickleweed NFD-Super Alliance	Not mapped
		Undetermined alliance-Managed	(Alkali Bulrush-Bulrush) Brackish Marsh NFD Super Alliance, Bulrush-Cattail) Freshwater Marsh NFD Super Alliance, (*Carex* spp.-*Juncus* spp.-Wet Meadow Grasses) NFD Super Alliance	Not mapped
		Giant Reed Series	Not mapped	Not mapped

Yolo HCP/NCCP Natural Communities	California Wildlife Habitat Relationship Classification System	Yolo HCP/NCCP Vegetation	Napa County Vegetation Map[a]	Department of Water Resources Map
Valley Foothill Riparian (Continued)	Valley Foothill Riparian	Blackberry NFD Super Alliance	Valley Oak-Fremont Cottonwood-(Coast Live Oak) Riparian Forest NFD Association	Not mapped
		Coyote Brush	Not mapped	Riparian Vegetation
		Mixed Fremont Cottonwood-*Willow* spp. NFD Alliance	Mixed Fremont Cottonwood-*Willow* spp. NFD Alliance	Riparian Vegetation
		Mixed Willow Super Alliance	Mixed Willow Super Alliance	Riparian Vegetation
		Tamarisk Alliance	Tamarisk Alliance	Not mapped
	Valley Foothill Riparian (Continued)	Undifferentiated Riparian Bramble and Other	Valley Oak-Fremont Cottonwood-(Coast Live Oak) Riparian Forest NFD Association, Mixed Fremont Cottonwood-*Willow* spp. NFD Alliance, Mixed Willow Super Alliance	Riparian Vegetation
		Undifferentiated Riparian Scrub	Valley Oak-Fremont Cottonwood-(Coast Live Oak) Riparian Forest NFD Association, Mixed Fremont Cottonwood-*Willow* spp. NFD Alliance, Mixed Willow Super Alliance	Riparian Vegetation
		Undifferentiated Riparian Woodland/Forest	Valley Oak-Fremont Cottonwood-(Coast Live Oak) Riparian Forest NFD Association, Mixed Fremont Cottonwood-*Willow* spp. NFD Alliance, Mixed Willow Super Alliance	Riparian Vegetation
		White Alder (Mixed Willow) Riparian Forest NFD Association	White Alder Riparian Forest NFD-Association (Mixed Willow-California-Big Leaf Maple)	Not mapped
Vernal Pool Complex	Annual grassland	Vernal Pool Complex	Not mapped	Not mapped
Open Water	Riverine	Open Water	Water	Water Surface
Agricultural (Seminatural Community)	Irrigated Row and Field Crops	Field Crops	Agriculture	Field Crops, Truck, and Berry Crops
	Dryland Grain Crops	Grain and Hay, Alfalfa	Agriculture	Grain and Hay Crops

Yolo HCP/NCCP Natural Communities	California Wildlife Habitat Relationship Classification System	Yolo HCP/NCCP Vegetation	Napa County Vegetation Map[a]	Department of Water Resources Map
	Pasture	Pasture	Agriculture	Pasture
	Rice	Rice	Agriculture	Rice
	Irrigated Row and Field Crops	Truck, Nursery, and Berry Crops	Agriculture	Field Crops, Truck, and Berry Crops
Land Cover Types that Are Not Natural or Seminatural Communities				
Yolo HCP/NCCP Land Cover Type	California Wildlife Habitat Relationship Classification System	Yolo HCP/NCCP Vegetation	Napa County Vegetation Map[1]	Department of Water Resources Map
Other Agriculture (not habitat for covered species)	Evergreen orchard	Citrus/Subtropical	Agriculture	Citrus and Subtropical
	Deciduous Orchard	Deciduous Fruits and Nuts	Agriculture	Deciduous Fruits and Nuts
	Vineyard	Vineyard	Agriculture	Vineyard
Barren and Developed	Urban	Semiagricultural/Incidental to Agriculture	Urban	Urban, Urban Landscape, Industrial, Commercial, Residential, Semiagricultural, and Incidental to Agriculture
	Barren	Barren-Anthropogenic	Not mapped	Barren and Wasteland
	Barren	Barren-Gravel and Sand Bars	Not mapped	Barren and Wasteland
	Barren	Rocky Outcrop	Rock Outcrop	Not mapped
	Urban	Urban or Built Up	Urban	Urban, Urban Landscape, Industrial, Commercial, Residential, Semiagricultural, and Incidental to Agriculture
	Urban, Annual Grassland	Vegetated Corridor	Urban, California Annual Grasslands Alliance	Urban, Urban Landscape, Industrial, Commercial, Residential, Semiagricultural, Barren and Wasteland, and Incidental to Agriculture

[a.] The acreage estimates provided for cultivated land crop types in this table are based on the existing conditions at the time of data capture (i.e., 2008, with updates provided by the member agencies' planning staff),

2.3.3 Mapping Methods

This section describes the methods used to develop the land cover dataset from existing datasets, which were developed for portions of the Plan Area at different points in time using differing land classification systems and mapping methods. These varying datasets were combined to develop a seamless land cover geographic information system (GIS) data layer.

To prepare the land cover database, multiple land cover and vegetation sources (Section 2.3.2, *Data Sources*) were obtained and assessed. Certain important characteristics, such as mapping scale, mapping methods, and land cover/vegetation classification, varied among these data sources. To minimize mapping inconsistencies that can result from using multiple data sources and classification systems, a crosswalk was developed for the various classification systems used in the mapping efforts, and a single, standardized classification system was developed for the Yolo HCP/NCCP, as described in Section 2.3.1, *Natural Community, Vegetation, and Other Land Cover Classification*, and Table 2-2, *Other Classification Systems*. Supplemental mapping was conducted to minimize inconsistencies as they were identified during the mapping process. This process involved spatial changes and attribute editing where necessary. The mapping units from the various sources were thus combined into a seamless GIS layer covering the extent of the Plan Area. Although some inconsistencies remain in the dataset, this process reduced remaining anomalies to a level that provides a reliable basis for developing the conservation strategy and analyzing the effects of the covered activities on the natural communities and covered species (Chapter 5, *Effects on Natural Communities and Covered Species,* and Chapter 6, *Conservation Strategy*).

Land cover in the Blue Ridge and Little Blue Ridge planning units (Figure 1-2) was identified using mapping data developed jointly by UC Davis, CDFW, and AIS: the data were developed for Napa County but extended into this portion of the Plan Area. The Napa County map was created using the MCV classification system, aerial photo interpretation, and limited field verification. Land cover that could be formally assigned to a defined type in the MCV classification system was classified at the alliance level (floristic-based), although a few associations, comprising several vegetation types, were also included. All grass types, many shrub types, and low-density stands of foothill pine were not identifiable in the aerial photos; these vegetation types were therefore aggregated into a super alliance. Vegetation types that could not be formally assigned because the type had not been formally defined, or because the type could not be distinguished in the aerial photographs, were assigned a provisional classification consistent with MCV and were identified as not formally defined (NFD). The minimum mapping unit of most land cover types was 2.5 acres, although units as small as 0.63 acre were delineated around important features such as agricultural ponds.

The Yolo County Community Planning and Public Work Works Department originally mapped riparian features within the Plan Area in 1989 and 1990, augmented the mapping in 1996 (Sacramento mainstem) and 1998 (Cache Creek and Putah Creek), and reviewed and adjusted the mapping in 2004, with some areas updated in 2011. The Yolo County Community Planning and Public Work Works Department's Riparian Zone Mapping Dataset includes mapping of the valley bottoms and lower slopes of Yolo County that occurred during the winter of 1989 and spring of 1990. Portions of the Sacramento River and major tributaries were mapped by California State University, Chico to inventory and map riparian lands along these hydrologic features (the Sacramento River and Major Tributaries Riparian Zone Mapping dataset). California State University, Chico mapped the Sacramento River mainstem in 1996, Cache Creek in 1998, and Putah

Creek in 1998; the study area was confined to streams in the Sacramento Valley, and mapping ended in the foothill canyons on both sides of the valley. All mapped areas were conducted at a 1:12,000 mapping scale. These data were incorporated into the initial land cover dataset to provide greater resolution of riparian land cover types. The 1989 and 1990 Yolo County Planning and Public Works Department's Riparian Zone Mapping dataset, consisting of printed maps but no digital data layers, was reviewed and compared with the 2004 digital orthophotographs. New polygons were digitized on the 2004 aerial photos to correspond to the printed mapped polygons, and the vegetation classification assigned on the printed maps was correlated with these newly digitized polygons. In the Davis, West Sacramento, Woodland, and Winters planning units, riparian vegetation was remapped in June 2011. Riparian features existing in the DWR 2008 land cover dataset that fell beyond the riparian features mapped in 1990, 1996, 1998, 2004, and 2011 were also included in the riparian mapping.

The alkali prairie and fresh emergent wetland features in the western portion of the Plan Area were mapped in February 2013 using 2012 NAIP and i-cubed imagery, in conjunction with CDFW biologists' interpretations. This land cover was initially mapped by aerial photo interpretation using 1993 USGS digital orthophotography.

The 2005 Bay-Delta vegetation mapping dataset was created by AIS for CDFW using CDFW's vegetation classification and mapping program to assess existing vegetation and land use conditions in the Delta region. The CDFW Bay-Delta vegetation cover dataset was used to augment vegetation mapping of areas of overlap between the Plan Area and the region surveyed by CDFW. The map classification is based on field data collected during the summer and fall of 2005. Vegetation was mapped from the suballiance to super alliance level using the National Vegetation Classification Standard. Maps were at 1:12,000 scale, vegetation was mapped at a two-acre minimum mapping unit, and critical vegetation types such as wetlands were mapped at a one-acre minimum mapping unit. Features that were distinct or deemed important were mapped below the minimum mapping unit size.

In the spring of 2008, 2004 orthophotography was used to update the land cover data layer for ponds and new development. The orthophotography was reviewed in detail to identify any ponds, which are a component of some covered species habitat models (Section 2.6.3, *Covered Species Habitat Models*), that were not captured by the previous mapping efforts. At the same time, areas that were seen as developed on the orthophotography were updated. Orthophotography was used to update further the developed lands layer in 2014.

Cultivated lands and natural land cover types not addressed in other data sources at greater resolution were identified using the DWR Land Use Map 2008 dataset. Where necessary, the classifications of DWR polygons were adjusted to conform to HCP/NCCP land cover dataset classification hierarchy. NAIP 2012 aerial imagery was reviewed to assign the appropriate land cover classification where the DWR classification of nonagricultural land cover types could not be directly aligned to HCP/NCCP classification. In the case of agriculture polygons that lacked detail, the Yolo County Agricultural Commissioner's field data were used to assign the appropriate polygon classification. Additionally, the Yolo Agricultural Commissioner's data were used, in the spring of 2014, to identify and update the conversion of field crops to orchards and vineyards. DWR crops are classified as nine types of structurally similar crop types or groups and three land use designations. This agricultural land cover component of the data set represents a point-in-time characterization of the agricultural landscape of the Plan Area. The distribution, acreage, and types of crops grown in the Plan Area, however, change annually and at larger timescales. As previously described, the

implementation process provides for decision-making (e.g., acquisition of lands that support covered species' habitats) based on the actual land cover types present at the time such decisions are made.

2.4 Natural Communities and Associated Plant and Wildlife Species

The 15 classified natural communities and associated plant and wildlife species are described in this section. The natural communities are grouped into five categories: cultivated lands, grassland, shrublands and scrub, woodlands and forest, and riparian and wetlands. The natural community categories provide a primary system for describing biological communities in this HCP/NCCP and assigning conservation measures that apply to multiple species. The natural communities are described in the order in which they are listed in Table 2-1, *Natural Communities and Other Land Cover Types,* and follow the framework of the California Wildlife Habitat Relationship classification system. The natural community descriptions provide information regarding use by covered species and by wildlife species in general. The descriptions focus mainly on primary uses of the habitats by species (i.e., regular use for certain key activities or periods by wildlife or areas of typical occurrence and highest density of plants). The acreage of each natural community for the Plan Area is presented in Table 2-1, *Natural Communities and Other Land Cover Types*.

2.4.1 Cultivated Land

The cultivated land seminatural community consists of nonrangeland agricultural crops that provide habitat for covered species.[2] Crop types that do not provide habitat for covered species are not included in the cultivated lands seminatural community, as described in Section 2.5, *Other Land Cover Types*. The cultivated lands seminatural community consists of 250,662 acres and makes up 38 percent of the Plan Area. This seminatural community is prevalent in the eastern portion of the Plan Area.

Yolo County and the four cities within the county have a longstanding commitment to the preservation of agricultural lands, encapsulated in both county and city planning documents. These plans control sprawl by concentrating growth in the urban areas and maintaining large areas of cultivated land and open space between the cities and towns. This cultivated land provides important habitat value in Yolo County for many covered species and species of local concern, including Swainson's hawk, white-tailed kite, tricolored blackbird, and giant garter snake. Many species depend on or benefit from agricultural operations on some croplands in Yolo County (e.g., tilling, harvesting, crop rotations). As natural habitat is lost, agricultural lands provide cover, forage, reproduction, and dispersal functions. In many locations, growers have enhanced field edges with hedgerows that provide habitat and refugia for common species and rodents (prey for Swainson's hawk and white-tailed kite).

Crop types on cultivated lands change over time with changes in demand, price, and other factors related to the wide variety of food and fiber crops grown in Yolo County; therefore, the acreage estimates provided for cultivated land crop types in this section and other chapters of the Yolo

[2] The cultivated lands natural community type does not include rangelands, which typically include grassland, oak woodlands, and other natural communities that are not cultivated.

HCP/NCCP are based on the existing conditions at the time of data capture (i.e., 2008, with updates provided by the member agencies' planning staff, as described in Section 2.3.3, *Mapping Methods*) for the land cover GIS database.[3] Crop types that constitute the cultivated lands seminatural community are described below.

2.4.1.1 Alfalfa

Alfalfa is a relatively low-growing perennial herbaceous legume species that is periodically irrigated and cut for hay, often five times during the growing season. Alfalfa is often used as a "green manure" fertilizer because it fixes nitrogen and is incorporated into the soil as part of many crop rotations. Alfalfa accounts for 48,897 acres, or approximately seven percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-5).

The high protein content of its leaves makes alfalfa highly palatable for rodents such as ground squirrels, gophers, and voles, which are often present in high numbers in the fields. As a result of the large rodent populations, alfalfa fields support particularly high-value foraging habitat for covered species such as the Swainson's hawk and white-tailed kite.

2.4.1.2 Rice

Rice is a flood-irrigated crop that is a seed-producing annual grass. It is generally grown in leveled fields that are flooded for most of the spring/summer growing period and then dried to mature and facilitate harvesting. Commercial rice generally grows to about two feet tall and has 100 percent canopy closure when it matures. Rice is generally planted in the spring and harvested in the fall. Rice accounts for 35,724 acres, or approximately five percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-5).

Rice fields provide valuable habitat that varies seasonally for a range of wetland and upland wildlife species. Rice is a particularly important food source for wintering migratory waterfowl. Rice fields support a number of common wildlife species, both seasonally and year-round, including the great blue heron, great egret, snowy egret, black-crowned night heron, tundra swan, greater white-fronted goose, snow goose, mallard, gadwall, northern pintail, black-necked stilt, long-billed dowitcher, dunlin, least sandpiper, mourning dove, red-winged blackbird, and various rodents. The black tern, bald eagle, northern harrier, purple martin, and yellow-headed blackbird are local concern species that use rice fields.

Rice fields provide habitat for covered wildlife species, including the giant garter snake, western pond turtle, bank swallow, tricolored blackbird, and wintering white-tailed kites. Irrigation and drainage facilities are of particular importance for the giant garter snake and western pond turtle because they have more structural permanence and hold water for longer periods. These features also serve as habitat corridors that allow them to disperse and move among habitat areas.

In Yolo County, rice is grown in two areas: (1) the Colusa and Yolo Basins where the historic vegetation was perennial freshwater marsh and (2) the Madison syncline where the historic vegetation was prairie/grassland and seasonal freshwater marsh. Madison syncline rice fields are isolated from the historic range of giant garter snake in the Colusa and Yolo Basins by the Dunnigan

[3] Annual crop reports published by the Yolo County Department of Agriculture and Weights & Measures provide a good indication of the changes in acreage and yields of crops in the county over the past 80 years (http://www.yolocounty.org/Index.aspx?page=486).

Hills/Plainfield Ridge. The basins continue to provide good giant garter snake habitat because water is present in the canals permanently, but rice in the syncline provides this snake with no habitat because the water is present only during irrigation.

2.4.1.3 Field Crops

Field crops vary in structure, irrigation requirements, and crop rotation. In general, field crops produce a dense canopy with variable openings, depending on the planting layout and time of season. Irrigation may be a single event at the beginning of the growing season, or crops may be periodically irrigated until harvest time. Crop types in this category include corn, dry beans, grain sorghum, safflower, sudan, sugar beets, and sunflowers. Field crops are irrigated row crops and are one of the most abundant agricultural types within Yolo County, accounting for approximately 42,131 acres, or six percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-5).

Herons, egrets, ibis, and hawks often congregate in large numbers to forage on insects, voles, and other prey flushed during harvesting or flood irrigating. Other common wildlife species found in field crops include the American kestrel, horned lark, American pipit, western meadowlark, red-winged blackbird, house finch, California meadow vole, house mouse, brown rat, and black-tailed jackrabbit.

Field crops provide foraging habitat for the white-tailed kite and the Swainson's hawk. The taller, denser crops such as corn, safflower, and sunflower, however, provide low-value foraging habitat for these species because prey accessibility is low (Estep 2014).

Freshly cultivated fields, before crop development, provide habitat for mountain plover, horned lark, and Swainson's hawk. Local barren areas around irrigation facilities can also provide habitat for burrowing owls.

2.4.1.4 Truck and Berry Crops

Truck and berry crops involve intensive agricultural operations to produce food and landscaping plants that are typically transported for sale elsewhere. Truck farming is the cultivation of fruit or vegetable crops on a relatively large scale for transport to distant markets and includes the production of tomatoes (the dominant crop), asparagus, melons, squash, cucumbers, onions, strawberries, and peppers. Nurseries produce flowering plants, shrubs, and trees for local and distant retail sales. Farming practices associated with these crops generally suppress the growth of other vegetation. These crop types support the yellow-billed magpie, a local concern species, and provide foraging habitat for covered wildlife species such as the white-tailed kite and Swainson's hawk. Truck and berry crops account for 43,464 acres, or seven percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*).

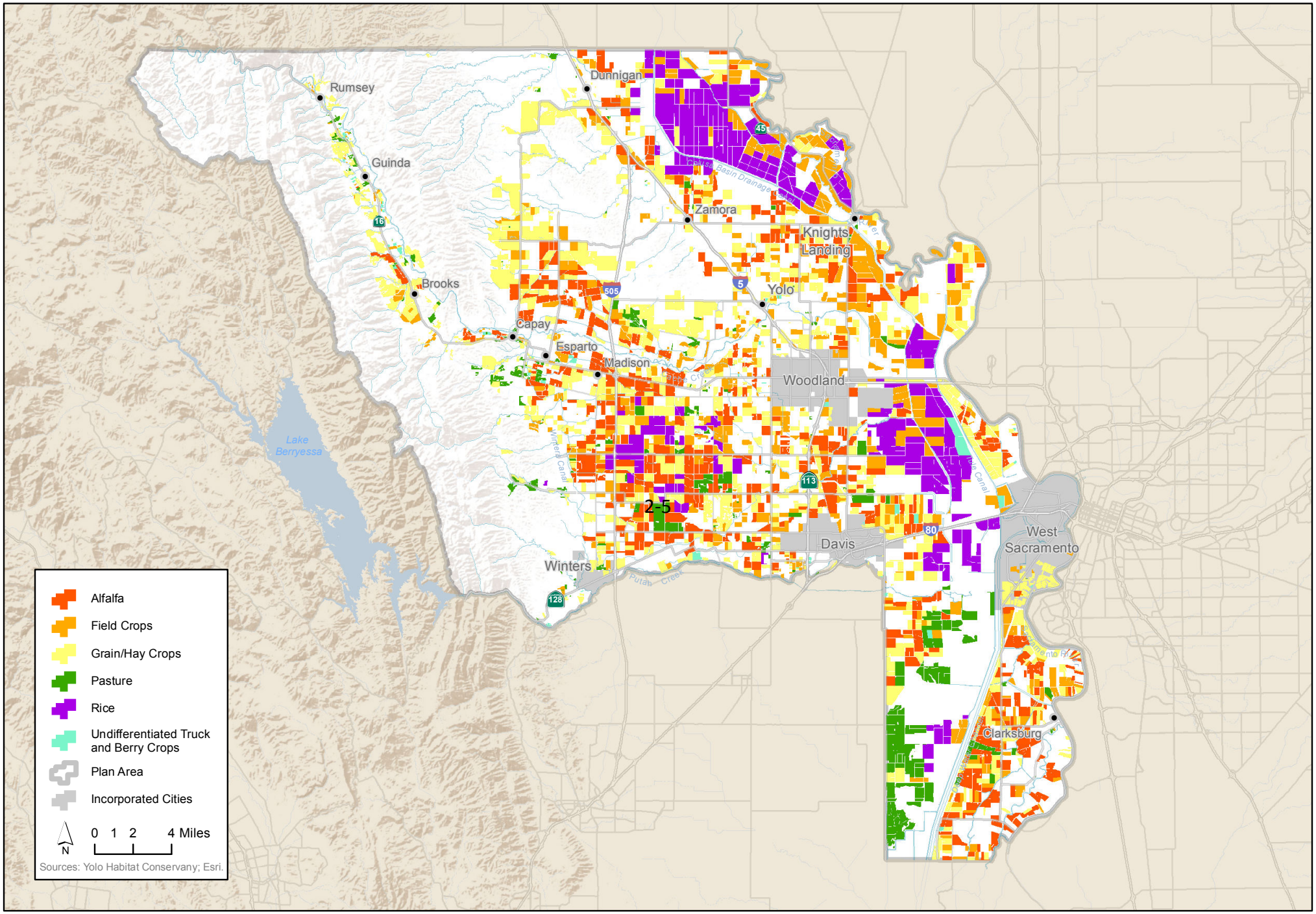

Figure 2-5. Distribution of Cultivated Land Seminatural Community in the Plan Area

2.4.1.5 Grain and Hay Crops

Grain and hay crops include irrigated and dryland grain and hay production operations. In dryland farming, wheat is the dominant grain crop, with smaller acreages of barley and rye. Oat hay is the dominant dryland hay crop. The abundance of this vegetation type may expand and contract rapidly with market conditions and crop rotations. In some years, dryland grain and hay production occurs on poorer soils, such as those in the Dunnigan Hills and along the base of the Blue Ridge. Overall, dryland grain and hay crops are unique because many crops are harvested in early summer, which leaves the fields fallow until fall. Summer annuals, including the nonnative invasive yellow star-thistle, dominate some of these fallow fields. Grain and hay crops account for 65,303 acres, or 10 percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types,* and Figure 2-5).

Grain and hay crops (dryland grain crops) support common wildlife species, including the mourning dove, northern harrier, western meadowlark, Brewer's blackbird, red-winged blackbird, coyote, California ground squirrel, and black-tailed jackrabbit. Grain and hay crops also provide important habitat for covered wildlife species such as the Swainson's hawk, white-tailed kite, and tricolored blackbird.

2.4.1.6 Pastures

Pastures are typically planted with nonnative grasses or leguminous plant species and irrigated for livestock grazing. Pastures that have been irrigated for decades may resemble meadows or seasonal wetlands as fresh emergent wetland species become established. They are usually located on landscapes with flat to gently rolling terrain to facilitate border or sprinkler irrigation. In the Plan Area, most of the pastures are located on valley floors and concentrated in the south-central and southeastern sections of the Plan Area. Pastures account for 15,197 acres, or two percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types,* and Figure 2-5).

Common wildlife species found in pastures include the mallard, killdeer, western kingbird, western meadowlark, and red-winged blackbird. Local concern species that use pastures are the short-eared owl, yellow-billed magpie, yellow-headed blackbird, loggerhead shrike, and Townsend's big-eared bat. Depending on type, pastures support a number of covered wildlife species, including the California tiger salamander (using existing rodent burrows), Swainson's hawk (for foraging), burrowing owl (including for breeding if ground squirrel burrows are present), and tricolored blackbird.

2.4.2 Grassland

2.4.2.1 Grassland Natural Community

The grassland natural community is composed of five vegetation types that support grasses and associated annual and perennial forbs: California grasslands alliance, *Lotus scoparius* alliance, sparse bush lupine/annual grasses/rock outcrop alliance, upland grasslands and forbs formation, and urban ruderal. In many cases, grassland is dominated by native and exotic forbs in certain seasons or during different periods within a season (D'Antonio et al. 2007). Many of the species that occupy this natural community also occur as understory plants in other natural communities such as blue oak woodland (Allen-Diaz et al. 2007). The grassland natural community accounts for 80,911 acres,

or 12 percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-6).

The grassland natural community is found in areas where trees account for less than 10 percent of the cover and the topography consists of flat plains or gently rolling foothills. Plants are typically less than three feet tall. Seed germination of annual grasses and forbs occurs in fall after the rains begin (D'Antonio et al. 2007). Winter is a period of slow growth, followed by rapid growth in spring and senescence during the summer (Reever-Morghan et al. 2007). The composition and structure of grassland species are influenced by factors, such as climate (e.g., annual precipitation), soil conditions, light intensity (which may be affected by shading from other plants and microtopography), farming history, and livestock grazing (Bartolome et al. 2007; D'Antonio et al. 2007). In many areas, nonnative species are dominant, but in some areas, native species are dominant at certain times of the year.

Although this natural community is commonly categorized as *California annual grassland*, it was historically categorized as *California prairie*. The *grassland* name is based on a theory that these lands were once dominated by native perennial bunchgrass, which was destroyed by grazing and supplanted by nonnative grasses. Historical evidence strongly suggests, however, that in the Central Valley, particularly in low precipitation areas and infertile old terrace soils, these areas were dominated by forbs and supported relatively few grasses (Holstein 2001, 2011).

Grasslands are a common feature of the Blue Ridge and Capay Hills planning units (Figure 1-2). In other areas, such as the Dunnigan Hills, it is difficult to distinguish grassland from weedy fallow grain fields or old fields on the basis of aerial photograph interpretation. In most cases, the dominant plants in heavily disturbed areas (i.e., areas where vegetation removal, soil disking, tilling, and scraping have occurred) are Eurasian annual grasses and forbs. Many of the disturbed areas along the lower slopes of the Blue Ridge were also cultivated and are currently dominated by nonnative medusahead and barbed goatgrass in the spring and yellow star-thistle in the summer.

Common nonnative species associated with grassland natural communities are barbed goatgrass, slender oats, wild oats, soft chess, ripgut brome, yellow star-thistle, broadleaf filaree, cutleaf filaree, Italian ryegrass, medusahead, various introduced clovers, and Zorro fescue. Native herbaceous species associated with grassland include rancher's fireweed, miner's lettuce, blue dicks, dove weed, California poppy, miniature lupine, baby blue-eyes, California plantain, vinegar weed, tomcat clover, butter-and-eggs, Ithuriel's spear, and small fescue.

Grasslands, along with the herbaceous understory component of other land cover types (e.g., blue oak woodland) in the Plan Area, have been managed primarily for livestock grazing for more than 150 years and could have been categorized as agricultural rangelands. The Yolo HCP/NCCP uses the term *grassland* to focus on the wildlife habitat function because that is the focus of this HCP/NCCP. The current and future management of these rangelands, however, is a key component of the conservation strategy (Chapter 6, *Conservation Strategy*) because this working landscape provides valuable wildlife habitat functions.

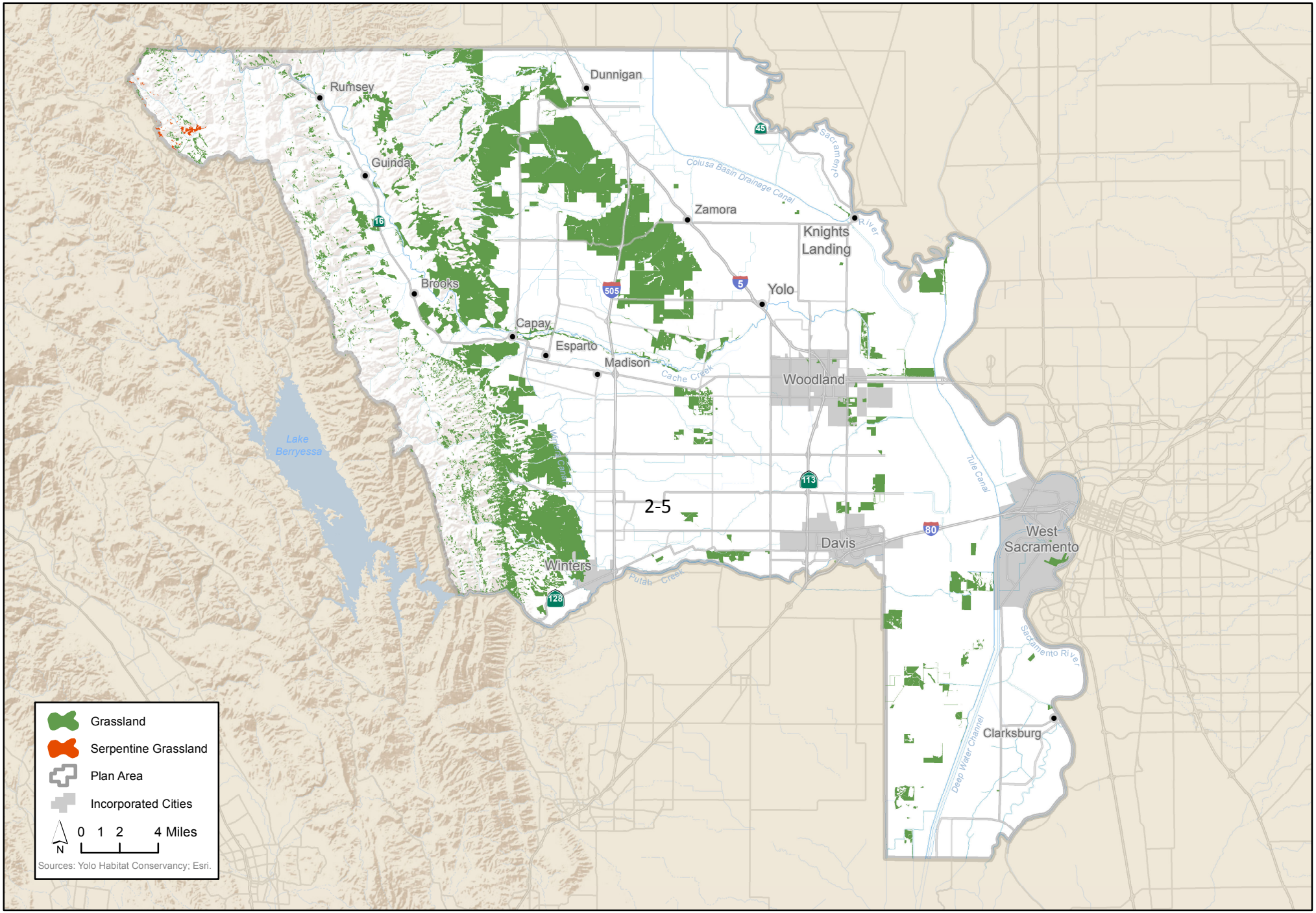

Figure 2-6. Distribution of Grasslands Natural Communities in the Plan Area

Most of the grassland mapped in the Plan Area consist of annual grassland, dominated by nonnative species. Although perennial grassland may be present in the Plan Area, they do not occur in amounts that allow mapping and quantification through aerial imagery, and no mapping data currently exist for perennial grasslands in the Plan Area. Restoration efforts have sought to reestablish native perennial grass–dominated natural communities in areas supporting grassland. Perennial grassland consists of various mixtures of native grasses and, to a lesser extent, wildflowers. Covered plant and wildlife species that occur in annual grasslands may also use perennial grassland.

Grasslands serve as foraging habitat for several species of local concern, including the pallid bat, badger, golden eagle, prairie falcon, short-eared owl, long-eared owl, purple martin, yellow-headed blackbird, northern harrier, loggerhead shrike, grasshopper sparrow, San Joaquin pocket mouse, and western spadefoot. Covered species that use grasslands include the western burrowing owl, Swainson's hawk, white-tailed kite, tricolored blackbird, and California tiger salamander. Historically this community was grazed by tule elk and pronghorn. Barren areas created by these grazers were almost certainly the primary historical habitat of burrowing owls.

2.4.2.2 Serpentine Natural Community

The serpentine natural community includes the serpentine chaparral and serpentine grasslands vegetation types as well as serpentine barrens, all of which are rare in the Plan Area. The serpentine chaparral and grassland natural communities occur on soils derived from serpentine outcrops on Little Blue Ridge in the northwestern corner of the Plan Area (Bailey et al. 1964). The vegetation types of this natural community vary in species composition and density, but most frequently they are dominated by leather oak chaparral with an overstory of foothill pines. These vegetation types include open stands of trees, mesic and arid chaparral, and mesic meadow-like serpentine grassland with a mixture of grasses and forbs. In some cases, the land may be almost entirely devoid of vegetation (Kruckeberg 2002; Harrison and Viers 2007; O'Geen et al. 2007) and is classified as serpentine barrens. The serpentine grassland natural community has been subject to considerable disturbance from prescribed fire and fire suppression actions, grazing, and mining. The serpentine grassland natural community accounts for 247 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*), but this may not include non-grassland serpentine communities.

As a result of unique soil conditions (i.e., high in magnesium and heavy metals and low in calcium), the serpentine natural community has generally not been diminished in value by invasions from exotic plant species. The heavier serpentine soils in flatlands, however, have been extensively invaded by the nonnative barbed goatgrass. Small patches of serpentine soil tend to be more heavily invaded by exotic annual grasses than larger patches (Harrison and Viers 2007).

The climatic, physical, and geographical characteristics of Little Blue Ridge provide conditions that support a rich array of serpentine endemic plant species. This natural community supports several local concern plant species, including drymaria-like western flax, Colusa layia, Hall's harmonia, and Morrison's jewelflower. No covered species are specifically associated with the serpentine natural community.

2.4.3 Shrubland and Scrub

2.4.3.1 Chamise Natural Community

The chamise natural community contains stands in which the shrub component is dominated by chamise, either in nearly pure stands or in mixed stands of chamise and other scrub species. The chamise natural community is usually found on south-facing or west-facing slopes that receive the greatest solar exposure, drain very rapidly, and have little soil development. In Yolo County, it is found almost exclusively on Great Valley sequence substrates. Shrub canopies in this fire-adapted vegetation type are often densely overlapping, with a general lack of herbaceous understory, except in the few years following a fire (Keeley and Davis 2007). Some of the species commonly found in these natural communities after a fire include California yerba santa, pitcher sage, and deerweed. The chamise natural community is commonly found on hills at middle and higher elevations relative to the Plan Area. It accounts for 30,187 acres, or five percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-7).

The chamise natural community may support the local concern plant species Colusa layia and drymaria-like western flax. This natural community also supports the western scrub-jay, wrentit, California thrasher, Bell's sparrow, and California towhee, which are all common wildlife species. No covered species use this natural community in the Plan Area as their primary habitat.

2.4.3.2 Mixed Chaparral Natural Community

The mixed chaparral natural community consists of dense stands of drought-adapted *sclerophyllous* (hard-leaved) shrubs (Keeley and Davis 2007). It generally occurs as a mosaic on exposed sites in the Blue Ridge and Capay Hills on Great Valley sequence substrates. The mixed chaparral natural community accounts for 14,518 acres, or two percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-7).

Nine vegetation types make up the mixed chaparral natural community. The most common vegetation type in mixed chaparral is an association of scrub oak, toyon, common manzanita, and birch-leaf mountain mahogany. This mesic community (i.e., occurring in moister sites) intergrades with the interior live oak association extensively on Blue Ridge.

Other dominant nonserpentine mixed chaparral plant species include California bay and buckbrush. This association is found primarily in the northern portion of the Blue Ridge but can also be found along the higher areas of the central and southern Blue Ridge. All other nonserpentine shrub associations have small distributions in the Plan Area.

The serpentine super alliance shrub vegetation type, located in the northwestern portion of the Plan Area, is dominated by California bay and leather oak on more mesic sites and by whiteleaf manzanita on drier sites. Leather oak can form an intermittent canopy and intergrade with the mixed chaparral alliance. Both leather oak and the serpentine super alliance support a number of rare and endemic plant species.

The mixed chaparral natural community supports several common wildlife species, including year-round residents such as the western fence lizard, western skink, gopher snake, common kingsnake, western rattlesnake, mule deer, coyote, gray fox, mountain quail, California quail, mourning dove, Anna's hummingbird, western scrub-jay, bushtit, Bewick's wren, California thrasher, wrentit, California towhee, spotted towhee, rufous-crowned sparrow, Bell's sparrow, and lesser goldfinch.

Summer residents include blue-gray gnatcatcher, orange-crowned warbler, and lazuli bunting. Winter residents include the hermit thrush, fox sparrow, golden-crowned sparrow, white-crowned sparrow, and dark-eyed junco.

Similar to the chamise, the mixed chaparral natural community may support the local concern plant species Colusa layia and drymaria-like western flax. No covered plant species are known to occur in mixed chaparral. The mixed chaparral natural community does not provide important habitat for any of the covered species.

2.4.4 Woodland and Forest

2.4.4.1 Oak-Foothill Pine Natural Community

The oak-foothill pine natural community is found in the foothills of the Plan Area. Areas mapped as oak-foothill pine also include large areas dominated by interior live oak and foothill pine.[4] Tree density can range from open savanna with scattered trees to a closed-canopy forest. Other associated tree species include interior live oak, California buckeye, and valley oak. The understory consists primarily of annual grasses and forbs, sometimes with a shrub component. The shrub understory may include buckbrush, redberry, poison oak, silver bush lupine, and blue elderberry. The oak-foothill pine natural community is represented by three vegetation types: interior live oak-blue oak (foothill pine) association, interior live oak alliance, and foothill pine alliance. The oak-foothill pine natural community accounts for 43,772 acres, or seven percent, of the landscape (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-8).

The oak-foothill pine natural community supports many common wildlife species, including the band-tailed pigeon, hairy woodpecker, pileated woodpecker, acorn woodpecker, western scrub-jay, oak titmouse, Hutton's vireo, mule deer, bobcat, and striped skunk.

Local concern species that may occur in the oak-foothill pine natural community are the Colusa layia, purple martin, mule deer, and Townsend's big-eared bat. No covered species are known to be dependent upon this natural community.

[4] Personal communication, Glen Holstein. Botanist. 2014.

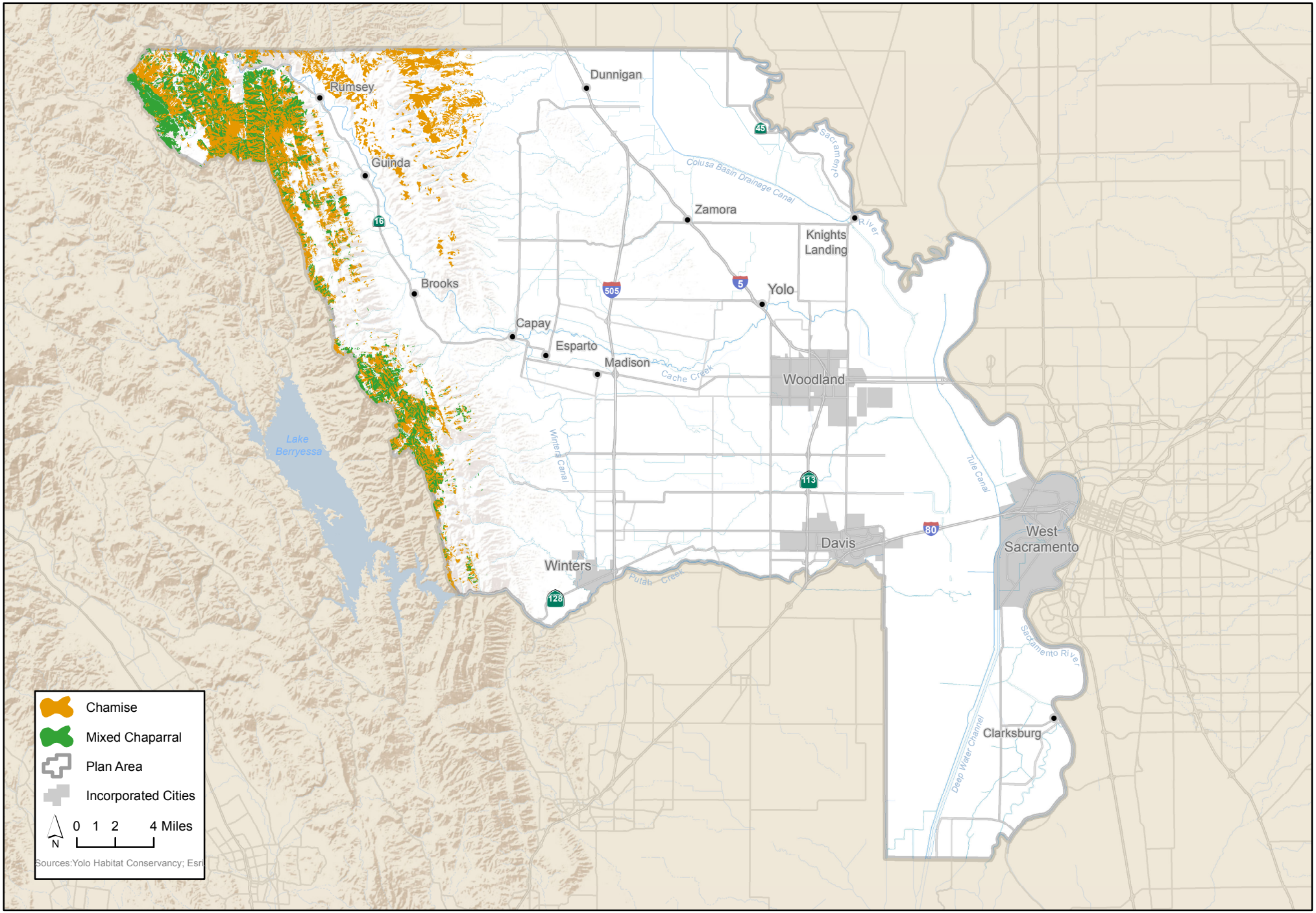

Figure 2-7. Distribution of Shrubland and Scrub Natural Communities in the Plan Area

2.4.4.2 Blue Oak Woodland Natural Community

Blue oak accounts for 85 to 100 percent of the trees in the blue oak woodland natural community. Generally, these woodlands have an overstory of scattered trees, although the canopy can be nearly closed on some sites (Pillsbury and De Lasaux 1983). Associated shrub species include poison oak, California coffeeberry, buckbrush, and common manzanita. The ground cover is composed mainly of species such as brome grass, wild oats, needlegrass, filaree, and fiddleneck. The blue oak woodland natural community accounts for 35,891 acres, or five percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types, and* Figure 2-8).

Blue oak woodland provides habitat for local concern species, including the Townsend's big-eared bat. The only covered species known to occur in blue oak woodland is the white-tailed kite, but it is uncommon there.

2.4.4.3 Closed-Cone Pine-Cypress Natural Community

The closed-cone pine-cypress natural community is composed of the knobcone pine alliance and MacNab cypress alliance vegetation types. Closed-cone pine-cypress is scarce in the Plan Area but more common in adjacent Napa County. This natural community is commonly found on serpentine soils; in Yolo County, it often includes leather oak and foothill pine. The closed-cone pine-cypress natural community accounts for 212 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-8).

There are localized patches of knobcone pine alliance vegetation on the north-facing slope of the Blue Ridge and at Yolo County's northern boundary immediately above Cache Creek. Little is known about this stand. The University of California McLaughlin Reserve at Little Blue Ridge, at the intersection of Yolo, Napa, and Lake Counties, on both sides of Rayhouse Road, supports the MacNab cypress alliance vegetation. This vegetation is almost entirely confined to serpentine soils. It shares many species with the serpentine grassland natural community (Holstein 2013).

Both vegetation types contain relatively small trees that require periodic fires to stimulate the recruitment of new trees. Fire clears the overstory and causes cones to open and release their seeds, resulting in a pulse of seedling recruitment. Stands mature rapidly and typically last between 35 and 100 years, depending on local fire-return intervals (Barbour 2007). MacNab cypress trees may occur in stands of mixed serpentine chaparral or may form nearly pure stands.

The closed-cone pine-cypress natural community in the Plan Area supports the common-to-rare plant and animal species of adjacent natural communities but is not known to support any covered species.

2.4.4.4 Montane Hardwood Natural Community

The montane hardwood natural community typically consists of a dominant hardwood tree component with a poorly developed shrub understory and little herbaceous vegetation. Tree spacing ranges from 10 to more than 30 feet apart. The montane hardwood natural community is composed of black oak alliance, canyon live oak alliance, and mixed oak alliance. Some areas that have been mapped as montane hardwood natural community in the Plan Area might be better

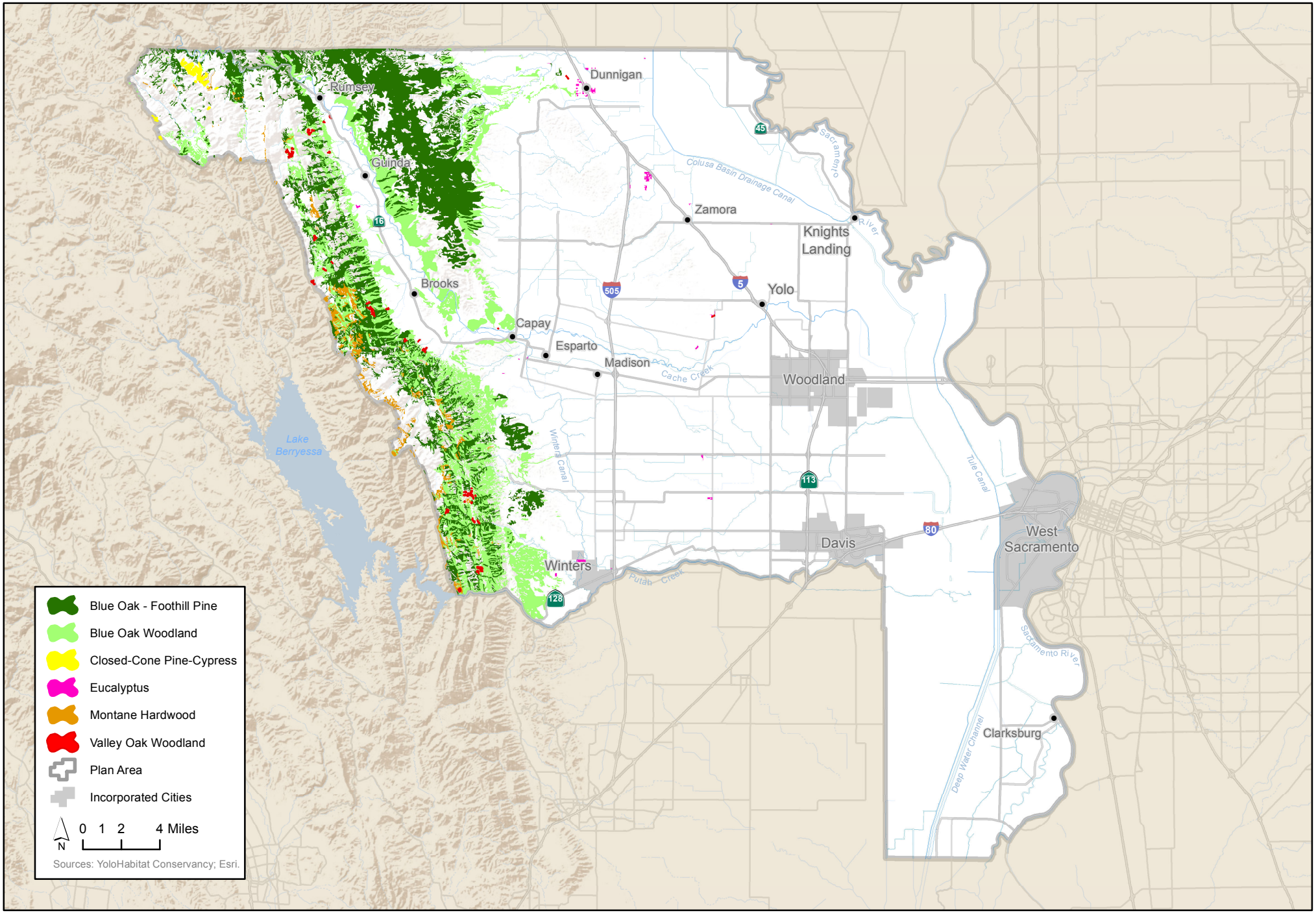

Figure 2-8. Distribution of Woodland and Forest Natural Communities in the Plan Area

characterized as live oak-foothill pine.[5] These woodlands are found on a wide range of slopes and particularly on moderate to steep slopes. Soil depth may be shallow or deep. The montane hardwood natural community accounts for 3,087 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-8).

The montane hardwood natural community supports a number of common wildlife species, including the western skink, northern alligator lizard, common kingsnake, gopher snake, western rattlesnake, red-tailed hawk, American kestrel, California quail, mourning dove, great horned owl, western screech-owl, northern pygmy-owl, Anna's hummingbird, acorn woodpecker, Nuttall's woodpecker, ash-throated flycatcher, western scrub-jay, oak titmouse, white-breasted nuthatch, Bewick's wren, house wren, blue-gray gnatcatcher, western bluebird, American robin, orange-crowned warbler, black-headed grosbeak, lazuli bunting, spotted towhee, California towhee, lark sparrow, Bullock's oriole, house finch, lesser goldfinch, dark-eyed junco, deer mouse, western gray squirrel, striped skunk, raccoon, bobcat, and mule deer. This natural community supports several local concern species: Colusa layia, drymaria-like western flax, purple martin, and Townsend's big-eared bat. This natural community does not support any covered species.

2.4.4.5 Valley Oak Woodland Natural Community

The valley oak woodland natural community consists of tree stands that are dominated by valley oak located outside of riparian zones. The valley foothill riparian natural community, described in Section 2.4.5.4, *Valley Foothill Riparian Natural Community*, can be dominated by valley oak but encompasses streamside communities that have a higher abundance of typical riparian species, such as cottonwoods, ash, and willows. The valley oak woodland natural community is usually located below 5,000 feet and on sites that support deep, well-drained alluvial soils, most often on valley floors. The valley oak woodland natural community was once much more abundant in lowland areas, but removal over the years through agricultural conversion and development has reduced the natural community to a few scattered dense groves and, more commonly, small groves of scattered trees or isolated individual trees around farmsteads, agricultural work areas, roadsides, and agricultural fields.

Most of the remaining stands of valley oak woodland in Yolo County lack the diverse understory that was present under historical conditions. Existing valley oak woodland stands outside the Plan Area, in and around the Cosumnes Reserve in Sacramento County, provide an example of historical conditions in the Plan Area. There, valley oaks are the overstory, while the intermediate canopy consists of blue elderberry and other large shrubs; beardless wild rye and other graminoids form the ground cover (Holstein 2001, 2003).

Mapping this natural community is challenging because of its scattered, low-density condition. Valley oak woodland was mapped in upland locations where valley oak was the prominent species. The valley oak woodland natural community accounts for 181 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-8). Additional sites that support small, sparse groves were not mapped and quantified because of their small areal extent.

The valley oak woodland natural community supports common wildlife species, such as the Nuttall's woodpecker, western scrub-jay, oak titmouse, white-breasted nuthatch, and western bluebird. This

[5] Personal communication, Glen Holstein. Botanist. 2014.

natural community supports suitable habitat for two local concern species: the bent-flowered fiddleneck and loggerhead shrike. The valley oak woodland natural community provides nesting habitat for the covered wildlife species white-tailed kite and Swainson's hawk.

2.4.5 Riparian and Wetland

2.4.5.1 Alkali Prairie Natural Community

The alkali prairie natural community is generally located at elevations below Cache and Putah Creeks. Its hydrology is determined by a mixture of rainfall, runoff, and flooding from adjacent drainages that vary annually, depending on both local and upper watershed precipitation patterns. The soils are composed of saline-alkaline clay with salts that include sodium, magnesium, and boron. The alkali prairie natural community accounts for 312 acres, or less than one percent, of the Plan Area, most of which is southeast of the city of Woodland (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-9).

Historically, the alkali prairie natural community occurred in the Hungry Hollow, Cache/Putah, Colusa, and Yolo Basins (U.S. Bureau of Soils 1909b; Mann et al. 1911; Bryan 1923; Thomasson et al. 1960; Olmsted and Davis 1961). The clays and salts in this natural community originated primarily in drainages of the California Coast Ranges that periodically flooded the western edges of the basins. Flooding is a much less significant source of water, clays, and salts than it was before the 1950s because dams have been constructed in the upper watersheds of Cache and Putah Creeks (Gerlach 2009). Most of the historical extent of the alkali prairie natural community in the Plan Area has been developed, intensively farmed, excavated for stormwater detention ponds, or maintained as flooded habitat for waterfowl.

Vegetation of the alkali prairie natural community is generally dominated by saltgrass. Some areas also include flat-face downingia, curly dock, gumplant, alkali coyote thistle, and alkali heath. Very small patches of alkali-adapted species are present in the natural community and include pickleweed, bush seepweed, alkali heath, common spikeweed, and annual hairgrass. The alkali prairie natural community in the Plan Area also supports several common wildlife species, including the great blue heron, killdeer, American pipit, and savannah sparrow.

The alkali prairie natural community provides primary habitat in the Plan Area for several local concern plant species, including alkali milk-vetch, brittlescale, San Joaquin spearscale, Heckard's peppergrass, and Ferris' milk-vetch. This natural community also provides habitat for vernal pool crustaceans that are federally listed but not covered under this HCP/NCCP: the Conservancy fairy shrimp, midvalley fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp. This natural community provides the last remaining habitat in the Plan Area for the one covered plant species: palmate-bracted bird's beak. The upland portions of the alkali prairie natural community also provide foraging habitat for two covered wildlife species: the Swainson's hawk and the white-tailed kite.

2.4.5.2 Vernal Pool Complex Natural Community

The vernal pool complex natural community consists of complexes of seasonal pools within a grassland matrix. In the Plan Area, these seasonal pools form in shallow depressions that hold water due to the slow infiltration rate of the underlying clay alluvium soil. The vernal pools on the clay alluvium soils of the floodplains contain a mixture of two general types in basins between seasonal drainages: smaller vernal pools connected by swales and larger playa-type vernal pools (Bryan

1923; Thomasson et al. 1960; Olmsted and Davis 1961). Both types of clay alluvium vernal pools are located at elevations slightly above the local drainages and filled primarily by rainfall. The vernal pool complex natural community accounts for 299 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-9).

Historically, the vernal pool complex natural community in the Plan Area occurred in the flood plains of Cache and Putah Creeks and Willow Slough (Gerlach 2009, 2011). Clay alluvium vernal pools historically occurred in a very limited area; much of that area has since been developed or is intensively farmed.

As a result of their close physical association, intergrading formations and geomorphology, and similar native vegetation, it is often difficult to distinguish between vernal pool complex natural community and alkali prairie natural community. Remnant patches of a vernal pool complex natural community occur at Woodland Regional Park, Grasslands Regional Park, and the Tule Ranch Unit of the CDFW Yolo Bypass Wildlife Area.

The vernal pool complex natural community supports a number of characteristic plant species, including downingia, vernal pool goldfields, popcorn flower, and woolly marbles. Local concern plant species that occur in the vernal pool complex natural community include Ferris' milk vetch, alkali milk-vetch, brittlescale, San Joaquin spearscale, Heckard's peppergrass, Colusa grass, Solano grass, and Baker's navarretia. The vernal pool complex also provides primary habitat for listed vernal pool crustaceans that are not covered under this HCP/NCCP: the Conservancy fairy shrimp, vernal pool fairy shrimp, midvalley fairy shrimp, vernal pool tadpole shrimp, and California linderiella. Covered wildlife species, including the Swainson's hawk, white-tailed kite, and western burrowing owl, may use the upland portions of vernal pool complex natural community.

2.4.5.3 Fresh Emergent Wetland Natural Community

The fresh emergent wetland natural community includes aquatic and semiaquatic vegetation types listed in Table 2-1, *Natural Communities and Other Land Cover Types*. The fresh emergent wetland natural community is most commonly found on level to gently rolling landscapes along rivers, lakes, and creeks but can be found anywhere the topography allows perennial or seasonal soil saturation or flooding by fresh water. Perennially flooded areas are typically dominated by cattails, tule, and California bulrush that can reach up to 12 feet in height. Seasonally saturated or inundated areas contain much shorter vegetation and are more variable in the composition of their plant species. Dominant species in many lower elevation seasonal wetlands include swamp timothy, Baltic rush, iris-leaved rush, and spikerushes. The fresh emergent wetland natural community accounts for 25,310 acres, or four percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-9).

Fresh emergent wetlands east of the Dunnigan Hills and the Cache/Putah Basin are found predominately in managed waterfowl habitat that is flooded during the winter and dry during the summer. A much smaller extent with the same winter-flooded hydrologic regime is associated with the lower Willow Slough Bypass and abandoned agricultural land in the lower Yolo Bypass. This natural community also includes small areas of unmanaged vegetation and areas that are inundated during the summer. Sedges and rushes dominate the emergent wetlands within the drainages located between the Blue Ridge and State Route 16, between Rocky Ridge and Interstate 5, and in the Dunnigan Hills. There are bulrush and cattail emergent wetlands in the Willow Slough Bypass just east of the city of Davis and alkali bulrush emergent wetlands in the lowlands just west of the Sacramento River Deep Water Ship Channel in southeast Yolo County.

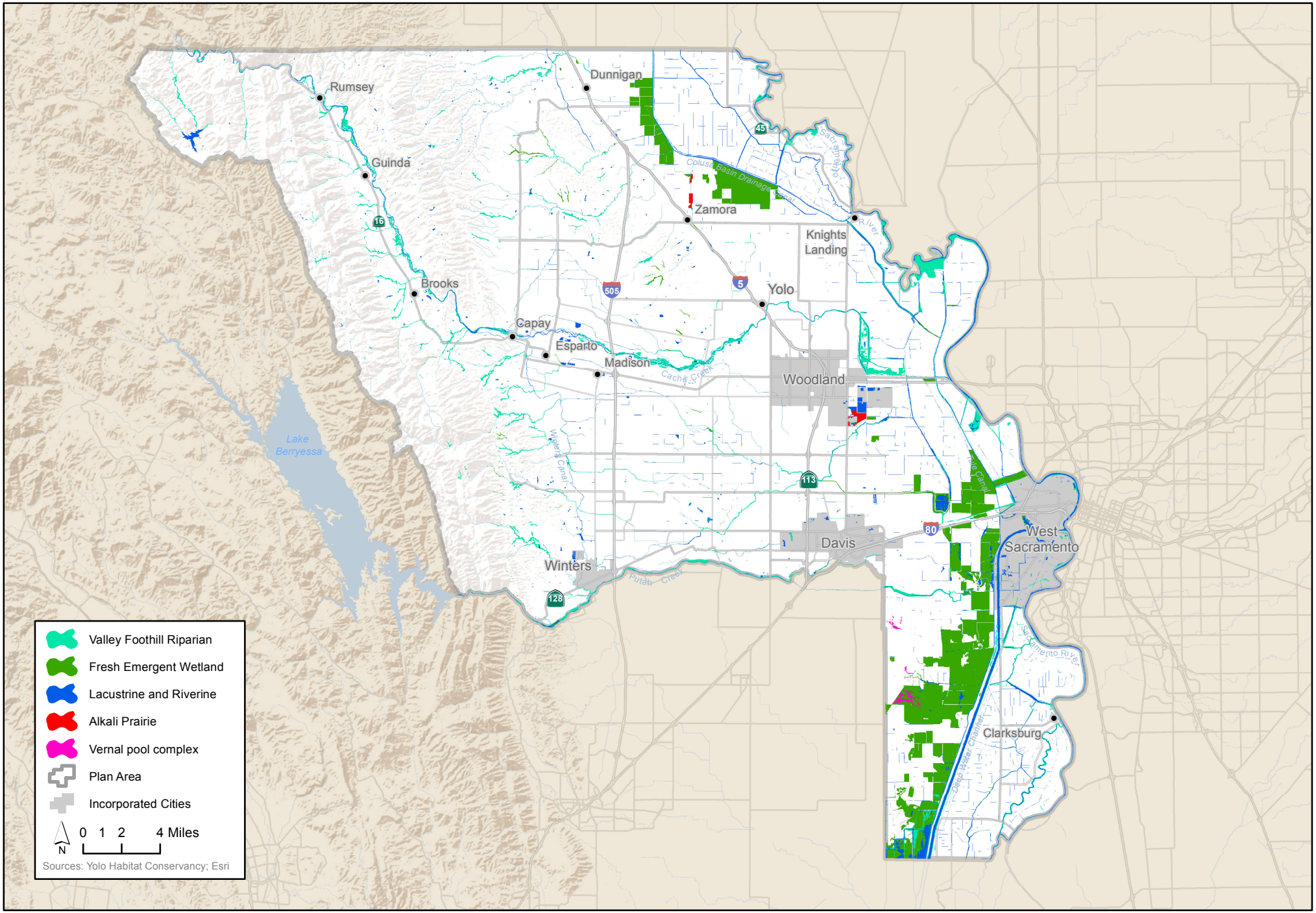

Figure 2-9. Distribution of Riparian and Wetland Natural Communities in the Plan Area

The fresh emergent wetland natural community supports a number of common wildlife species, including the great blue heron, American bittern, great egret, snowy egret, black-crowned night-heron, Virginia rail, sora, common gallinule, American coot, marsh wren, song sparrow, red-winged blackbird, and many species of wintering waterfowl in large numbers. Local concern plant species that use small, specialized habitats in the fresh emergent wetland natural community include the rose mallow, Mason's lilaeopsis, and delta tule pea. The fresh emergent wetland natural community provides habitat for four local concern wildlife species: the black tern, northern harrier, California black rail, and least bittern. This natural community also provides primary habitat for three covered species: the tricolored blackbird, giant garter snake, and western pond turtle.

2.4.5.4 Valley Foothill Riparian Natural Community

The valley foothill riparian natural community consists of a multilayered woodland plant community with a tree overstory and diverse shrub layer. Canopy species include mature valley oak, Fremont cottonwood, ash, and willows. In a mature riparian forest, canopy heights reach approximately 100 feet, and canopy cover ranges from 20 to 80 percent. Blue elderberry, California rose, poison oak, and California blackberry may form dense thickets in the understory of mature riparian forests. California grape creates a dense network of vines in the canopy. In areas that are disturbed by frequent flooding, fire, or human activity, this natural community often consists of smaller trees, more shrubs, and more invasive nonnative species. The valley foothill riparian natural community is usually associated with streams and creeks with low-velocity flows, floodplains, and low topography. The valley foothill riparian natural community accounts for 12,656 acres, or two percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-9)[6].

The valley foothill riparian natural community is composed of 13 vegetation types (Table 2-1), reflecting the diversity of riparian conditions. These types represent recognizably different abundances of the main constituent tree and shrub species (i.e., cottonwood, ash, valley oak, willow, and alder) and several shrub types, including those dominated by the highly invasive nonnative giant reed and salt cedar.

The valley foothill riparian natural community occurs most extensively along Cache Creek, Putah Creek, Willow Slough, Union School Slough, Dry Slough, Chickahominy Slough, the Colusa Basin Drain, the Sacramento River, and Sacramento River delta sloughs including Babel Slough, and Winchester Lake, Elk Slough. Many other streams, sloughs, and canals, as well as some lowland areas with shallow groundwater away from watercourses, support less developed riparian vegetation. Some of the riparian vegetation types occur in characteristic types of watercourses. For example, the Fremont cottonwood-valley oak-willow (ash-sycamore) riparian association occurs along major watercourses, the mixed-willow super alliance occurs along both natural and artificial watercourses, and the mixed Fremont cottonwood-willow NFD alliance occurs along less active streambanks. The tamarisk alliance is currently found only in Cache Creek, and efforts are under way to reduce or eliminate the nonnative invasive tamarisk species that defines it. Coyote brush–dominated riparian vegetation occurs along Buckeye Creek in the northern Dunnigan Hills.

The riparian natural community supports a diversity of plant and animal species and a variety of specialized plant and animal species that are restricted to this natural community for all or

[6] The City of Davis has asked the Conservancy to verify the "fresh emergent wetland" land cover type assigned to the City's Wastewater Treatment Plant Overflow area, which totals approximately 60 acres. This will be addressed in the final Yolo HCP/NCCP.

important parts of their life cycle. It provides nesting habitat and cover for many wildlife species. It also provides continuous corridors and isolated matrix stopover habitat that facilitates movement between habitat areas for many wildlife species. Riparian natural communities are the most productive among California's natural communities because they receive abundant water during the hot, dry summers of California's Mediterranean climate. The riparian communities produce an abundance of insects, which in turn support an abundance of insectivorous migratory birds (Holstein 2003).

Common wildlife species found in the valley foothill riparian natural community include the red-shouldered hawk, great horned owl, black-chinned hummingbird, western scrub-jay, Nuttall's woodpecker, downy woodpecker, American crow, bushtit, oak titmouse, white-breasted nuthatch, black-headed grosbeak, blue grosbeak, lazuli bunting, Bullock's oriole, house finch, American goldfinch, striped skunk, raccoon, and various rodents. Local concern species that use valley foothill riparian include the rose mallow, pallid bat, yellow-breasted chat, yellow-billed magpie, and Townsend's big-eared bat. The California red-legged frog is a listed but noncovered species that has potential to occur in the valley foothill riparian natural community, although there are no known occurrences of the California red-legged frog in this natural community in the Plan Area.

The valley foothill riparian natural community supports habitat for the following covered wildlife species: the valley elderberry longhorn beetle, western pond turtle, bank swallow, Swainson's hawk, western yellow-billed cuckoo, white-tailed kite, and least Bell's vireo.

An atypical riparian community that may be included is riparian chaparral along Cache Creek's losing reach in the Madison syncline where rapid drainage through coarse sediments causes the depth to groundwater to increase so much that few riparian trees can survive. Instead, the sparse vegetation of this area is dominated by California yerba santa, mule fat, and rayless golden aster. This community provides habitat for bank swallow and lesser nighthawk.

2.4.5.5 Lacustrine and Riverine Natural Community

The lacustrine and riverine natural community includes a variety of lakes, reservoirs, and ponds (lacustrine); rivers and streams (riverine); and other open-water land cover types, such as stock ponds, stormwater detention ponds, and wastewater treatment ponds. The lacustrine and riverine natural community is designated as open water in the land cover database (Table 2-1, *Natural Communities and Other Land Cover Types*). The lacustrine and riverine natural community accounts for 13,493 acres, or two percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-9).

Perennially aquatic natural communities usually support fish, which may affect suitability for invertebrates, amphibians, and some reptiles, while seasonal riverine natural communities may contain unique assemblages of fish (Moyle 1983, 2002). Lacustrine and riverine natural communities support algae, mosses, and aquatic plants such as duckweed.

Turbidity, water temperature, and oxygen content affect the quality of habitat for many plant and animal species, including covered species. The concentration and characteristics of the particles that cause turbidity within the water column affect the quantity and quality of light penetration, which affects plant and algal growth rates. Water temperature varies by season and depth within the water column.

The lacustrine and riverine natural community supports a number of common wildlife species, including the eared grebe, pied-billed grebe, double-crested cormorant, common goldeneye, bufflehead, ruddy duck, American coot, osprey, and California gull. Local concern species that use the lacustrine and riverine natural community include the foothill yellow-legged frog, redhead, and bald eagle. This natural community provides breeding and foraging habitat for several covered wildlife species: the western pond turtle, giant garter snake, and California tiger salamander. Artificial ponds in or adjacent to urban areas often support nonnative species, such as red-eared sliders and American bullfrogs, that out-compete or are predators of native species such as western pond turtle.

2.5 Other Land Cover Types

The land cover types described below are not classified as natural communities under this HCP/NCCP. Some of these land cover types may provide species habitat values, as described below.

2.5.1 Other Agricultural Land

The following agricultural land cover types do not provide habitat for covered species and are not included in the cultivated lands natural community for the purpose of this HCP/NCCP. However, these lands can provide buffers between natural communities and nearby development. Furthermore, these lands have the potential to rotate into crop types that have value for covered species.

2.5.1.1 Citrus and Subtropical Orchards

Citrus and subtropical orchards in the Plan Area are typically single-species, tree-dominated agricultural lands and do not support any covered or local concern species. In the Plan Area, this land use category includes olives, oranges, and kiwis. Citrus and subtropical orchards account for 1,159 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-10).

2.5.1.2 Deciduous Fruit and Nut Orchards

Deciduous fruit and nut orchards are typically planted with a single-tree species. In the Plan Area, this land use category includes various small trees that produce almonds, apples, apricots, figs, mixed deciduous fruits and nuts, nectarines, peaches, pears, pistachios, plums, and walnuts. Deciduous fruit and nut orchards support a number of common wildlife species, including the American crow, American robin, and house finch. Mule deer, jack rabbits and cottontail rabbits may browse on foliage, while California ground squirrels may consume fruits and nuts. Deciduous fruit and nut orchards do not support any covered species but do support two local concern species: the pallid bat and yellow-billed magpie. Deciduous fruit and nut orchards account for 43,591 acres, or seven percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-10).

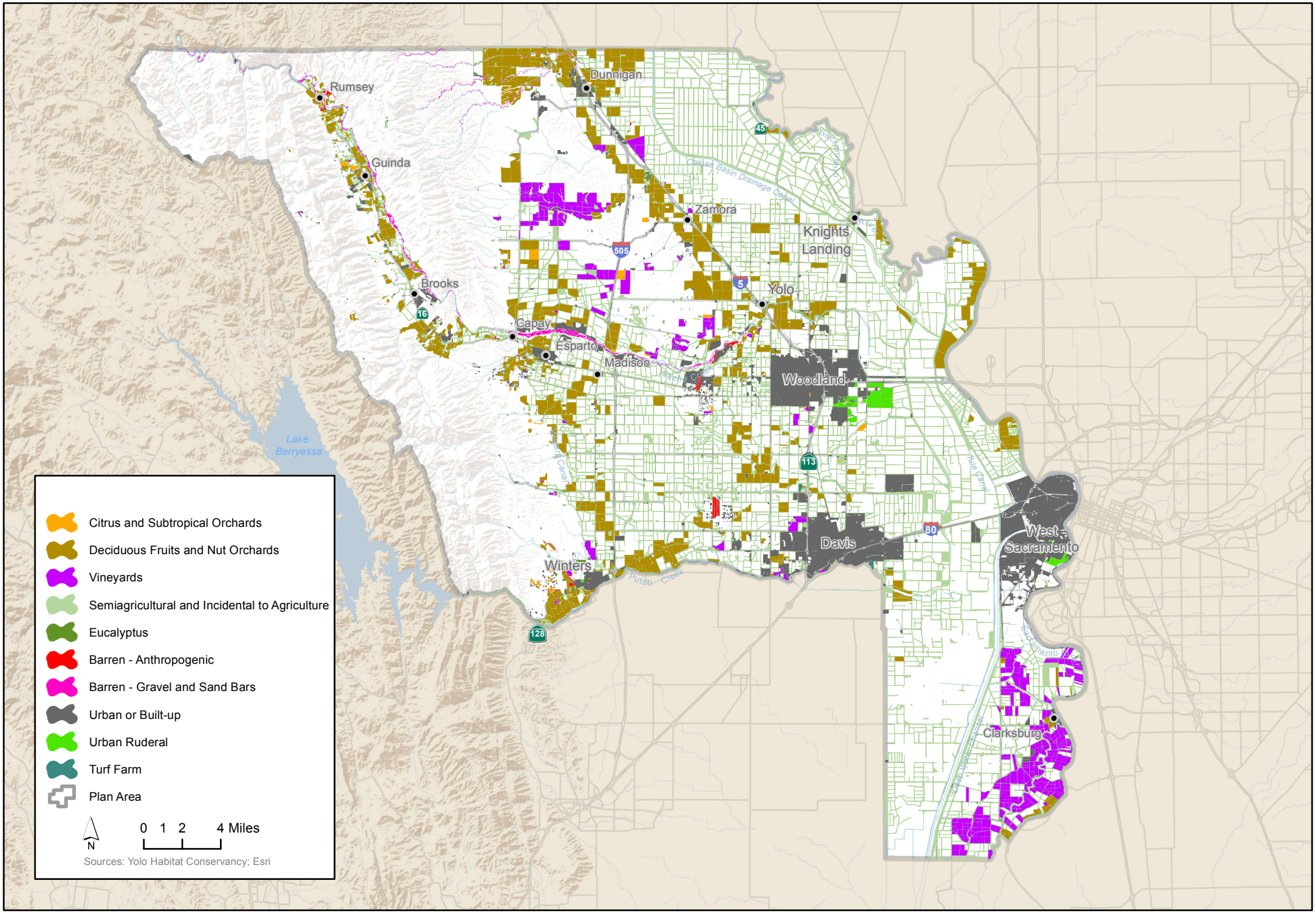

Figure 2-10. Distribution of Other Land Cover Types in the Plan Area

2.5.1.3 Vineyards

Vineyards comprise single species planted in rows, usually supported on wood and wire trellises. Vineyards are usually treated with herbicides to prevent the growth of herbaceous plants. Vineyards are predominant in the north-central portion of Yolo County, near the Interstate 5 corridor, and along the Sacramento River, near the county's southern boundary. Vineyards support a number of common wildlife species, including the American crow, western scrub-jay, American robin, European starling, mourning dove, and house finch. Vineyards do not support any covered species but do support the yellow-billed magpie and pallid bat, which are local concern species. Vineyards account for 17,151 acres, or three percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-10).

2.5.1.4 Turf

Turf consists of sod farms that are heavily maintained to eliminate pests. There are an estimated 141 acres of this land cover type in the Plan Area. This crop undergoes frequent fertilization, watering, mowing, and vacuuming to remove grass clippings. Because of the heavy maintenance required for this crop and lack of prey base, turf has little to no habitat value for wildlife, although it may provide buffers between developed areas and covered species habitat, and some species may disperse through these areas to favorable habitat areas.

2.5.1.5 Flowers/Nursery/Tree Farm

There are an estimated 122 acres of this land cover type in the Plan Area. This type consists of nurseries, flower fields, and tree farms. This land cover type may provide buffers and connectivity for some wildlife species, but the covered species are not expected to inhabit these lands.

2.5.2 Semiagricultural and Incidental to Agriculture

Semiagricultural areas include livestock feedlots, farm steads, and miscellaneous semiagricultural features such as small roads, ditches, and unplanted areas of cropped fields (e.g., field edges). Feedlots are confined livestock feeding operations that are used for preparing livestock, mainly cattle, for slaughter. They may contain thousands of animals in an array of pens and support virtually no vegetation. Poultry farms raise chickens, turkeys, ducks, and geese for meat or egg production. Egg-producing farms house birds in rows of cages or batteries. Meat chickens, commonly called broilers, are floor-raised on litter such as wood shavings or rice hulls in climate-controlled housing. Similar to feedlots, chicken farms generally do not support any vegetation. The tricolored blackbird, a covered wildlife species, may congregate in large numbers to feed on grain from feedlots and poultry operations. Semiagricultural areas account for 30,510 acres, or five percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-10). Most of the acreage in this land cover type consists of farmsteads and field edges, which provide habitat for covered Swainson's hawk, white-tailed kite, and western burrowing owl.

2.5.3 Eucalyptus

Eucalyptus consists of monotypic eucalyptus stands that have been generally planted for wood production or as wind breaks for fields and buildings. This land cover type has a dense canopy and groundcover that consists of a thick layer of leaf litter and bark. Sparsely planted trees may have a

dense herbaceous and shrub understory. Tree spacing and species composition influence the size of mature eucalyptus groves. Eucalyptus species have invaded the riparian natural community in some areas and are most likely increasing in number but are a more localized threat than some other invasive species (e.g., tamarisk and giant reed). Eucalyptus stands account for 369 acres, or less than one percent, of the Plan Area, with most stands located in the town of Dunnigan and on a few isolated parcels that were planted as woodlots in agricultural lands (Table 2-1, *Natural Communities and Other Land Cover Types*, and Figure 2-8).

Eucalyptus supports several common wildlife species, including the barn owl, red-shouldered hawk, American crow, and Anna's hummingbird. One eucalyptus grove north of Davis supports a large nesting colony (rookery) of egrets and herons. Eucalyptus stands in Yolo County do not support covered wildlife or plant species, except that some Swainson's hawks regularly nest in eucalyptus trees.

2.5.4 Barren

Barren lands are areas that are devoid of vegetation. Barren, rock outcrop, levee (tops and riprapped areas), and gravel/sand bars land cover types (Table 2-1, *Natural Communities and Other Land Cover Types*) fall within this general definition. . As opposed to the urban land cover type, which is dominated by structures and pavement, barren lands include areas that have been cleared of vegetation and are not closely associated with a human structure. These include mined areas along Cache Creek. Rock outcrops are natural formations that support sparse vegetation and limited or no soil. Gravel/sand bars are sparsely vegetated areas that are associated with active erosion and depositional processes along streamcourses, such as floodplain areas along Cache Creek. Some of these areas contain herbaceous riparian vegetation and might also be characterized as riparian scrub.[7] Barren areas on serpentine rock and soils are included under the serpentine grassland natural community, rather than barren land cover. Barren land cover accounts for 2,122 acres, or less than one percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*).

Barren land supports common wildlife species, including the killdeer, California gull, mourning dove, horned lark, and house sparrow. The rock outcrop component of this land cover also may support Morrison's jewelflower, a local concern plant species. Barren land cover in Yolo County's lowlands may also provide habitat for the western burrowing owl and mountain plover.

2.5.5 Developed

Developed areas are dominated by pavement and building structures. Vegetation in developed areas generally consists of vegetated corridors (e.g., vegetation maintained adjacent to highways) and patches of mostly ornamental vegetation, such as tree groves, street strips, shade trees, lawns, and shrubs that are typically supported by irrigation. Urban lands cover 45,683 acres, or seven percent, of the Plan Area (Table 2-1, *Natural Communities and Other Land Cover Types*). This area includes urban vegetation and all areas with structures, graded lots, road and highway medians, anthropogenic drainage canal vegetation, rail rights-of-way, and sewage treatment ponds that do not provide habitat.

Depending on their specific conditions, developed areas can support a number of common wildlife species, including the Nuttall's woodpecker, barn swallow, western scrub-jay, ruby-crowned kinglet, northern mockingbird, American robin, cedar waxwing, yellow-rumped warbler, white-crowned

[7] Personal communication, Glen Holstein. Botanist. 2014.

sparrow, dark-eyed junco, house finch, raccoon, and numerous nonnative species, including the European starling, house sparrow, Virginia opossum, eastern fox squirrel, house mouse, and black rat.

Large trees in urban lands support roosting and nesting of the white-tailed kite and Swainson's hawk, and the western burrowing owl may be found in remnant fields within urban lands. All are covered species.

2.6 Covered Species

Covered species are those species for which take authorization would be provided by the permits issued for the approved HCP/NCCP. This HCP/NCCP provides for the conservation and management of these species in the Plan Area to offset the effects of implementing the covered activities on these species.

2.6.1 Development of the Covered Species List

Approximately 175 species were evaluated for inclusion as covered species (Appendix C, *Evaluation of Species Considered for Coverage*). The evaluation list was based on the species' legal status, conservation status, and potential for occurrence in the Plan Area. This initial list was inclusive to ensure that as many potential covered species as possible could be evaluated for coverage. Fish species that are listed, proposed for listing, or candidates for listing under the Federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA) and are found in the Plan Area are not proposed for coverage under this HCP/NCCP. This HCP/NCCP does not cover in-water activities that typically affect these fish species (Chapter 3, *Covered Activities*). Any activities in the Plan Area that may affect fish species that are listed under the FESA or CESA would require project proponents to complete regulatory compliance actions separate from this HCP/NCCP.

The screening criteria below were used to evaluate the initial list of special-status plant and wildlife species to determine whether to include them as covered species. Species were recommended for coverage if they met all five criteria.

- **Geographic Range.** The species is currently known to occur or is expected to occur in the Plan Area based on knowledge of the species' geographic range and the presence of suitable habitat.
- **Listing Status.** The species is either currently listed under the FESA or CESA, is likely to become listed during the term of the permits, or is fully protected under the California Fish and Game Code.
- **Effects of Covered Activities.** The species could be adversely affected by covered activities that are currently occurring within the Plan Area or are likely to occur over the permit term.
- **Adequacy of Existing Data on the Species.** Sufficient data is available regarding the species' life history, habitat requirements, and presence in the Plan Area to evaluate effects on the species adequately and develop appropriate conservation measures.
- **Cost and Funding.** Funding will be available to provide sufficient monitoring and conservation over the 50-year permit term and meet NCCPA standards for the species.

These criteria were applied iteratively through reviews conducted by the planning team, which were based on a variety of published and unpublished information sources and input from the

Advisory Committee, CDFW, USFWS, the Independent Science Advisors, independent species experts, and the public.

Appendix C, *Evaluation of Species Considered for Coverage*, summarizes the results of the evaluation of species for coverage under this HCP/NCCP using the four covered species' criteria. As a result of this evaluation, 12 species were identified as meeting the criteria for inclusion as covered species in this HCP/NCCP (Table 1-1).

2.6.2 Covered Species Accounts

Information on the status, life history, distribution, population trends, and habitat use of each of the covered species is included in the species accounts provided in Appendix A, *Covered Species Accounts*. The species accounts summarize the main elements of each species' life history, including habitat and species associations (e.g., vegetation communities, interspecific relationships), key habitat requirements (e.g., soils, cliffs, burrows, nest trees, flow regimes, disturbance), area requirements, dispersal abilities, reproductive requirements and abilities, forage and cover needs, temporal requirements of various needs, and relevant behavioral ecology. The species accounts are not intended to include all biological information that is known about a species. Rather, each account summarizes the scientific information that is relevant to this HCP/NCCP. The biological data presented in these accounts provide the basis for the effects analysis and conservation strategy of this HCP/NCCP. The accounts summarize each species' overall distribution and describe where in the Plan Area the species is known to occur based on available GIS data, published and unpublished literature, and expert knowledge. The species accounts also identify the status and population trend for each species and known or potential threats and other limiting factors throughout its range and specifically in the Plan Area.

Information in the species accounts was used to develop species habitat models for evaluating the distribution of potentially suitable habitat in the Plan Area for each species. Information in the species accounts was also used to assess the level of adverse effects from covered activities, develop species goals and objectives as well as conservation measures to implement the conservation strategy, and inform the adaptive management and monitoring program.

2.6.3 Covered Species Habitat Models

The information in the species accounts was used to develop predictive models to quantify and display the known or potential distribution of suitable habitat for each species in the Plan Area. These models provide a basis for assessing the effects of covered activities, establishing conservation goals, and determining the level of conservation that could be achieved under the proposed conservation strategy. For each species model, one or more of the vegetation types or soil types that are commonly associated with the species were used to predict the distribution of potentially suitable habitat. Some species required a more complex species habitat model that considered many factors and habitat associations (e.g., elevation, slope, distance to water, or other factors, in addition to vegetation community or soil type). The processes for developing the species habitat models are described in Appendix A, *Covered Species Accounts*. Central elements of the model development process and its outcome are summarized here.

Known locations of occurrences of covered species, derived mostly from the California Natural Diversity Database (CNDDB), were incorporated into the GIS data and used both to formulate habitat models (e.g., identifying the mapped land cover type in which the species typically occurs)

and test the habitat models (e.g., determining if all known occurrences fall within the modeled habitat). Evaluations of habitat extent were made using aerial imagery to delineate occupied, rather than modeled, habitat of covered species for which information was available. The date of baseline occurrence data was September 2015 for the CNDDB; individual surveys are listed in Appendix A, *Covered Species Accounts,* in the occurrence sources (e.g., Estep 2007, 2008 for the Swainson's hawk). Further refinement was made to the models by using known ranges of species, as found in the extent maps of the California Wildlife Habitat Relationships Systems. This was done in coordination with CDFW staff members. Expert input from CDFW was also used to filter model outputs to known locations of suitable habitat by planning units. Additionally, Eric Hansen and species experts from USFWS and USGS validated the giant garter snake model.

Comprehensive survey information across the entire Plan Area on known species locations was not available for the covered species; therefore, the species habitat models were especially useful tools for estimating the potential distribution of each species. To supplement the available species location data, the species habitat models provided the following:

- Allowed reasonably reliable prediction and extrapolation of species occurrences for areas where adequate survey data were lacking.
- Provided a basis for synthesizing and analyzing multiple data sources across the entire Plan Area.
- Provided a means for identifying and comparing biological values throughout the Plan Area (i.e., which areas are most important for species and habitat conservation, and what are their priorities for conservation).
- Provided a basis for comparing the conservation value of existing conditions and the merits of alternate preserve designs.

GIS data layers were collected and integrated into the GIS database to support species modeling. Most models include more than one habitat category type for a given species to represent its distribution accurately. For example, the model for the Swainson's hawk incorporates known breeding locations, characterizes suitable nesting habitat, and identifies natural and agricultural foraging habitat area. Together, these data sources and modeling outcomes predict the distribution and quality of habitat for the hawk.

The species habitat models were developed with consideration of error rates for identifying actual suitable habitat. Habitat model errors include both false-negative habitat (those areas that are actually suitable habitat but are not included within the modeled habitat area) and false-positive habitat (those areas that are not actually suitable habitat but are included within the modeled habitat area). The general rule used in developing the species habitat models was to reduce false-negatives for habitat to the greatest extent possible within the resolution of the GIS data available but not to increase false-positives for habitat to such an extent that the model provides no valuable information for conservation planning or impact assessment. The models generally overestimate the amount of actual habitat in the Plan Area because the approach for minimizing false-negatives was used. As described in Chapter 4, Section 4.2.2.3, *Item 3, Land Cover Mapping and Planning-Level Surveys,* during HCP/NCCP implementation each project proponent will retain a qualified biologist

to conduct surveys of project sites and identify natural communities and covered species habitat at the site-specific level. [8]

[8] The HCP/NCCP species habitat models were developed for the purpose of preparing the conservation strategy and effects analysis (Chapters 5 and 6). Implementation of this HCP/NCCP will be based on the habitat that is present on parcels affected by the covered activities and lands protected under this HCP/NCCP (Chapter 5, Section 4.2, *Receiving Take Authorization under the Yolo HCP/NCCP,* and Chapter 7, Section 7.9, *Data Tracking and Reporting*).