# **Physical and Biological Resources**

# 3.1 Introduction

This chapter describes the physical and biological setting of the Plan area upon which the impact analysis (Chapter 4) and conservation strategy (Chapter 5) are based. Both pre-existing and new data were used to create the baseline inventory. Topics addressed in the physical setting section include:

- Location:
- Topography;
- Geology and soils; and,
- Climate and hydrology.

The biological setting of the study area is described in terms of the following subject areas:

- Land-cover types;
- Historical extent and locations of land-cover types;
- Associated wildlife and plants;
- Covered species associations;
- Ecosystem function;
- Natural disturbances; and
- Threats to each natural community.

The ecology and distribution of covered species are also described in Appendix D.

# 3.2 Physical Setting

# 3.2.1 Location

The Plan area (212,090 acres) is located in western Placer County in the Sacramento Valley and Sierra Nevada foothills (Figure 1-1). Placer County is bordered on the west by Sutter County, on the north by Yuba and Nevada Counties, on the east by Eldorado County, and on the south by Sacramento County. As a whole, the county represents an ecological transect from the Sacramento Valley to the crest of the Sierra Nevada. The Plan area occupies the lower elevations of that transect.

# 3.2.2 Topography

The Plan area lies within the Great Valley geomorphic province. Elevations range from approximately 30 feet in the extreme western part of the county to 1,600 feet north of Auburn (Figure 1-3). Slopes are generally gentle to moderate, facing west and southwest. Streams drain from the northeast to the southwest, eventually reaching the Sacramento Valley. Dry Creek is an exception in that it drains to the American River before reaching the Sacramento River. Major streams in the Plan area have relatively extensive natural floodplains in the valley floor.

In Mediterranean climates such as in Placer County, the direction that a slope faces (aspect) affects vegetation and species occurrence. South and southwest-facing slopes receive a greater amount and intensity of solar radiation and are generally drier relative to north and northeast-facing slopes. In the northeast section of the Plan area, the slopes are generally northeast and southwest facing, consistent with the overall northwesterly trend of the foothills there. Conversely where the foothills trend in a southwesterly direction, in the southeast section of the Plan area, the slopes are generally northwest and southeast-facing. As discussed below, this difference explains in part the differences in natural vegetation between the two areas.

# 3.2.3 Geology

The geology and seismicity of the Plan area influence the distribution of landforms and soil types, which in turn influence vegetation and plant species occurrence and abundance. Wildlife in turn is dependent on the habitats created by the vegetation. In some cases e.g., certain plants and invertebrates, covered species are obligatorily associated with specific geologic and soils conditions such as serpentine soils.

Placer County has three general areas, each with distinct geological and topographical features including the Western Region, Central Region, and Eastern Region. The Plan area is located along the eastern edge of the

Central Region, which includes the City of Auburn and surrounding areas. This region is in a relatively quiet seismic region between two areas of documented tectonic activity. Placer County is situated in a low seismically active area of the State.

# **Geologic Units**

The geologic units that occur within the Plan area are presented below in order of location from west to east.

- Basin deposits and alluvium are both from the Quaternary Period and are associated with present-day stream channels throughout the Plan area (Wagner 1981).
- The Riverbank Formation originates from the Quaternary Period. It is located throughout the western third of the Plan area and consists mainly of alluvium (Wagner 1981).
- The Turlock Lake Formation also originates from the Quaternary Period. It is located east of the Riverbank formation and consists of sand, silt, and gravel (Wagner 1981).
- The Mehrten Formation originates from the Tertiary Period. It is located east of the Turlock Formation and consists of andensitic consglomerate, sandstone, and breccias (Wagner 1981).
- Mesozoic dioritic rocks are plutonic rocks that originate from the Mesozoic Period. They are found from the northwest side of Folsom lake past the northwest side of Auburn (Wagner 1981).
- Copper hill volcanics originate from the Jurassic Period. They are found east of the Mesozoic rocks (Wagner 1981).
- Volcanic rock of the smartville complex is found east of the Copper hill volcanics (Wagner 1981).
- A small section of metasedimentary rock is found in the jurisdiction that is under contention east of the volcanic rock of the smartville complex (Wagner 1981).
- Mesozoic plutonic rocks are found north of the metasedimentary rock, and also south of Bear Lake (Wagner 1981).
- Jurassic volcanic rocks of the smartville complex are found north of the Copper hill volcanic (Wagner 1981).
- Natural levee and channel deposits spread intermix with the riverbed formation in the northern portion of western Placer (Saucedo et al. 1992).

## 3.2.4 **Soils**

The soils of western Placer County were classified into 12 soil associations that vary by texture and composition (U.S. Department of Agriculture 1980).

Soil conditions are generally correlated with landforms. In the valley, on terraces most soils are well drained, moderately deep to deep over a claypan or hardpan, with a sandy loam or loam surface layer and a dense clay subsoil. The soils on alluvial bottoms are very deep, with a sandy loam or loam surface layer and a sandy loam to clay subsoil. In the foothills, soils are somewhat excessively drained to well drained gravelly coarse sandy loams to silt loams. At higher elevations in the Plan the soils are generally well-drained sandy loams and loams derived from metamorphic and volcanic parent materials. The Dubakella soils are derived from serpentine. Several rare and endangered plant species are associated with Dubakella soils.

# **Hydric Soils**

Several of the soil types in the valley have dense subsurface clay and hardpan layers that impede water percolation and are seasonally saturated. These are termed hydric soils and they often support wetlands especially when found in topographic depressions. The main hydric soils found in western Placer County (USDA Natural Resources Conservation Service):

- Cometa-Ramona sandy loams (1-5% slopes);
- Inks-Eschequer complex (2-25 % slopes);
- San Joaquin-Cometa sandy loams (1-5% slopes);
- Fiddyment loam (1-8% slopes);
- San Joaquin sandy loam (1-5% slopes);
- Cometa sandy loam (1-5%);
- Fiddyment-Kaseberg loams (2-9% slopes); and
- Placer diggings.

Additional hydric soils in western Placer County that are depressional, poorly drained (or very poorly drained), and are ponded for long duration or very long duration during the growing season:

- Exchequer-Rock outcrop complex (20-30% slopes);
- San Joaquin silt loam (0-3% slopes);
- Exchequer very stony loam (2-15% slopes);
- Sobrante silt loam (2-15% slopes); and

Redding and Corning gravelly loams (2-9% slopes).

### **Mehrten Formation Soils**

Mehrten Formation soils can support distinct biotic communities. The Mehrten Formation is comprised of ancient volcanic mudflows, some 4–10 million years old (Helley and Harwood 1985, as cited in JSA 2004) that arose in the Sierra Nevada and flowed down the eastern foothills to the Central Valley. The mudflows now remain as high-standing flat-topped ridges. The volcanic rock is impermeable or very slowly permeable and vernal pools form in the depressions (Smith and Verrill 1998, as cited in JSA 2004). In western Placer County, northern volcanic mudflow vernal pools are restricted to the Mehrten Formation. Large vernal pool complexes are concentrated in western Placer County, for example between Lincoln and Roseville (Keeler-Wolf et al. 1998, as cited in JSA 2004). Any remaining Merhten Formation soils with vernal pools would presumably support the same suite of covered and other special-status species described below (*Vernal Pool Grassland Complex*, Section 3.3.4).

Mehrten Formation soils occur at elevations from approximately 89 to 1,453 feet MSL. These soils occupy approximately 4,200 acres, or approximately 1.5 percent of the land area in the Plan area, but nearly all of these lands are in private ownership and have already been converted to urban and suburban development.

# **Serpentine Soil Formations**

Serpentine soils also support distinct biotic communities. Many of California's rare plants and unusual natural communities occur on serpentine soils, a particularly hostile substrate. Serpentine soils are deficient in calcium, nitrogen, and phosphorus and have toxic levels of the heavy metals chromium and nickel; accordingly, this ecosystem presents a challenge for successful plant growth, and relatively few plant species can tolerate the extreme conditions (Kruckeberg 1984, as cited in JSA 2004). This severe and challenging environment supports plant communities characterized by a high degree of endemism and sparse plant cover.

Serpentine ecosystems occur in a variety of topographic settings and plant species composition may be driven as much by soil chemistry as by elevation or aspect. Serpentine ecosystems support plants that are restricted to those soils (endemics), plants that are strong indicators (plants largely confined to serpentine in parts of their range), and plants that are found both on and off serpentine soils (indifferent species). Most native and non-native plant species in Placer County are excluded from serpentine soils by the harsh soil chemistry. However, characteristic species also include many indifferent species that are tolerant of western

Placer County serpentine soils. No plant or animal species covered in the PCCP is known to occur within serpentine ecosystems.

The majority of the county's serpentine soils are found at elevations of about 270–1,715 feet in western Placer County. Serpentine soils comprise about 840 acres, or less than one percent of the Plan area. Nearly all these soils are on private land. Serpentine soils overlap with foothill chaparral, woodland, and barren areas (see below, Natural Communities and Land-cover Types, Section 3.3.4).

# 3.2.5 Climate and Hydrology

### Climate

Western Placer County is located within the Sacramento Valley Air Basin (SVAB), which is relatively flat and bordered by mountains to the east, west, and north. The climate is characterized by hot, dry summers and cool, rainy winters. Periods of dense and persistent low-level fog that are most prevalent between storms are characteristic of SVAB winter weather. The extreme summer aridity of the Mediterranean climate is caused by sinking air of subtropical high-pressure regions. In the case of the SVAB, the ocean has less influence than in the coastal areas, giving the interior Mediterranean climate more seasonal temperature variation (Ahrens 2003).

Most precipitation in the area results from air masses that move in from the Pacific Ocean during the winter months. These storms usually move from the west or northwest. The normal annual precipitation, which occurs primarily from November through March, is approximately 18 inches. The average winter temperature is 49 degrees Fahrenheit (°F). During the summer, daily temperatures range from 50°F to more than 100°F (citation needed). The inland location and surrounding mountains shelter the area from much of the ocean breezes that keep the coastal regions moderate in temperature. The predominant wind direction and speed is from the south-southwest at 10 mph (California Air Resources Board 1994).

# Watershed Hydrology

The Plan area is located on the Sierra west slope of the Lower Sacramento River Basin. Sacramento River tributaries define a series of subbasins. Western Placer County falls in four subbasins at USGS hydrologic unit code level HUC-8:

- The Upper Bear River defines the northern Plan area boundary;
- The Upper Coon Creek Upper Auburn Ravine watershed covers the majority of the Plan area;
- The Lower American River; and

The North Fork American River delineates the southeastern Plan area boundary.

To provide better resolution of planning issues, the PCCP further divides the Coon Creek/ Auburn Ravine watershed into four watersheds: Coon Creek, Markham Ravine, Auburn Ravine, and Pleasant Grove Creek. This watershed breakdown of the Plan area meets the Plan needs by providing a useful balance of data detail and data aggregation. The watersheds are listed in Table 3-1 and shown in Figure 3-1.

Rainfall and the subsequent groundwater release is the primary water source for surface flows in the winter and spring, however, water deliveries and wastewater treatment plant (WWTP) effluent can comprise significant portions of total stream flow in the spring, summer, and fall. For example, Auburn Ravine receives water imports from the Bear, Yuba, and American rivers via the Nevada Irrigation District (NID) that create above-normal spring and summer flow conditions (JSA 2005). Spring and summer flows in Coon Creek are dominated by NID imports and Placer County WWTP effluent (JSA 2005); although import flows in this system do not significantly alter flows above natural conditions. The Pleasant Grove and Curry Creek watersheds, once intermittent, are now perennial due to urban runoff, irrigation, and WWTP effluent contributions (Foothill Associates Inc. 2005).

The watersheds are described below in more detail. Unless noted, the watershed descriptions are based on the JSA (2005) Assessment of Habitat Conditions for Chinook salmon and Steelhead in Western Placer County, CA.

## **Upper Bear River Watershed**

Headwaters for the Bear River are in the vicinity of Emigrant Gap and Lake Spaulding in Nevada County. The Bear River generally flows southwesterly to a point approximately eight miles north of Auburn, where it turns west and flows to its confluence with the Feather River in the vicinity of Nicolaus in Sutter County. The Bear River is the second largest tributary to the Feather River.

The Bear River historically experienced high winter flows and low summer flows, but today the timing of flow and volume is highly regulated by releases from reservoir storage and diversions. Camp Far West is the largest storage reservoir on the Bear River. The exportation of water diverted from the Bear River watershed is made through the conveyance facilities of Nevada Irrigation District (NID) and Pacific Gas & Electric. These diversions supply nearly all of the water imported to the Coon Creek watershed and a substantial percentage of the flows imported to the Auburn Ravine watershed. The flow is diverted for irrigation, power generation, and domestic supply in the Auburn and Mt. Pleasant area. The upstream diversions from the Bear River basins have depleted the streamflow downstream from the Sutter Irrigation District Diversion Dam

(SIDDD), which is just downstream of Camp Far West Reservoir. Minimum flow releases are 25 cfs in the spring and 10 cfs during the rest of the year. Bear River flows below the SIDDD range between 0 and 40 cfs from June to December. Currently, winter flows during wet years are similar to unimpeded flows, averaging 2,500 to 5,200 cfs. Summer flows are currently 30–50 percent less than the unimpaired flows (NMFS 2001).

The SIDDD is the upstream limit of anadromous fish migration in the Bear River. Anadromous fish have access to of the Bear River from its confluence with the Feather upstream for 15 miles. Habitat for Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (Oncorhynchus mykiss) is limited by inadequate streamflow and the high incidence of fine sediment, which is partially attributable to the relatively low gradient and reduced streamflow. During heavy rain events, flow spills from Camp Far West Reservoir, and Chinook salmon and steelhead may migrate and spawn in the lower Bear River (NMFS 2001).

## Yankee Slough Watershed

Yankee Slough originates north and east of the unincorporated township of Sheridan in the lower Sierra foothills. Yankee Slough flows perennially due to irrigation run-off. Situated south of the Bear River and north of Coon Creek, Yankee Slough flows into the Bear River drainage downstream of Highway 65 and outside of the Plan area in Sutter County. Yankee Slough historically flowed into the American River basin, once a massive marsh complex that is now principally rice fields and urban neighborhoods.

Little or no riparian vegetation is present on Yankee Slough in Placer County. Outside the Plan area, Yankee Slough is mostly channelized and serves as drainage facility for agricultural runoff. Some of the largest perennial freshwater marshes in Placer County are along Yankee Slough east of Highway 65. There is no evidence that anadromous fish are present within the Yankee Slough watershed.

#### Coon Creek Watershed

Coon Creek originates east of Auburn near Meadow Vista and flows westward. It is intercepted by the East Side Canal downstream of Highway 65 and outside of the Plan area in Sutter County. The East Side Canal then flows into the Cross Canal. The Cross Canal joins the Sacramento River immediately downstream of the confluence of the Feather and Sacramento Rivers near Verona. Coon Creek historically flowed into the American River basin.

In the lower reaches of Coon Creek, runs are the most dominant channel structure element, followed by low-gradient riffles, glides, dammed pools, midchannel pools, lateral scour pools, and channel confluence pools (JSA 1996, as cited in JSA 2005). There are minimal amounts of instream cover (i.e., woody debris and undercut banks) and overhead cover (i.e., riparian vegetation). Streamside vegetation is sparse in many places due to grazing by livestock. Channel instability and resultant bank cutting may also prevent the establishment of vegetation. Stream channel substrates consist predominantly of cobble, gravel, sand, and silt- and clay-sized particles.

Flow is an essential component of fish habitat. Low-flow conditions can result in lack of depth for adult fish passage, minimal flow over redds, increased siltation of redds and reduced levels of oxygen to the eggs, and reduced space for juvenile rearing. The natural flow pattern for small foothill streams is a gradual decline in flow during the spring, summer, and early fall, until the first rainstorms begin in late fall. In Coon Creek, most of the streamflow present during the late spring through early fall consists of imported water en route to downstream agricultural diversions (Placer County 2002).

Coon Creek historically had little or no summer flow in the lower reaches. The creek currently receives a daily discharge of around 2 cfs from the Placer County Sewer Maintenance District #1 (SMD-1) WWTP. NID discharges an additional 7.5 cfs during the summer and fall (i.e., about April 15 through October 15). Flow in Coon Creek is controlled by releases from Orr Creek Reservoir, operated by NID. The last downstream diversion receiving NID deliveries of water is near Gladding Road. Streamflow is managed to have no excess flow at Highway 65 (i.e., essentially dry) (Placer County Planning Department 1999 as cited in JSA 2005).

Doty Ravine is the main tributary to Coon Creek. It originates west of Auburn. The streambed in the headwaters consists primarily of gravel and cobbles with some larger granitic boulders. Doty Ravine upstream of Gladding Road flows through oak woodland and is bordered by rural-residential and ranch lands. Downstream of Gladding Road, the bordering lands experience increased livestock use, and the ravine is considered highly disturbed (Placer County 2002).

Doty Ravine receives water from deliveries by NID as well as natural runoff. Import of NID deliveries and conveyance down Doty Ravine is generally completed by October. Winter flows can exceed several thousand cfs, but during the irrigation season the flows generally average less than 20 cfs and are usually substantially less (Placer County 2002). All irrigation water is diverted at the Doty South Diversion Dam (DSDD) west of Crosby Harold Road. Downstream of the DSDD, flow in the stream accretes from leakage at the DSDD, groundwater, and agricultural runoff. During the nonirrigation season, the flows are around five to six cfs.

#### **Markham Ravine Watershed**

The following section was taken from the Auburn Ravine and Coon Creek Ecosystem Restoration Plan (Placer County 2002).

The Markham Ravine watershed is almost entirely on the valley floor, originating in the low elevation hills northeast of the City of Lincoln and emptying into the East Side Canal approximately one mile north of Auburn Ravine. Markham Ravine drains 26.7 square miles of the Plan area and contains 59.7 stream miles within the Plan area. Watercourses consist of 13.2 aqueduct miles and 46.5 intermittent stream miles. In its headwaters, the channel of Markham Ravine is poorly defined. Near SR 65, the channel becomes more distinct and passes through industrial, light industrial and rapidly urbanizing areas located in the western side of Lincoln. West of the City of Lincoln, the channel passes through a mixture of farms and ranches, including pastures used for grazing as well as rice and other grain farming. In this reach of Markham Ravine, streamflow is artificially augmented by irrigation return flows. The presence of relatively permanent flow allows the establishment of riparian and wetland vegetation. Beavers are very active west of Lincoln resulting in small impoundments forming seasonal and perennial marshes.

#### **Auburn Ravine Watershed**

Auburn Ravine originates on the north side of the City of Auburn and flows west to its confluence with East Side Canal. The East Side Canal flows into the Cross Canal. The Cross Canal joins the Sacramento River immediately downstream from the confluence of the Feather and Sacramento Rivers near Verona. The elevation of the basin ranges from 30 to 1,600 feet above mean sea level.

In its headwaters, Auburn Ravine is characterized by a high gradient, incised channel with steep-sided banks. Large boulders and cobbles dominate the substrate. The channel includes scour pools, waterfalls, and high-velocity chutes. Riparian vegetation is abundant. In its middle reaches downstream to the City of Lincoln, the stream's gradient decreases substantially, and the substrate is characterized by sand, gravel, and cobbles. Pools and riffles are common, and trees and shrubs dominate the riparian zone. The channel contains large woody debris and bank erosion increases relative to the upper reach.

Within the city limits of Lincoln, Auburn Ravine has a very low gradient and sandy substrate. Riparian vegetation is characterized by a relatively open tree canopy with an understory dominated by blackberries and shrubs.

Downstream from Lincoln, rice farms and livestock ranches border the stream. In some places, the stream is contained within levees and

riparian vegetation may be absent. Stream channel substrate is mostly clay and fine sediments, with occasional pieces of large woody debris. Grazing and channel maintenance activities restrict the development of riparian vegetation. The lower four kilometers (2.5 miles) of Auburn Ravine was rerouted and leveed to flow into the East Side Canal.

Winter flow in Auburn Ravine is dominated by runoff from rainfall events and water imported for domestic and agricultural uses. Winter flows range from less than 3 cfs to an estimated 100-year flow event exceeding 14,000 cfs. Summer flows are high relative to natural conditions due to the effects of water imports. In September or October, flow is substantially decreased as irrigation demands diminish or cease. Flow during the fall may often be less than 3 cfs. Auburn Ravine's artificially high flow in the summer months provides more and substantially different aquatic habitat than would exist under natural flow conditions. Reduced flow in September and October substantially reduces the area of aquatic habitat relative to habitat available in the summer.

# **Pleasant Grove and Curry Creek Watersheds**

The Pleasant Grove and Curry Creek watersheds are located in western Placer County, including the western portions of the Cities of Roseville and Rocklin and eastern Sutter County. Both of these creeks empty into the Pleasant Grove Creek Canal which drains to the Sacramento River via the Cross Canal. The combined watershed covers approximately 40,800 acres with elevations ranging from around 590 feet on the eastern boundary to approximately 35 feet where Pleasant Grove Creek meets the Pleasant Grove Creek Canal.

The watershed is composed of five major drainages: Curry Creek, Lower Pleasant Grove Creek, Kaseberg Creek, South Branch Pleasant Grove Creek, and upper Pleasant Grove Creek. The Pleasant Grove and Curry Creek watersheds drain 61.9 square miles of the Plan area and include 141.3 miles of watercourse. In general, slopes are very flat, less than five percent, particularly in the lower watershed.

These creeks were historically dry or very nearly dry in the summer months, but are now mostly perennial due to urban runoff and agricultural irrigation return flows. The Pleasant Grove Wastewater Treatment Plant operated by Roseville also augments natural stream flow, on average, by 11 cfs per day.

The dominant land-cover types within the watershed are annual grassland (approximately 39 percent), urban and suburban (approximately 24 percent), and agriculture (approximately 26 percent). Urban and suburban land uses within the watershed are currently confined to the Cities of Roseville and Rocklin and the Town of Loomis, but significant growth in urban and suburban land uses are expected in the next ten years. Current development in the watershed is resulting in

conversion of agricultural and grasslands to suburban land uses: predominantly low to medium density residential communities with associated neighborhood or community commercial.

Both watersheds were historically dominated by agriculture and that is still true in the lower portions. Rice farming in the lower watershed is very active, with farmers growing white, wild, and organic rice. Agriculture in the middle portion of the watershed is primarily rice farming and cattle ranching on unirrigated grasslands.

## **Lower American – Dry Creek Watershed**

The following section was taken from the Dry Creek Watershed Coordinated Resource Management Plan (ECORP 2003) and the Assessment of Habitat Conditions for Chinook salmon and Steelhead in Western Placer County, CA. (JSA 2005).

The Dry Creek Watershed covers approximately 101 square miles. It ranges from the unincorporated community of Newcastle (near Auburn) to Sacramento County. Major tributaries to Dry Creek include: Antelope Creek, Secret Ravine, Miners Ravine, Strap Ravine Creek, Linda Creek, Clover Valley Creek, and Cirby Creek. The gradient of the main stem of Dry Creek is low (i.e., generally less than 1 percent). The channel is well defined with sandy substrate and bordering riparian vegetation. Dry Creek drains 82.0 square miles of the Plan area. It has 239.1 miles of associated watercourse including 22.6 miles of aquaduct, 107.0 miles of intermittent stream and 109.5 miles of perrential stream.

In general terms, the middle portion of Dry Creek watershed has been subject to extreme development pressure by relatively recent growth, primarily within the cities of Roseville and Rocklin. The upper and lower portions of the watershed are anticipated to experience similar growth in the coming years. Urbanization has exacerbated flooding in the lower watershed, particularly in Sacramento County. In addition, water quality concerns have arisen, due to the perceived increase in sedimentation and potential contamination from non-point sources.

As with most of the streams in the Plan area, late summer flows in Dry Creek are largely composed of urban runoff and releases from wastewater treatment plants. The City of Roseville's Wastewater Treatment Plant (WWTP) drains into Linda Creek and ultimately Dry Creek.

#### **North Fork American**

The North Fork American River defines the southeast border of the County and forms Folsom Lake. No part of North Fork American stream habitat will be managed as part of the PCCP, as most of this land is managed by California Department of Parks and Recreation.

# **Hydrologic Modifications**

Urbanization and water-supply projects throughout the County and elsewhere in the Sierra Nevada have altered the natural hydrology of many streams and watersheds. Hydrologic effects vary and range from increased peak flows to reduced or augmented summertime flows. As a watershed urbanizes, the amount of impervious surface increases and the proportion of precipitation that is surface runoff also increases. This changes the timing and magnitude of peak flows in receiving channels. In addition to increasing the potential for downstream flooding, increased peak flows also have the capacity to erode channels.

While some of the stream channels in the upland areas of western Placer County are still natural, most of the tributaries within the valley floor area of the watershed have been significantly modified to accommodate flood flows and reduce channel erosion in support of agricultural production historically. Many types of control structures have been installed including earthen levees, trapezoidal concrete channels, floodwalls, and culverts. These structures were historically focused on conveying 100-year storm flows and preventing flooding in new development adjacent to these stream corridors.

Channelization has complex effects that vary from stream to stream. Generally, current flood control methods emphasize other than structural approaches to reducing hydrologic impacts of development. These include the use of retention basins, bypass channels and other means of minimizing urbanization impacts on peak flows.

#### Water Deliveries and Diversions

Inter-basisn transfers artificially augment streamflow in most western Placer County watersheds. Water is delivered to the various watersheds for agriculture, domestic, and commercial use. The main entities involved in the delivery of water in western Placer County include: the South Sutter Water District (SSWD), Nevada Irrigation District (NID), PG&E, and the Placer County Water Agency (PCWA). As described previously (see Chapter 2), Auburn Ravine receives a large amount of water from the Bear, Yuba and North Fork American River via PG&E, NID, and PCWA. PG&E delivers Bear, Yuba, and North Fork American River water to Auburn Ravine just upstream of the City of Auburn's WWTP at the Wise Powerhouse and at the Lozanos Road Bridge. The NID delivers Yuba and Bear River water to Auburn Ravine for downstream diversions at the Auburn Ravine One Canal and the Hemphill Canal. PCWA diverts Middle Fork American River water to Auburn Ravine through the Auburn Tunnel (Placer County 2002).

The upper half of the Coon Creek basin has a complex network of irrigation canals managed by NID to carry water imported from the Bear River. NID uses Orr Creek, or sometimes Rock Creek in dry years, to transport imported water from the Bear River downstream to agricultural

users. During the irrigation season, flows in Orr Creek average about 40 cfs above natural flows. The primary NID diversion on Coon Creek takes place at the Camp Far West Canal. Doty Ravine, the main tributary of Coon Creek, receives NID deliveries through the Auburn Ravine I and Gold Hill II/Sailor's Ravine canal system. The management objective on Doty Ravine is to divert all irrigation water at the Doty South Diversion Dam located just west of Crosby Herold Road (Placer County 2002).

The PCWA and the City of Roseville are the major water resource management agencies within the Dry Creek watershed. The PCWA delivers approximately 110,000 acre-feet of water from the Yuba-Bear River Watershed and the American River Watershed. Consequently, water supplies from outside of the Dry Creek watershed are augmenting Dry Creek flows and may dominate them during the dry season (ECORP 2003).

#### **Wastewater Treatment Plants**

Some of the water imported into Auburn Ravine is the discharge from WWTPs operated by the Cities of Auburn's and Lincoln. Lincoln's current permit allows a dry weather flow discharge of 4.2 mgd, with current dry weather flows running at 2.8 mgd. The City's permit has been crafted to allow for expansions up to 12 mgd (18.6 cfs of effluent). The actual level of discharge will vary and may be less than the permit limits depending upon the City's level of beneficial use of reclaimed water during the course of the year.

The Placer County Wastewater Treatment Plant (SMD-1), located by Joeger Road in Auburn off Highway 49, discharges treated effluent into Rock Creek, a tributary of Orr Creek, which is a tributary to Coon Creek. The effluent discharge from SMD-1 is approximately 1.3 mgd, or about two cfs, which is only a significant portion of total flow in the fall when NID imports to Coon Creek stop (Placer 2002).

Dry Creek receives treated effluent from the Roseville/Dry Creek Wastewater Treatment Plant. The design capacity is 18 million gallons per day. Treated effluent contributes relatively little to flows during the wet weather months; however, they can comprise a high proportion of dry weather flows (greater than 50% of total flow at the Vernon Street Bridge) (ECORP 2003).

The Placer County Sewer Maintenance District #3 (SMD-3) facility is a minor discharger of municipal wastewater, with a design flow rate of 0.75 mgd. This facility outfalls into Miners Ravine, a tributary to Dry Creek. Currently, this facility is operating at less than 20 percent of design capacity. At capacity, effluent would dominate flow (approximately 50 percent of total flow) in the upper reaches of Miners Ravine during the dry season (ECORP 2003).

# 3.3 Ecosystems, Natural Communities, and Land Cover

## 3.3.1 Definitions

The following definitions are provided to clarify terms used in the NCCP Act. These terms are also found in the glossary (Appendix A).

# **Ecosystem Function**

In order for this Plan to be approved, the NCCP Act requires CDFG to make findings that this Plan conserves, restores, and manages representative natural and semi-natural landscapes to maintain the ecological integrity of large habitat blocks, ecosystem function, and biological diversity (California Fish and Game Code Section 2820 (a)(4)). For the purposes of this Plan, ecosystem function is defined as processes operating at the ecosystem level, such as the cycling of matter, energy, and nutrients that maintain the characteristics and biodiversity of an area (Mooney et al. 1995). Ecosystem functions include such biological and physical processes as dispersal, predation, pollination, decomposition, nutrient cycling, and energy fluctuations.

# **Biological Diversity**

The NCCP Act calls for the protection of species diversity on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the area (California Fish and Game Code Section 2820 (3)). The NCCP Act also calls for maintaining biological diversity through conservation, restoration, and management of natural and semi-natural landscapes.

Biological diversity or biodiversity is defined in this Plan as the variety of organisms considered at all levels, from genetic variants of a single species through arrays of species to arrays of genera, families, and higher taxonomic levels (Lincoln et al. 1998).

# **Ecological Integrity**

The NCCP Act calls for sustaining the effective movement and interchange of organisms between habitat areas in a manner that maintains the ecological integrity of the Plan area (California Fish and Game Code Section 2820 (a)(4)(E)). The Act also calls for maintaining the ecological integrity of large habitat blocks through conservation, restoration, and management of natural and semi-natural landscapes.

Ecosystems have ecological integrity when their native components are intact, including abiotic components, biodiversity, and ecosystem processes. This Plan seeks to support the goal of maintaining and restoring ecological integrity by protecting large blocks of habitat such that the various components of functioning ecosystems are maintained in an interconnected area.

## **Environmental Gradients**

The NCCP Act calls for incorporating a range of environmental gradients such as slope, elevation, aspect, and coastal or inland characteristics to provide for shifting species distributions due to changed circumstances (California Fish and Game Code Section 2810 (D)).

This Plan defines environmental gradient as a shift in physical and ecological parameters across a landscape, such as changes in topography, climate, geology, land-cover types, and natural communities.

## **Natural Communities**

The NCCP Act calls for the protection of natural communities on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the area (California Fish and Game Code Section 2820 (a)(3)).

Natural communities are a collection of species that co-occur in the same habitat or area and interact through trophic and spatial relationships. Communities are typically characterized by reference to one or more dominant species (Lincoln et al. 1998). In the PCCP Plan area, seven natural communities, and two additional semi-natural land-cover types (agriculture and developed) are defined and will be discussed further in the chapter.

## 3.3.2 Methods

The PCCP represents an intensive effort to gather biological and economic data on western Placer County. Preparation of the PCCP required an inventory of biological and natural resources to compile detailed information on the status, extent, and distribution of covered species and their habitats and major ecosystems. All reports prepared for the PCCP are included in the *Literature Cited* (Chapter 13).

The Placer County Natural Resources Report (JSA 2004) provided comprehensive maps and compilations of data on habitat and land-cover types, covered and other special-status species, and sensitive natural communities.

The Science Advisors prepared a report that described the major land-cover types of western Placer and associated conservation issues, including conservation planning and reserve design principles relevant to the Plan area (Brussard 2004). The report also described principles of adaptive management relevant to implementation of the PCCP.

Thomas Reid Associates (TRA) and Placer County staff compiled scientific and other GIS data. TRA established a detailed, spatially explicit model of wildlife habitats and projected growth used to estimate take and evaluate the cumulative effect of mitigation for take.

# **Land-Cover Mapping**

One of the primary sources of data for this Plan is a detailed geographic information system (GIS) -based map of land-cover types of western Placer County and the Plan area. A land-cover type is defined as the dominant character of the land surface discernible from aerial photographs, as determined by vegetation, water, or human uses. Land-cover types are the most widely used units in analyzing ecosystem function, habitat diversity, natural communities, wetlands, streams, and habitats used by covered species. The land-cover data were used to project urban, suburban, and rural residential growth, assess take and other impacts, and develop the conservation strategy for the PCCP. Data sources, mapping standards, and the classification and interpretation of land-cover types are discussed below.

#### **Data Sources**

TRA Environmental Sciences (TRA) compiled a GIS-based land-cover map from numerous sources for the PCCP. These sources included mapping prepared by JSA (2004) for the eastern portion of the Plan area and mapping by North Fork Associates (2009) that characterized the vernal pool grassland complexes of the western portion of the Plan area below 200 feet in elevation. Additional sources were:

- Placer County GIS data for jurisdiction boundaries, cities and city Spheres of Influence (SOI);
- Placer County General Plan:
- City of Lincoln General Plan;
- Placer County Assessors Parcel Database;
- JSA Year 2002 Land Cover mapping;
- North Fork Associates Year 2002 Freshwater Wetlands mapping; and
- Eric Beckwitt 2002 Watershed Analysis and supporting GIS data.

To create a land-cover map from these sources, TRA manipulated the data where needed to: change the map projection; clip to the western Placer Plan area; create polygons to represent missing or no data; provide attributes for blank polygons; and generally clean-up the layers to allow data overlay (eliminating fly-away vertices, slivers, etc.). Generally, polygons that were smaller than 0.01 acres were deleted to improve tabulation. The total area lost in any layer was less than 100 acres out of the 212,090 acre total.

## **Land-Cover Type Classification**

The PCCP used the California Wildlife Habitat Relationship ("CWHR" or "WHR") habitat classification system to classify land-cover types. The CWHR was slightly modified to reflect conditions in Placer County (referred to here as the "PCWHR"). The CWHR was selected over other habitat classification systems because it is widely used by land managers and wildlife biologists throughout California, and it is the system most easily understood by decision makers and the general public. The revised PCWHR system is similar to the CWHR system, except that some land-cover types were expanded for mapping purposes. For example, the CWHR urban land-cover type was divided into eight subtypes in order to distinguish among areas that are surrounded by native ecosystems and areas that are entirely developed (JSA 2004).

## **Mapping Procedures**

JSA mapped the PCWHR habitat types occurring in western Placer County in 2002. The resulting Natural Resources Report described the natural communities mapped within each watershed (JSA 2004). All patches of vegetation and land-cover types 0.1 acre or larger were mapped. JSA botanists mapped large- and small-patch ecosystems and other land-cover types from rectified, year-2002 aerial photographs. Botanists drew lines delineating land cover based upon visible signatures—differences in color tones and textures—on the underlying photographs. The drawings were electronically scanned and imported into a GIS. The GIS allows different data sources for the same area to be overlaid atop one another for analysis and mapping. The term "layer" refers to a collection of GIS data. The GIS layer was checked against the

original hand drawn polygons. All PCWHR land-cover types were mapped except vernal pool grassland complexes, because North Fork Associates had mapped this land-cover type for western Placer County in 2002, and subsequently remapped this type in 2009 to reflect more current conditions (see below) and to utilize a revised definition of vernal pool "complex".

The JSA Natural Resources Report and corresponding land-cover layers contained some minor inconsistencies that were rectified by TRA for use in the PCCP. Specifically, the Natural Resources Report reported a foothill hardwood woodland "super-type" land-cover with a corresponding acreage. Foothill hardwood woodland was composed of four "sub-types": mixed oak woodland, blue oak woodland, interior live oak woodland, and valley oak woodland, which also had corresponding acreage values (see Section 3.3.4 *Oak Woodland and Chaparral Natural Community* below for further discussion of oak woodland land-cover types). The foothill hardwood woodland "super-type", however, was not mapped as a land-cover type in the GIS land-cover data provided by JSA. Therefore, for clarity, TRA eliminated the foothill hardwood woodland "super-type" and the "sub-type" status of the four oak land-cover types.

JSA botanists and wildlife biologists conducted field surveys in 38 terrestrial watersheds in the western Placer Plan area from February 27 through May 4, 2003. Time and access limitations did not permit all watersheds to be surveyed with equal intensity or precision. Because the watershed surveys were conducted at a reconnaissance level, they were not intended to be comprehensive or site specific. This type of inventory is appropriate and adequate for the identified survey objectives. The following major data themes were verified at randomly selected polygons in each watershed: mapped vegetation and land-use polygons, land uses and impacts, characteristics of surrounding areas, types and levels of disturbance, problems with interpretation, covered and other specialstatus species observations and suitable habitat areas, and the presence and extent of invasive non-native species. No surveys for special-status plant species were conducted for the PCCP. See the Natural Resources Report (JSA 2004) for further discussion of the methodology used to prepare the land cover data.

In conjunction with the Placer County Planning Department, North Fork Associates mapped vernal pool complexes along the Valley floor of western Placer County in 2002 using 1999 and 2000 aerial photography interpretation. To reflect more current conditions, North Fork Associates remapped vernal pool complexes along the Valley floor of western Placer County in 2009 using high resolution photography from summer 2007 and fall 2008. The 2009 map was integrated into the JSA land-cover map to analyze impacts of covered activities and develop the conservation strategy. A spring 2002 aerial photo was also used to evaluate spring/wet conditions for potential vernal pool complexes. Vernal pools and vernal pool complexes were then identified based on a two-dimensional interpretation of these sub-meter aerial photographs.

The following describes the methods used to remap vernal pool complexes in 2009. All land-cover types that could support vernal pools in western Placer County below the 200 foot contour were identified through photo interpretation. Once identified, all land-cover types and vernal pool complexes were digitized at a scale of one inch equals 200 feet utilizing ArcGIS 9.3. The final data were produced in survey feet, North American Datum 1983 (NAD83), StatePlane California Zone II.

The majority of vernal pools occurred in the annual grassland and pasture land-cover types. Vernal pools are often clustered into complexes that are connected hydrologically. For the purpose of this mapping effort, a complex was defined as a grouping of two or more vernal pools that occur in relatively high density and separate from other complexes. Each polygon of vernal pools was mapped by drawing a tight line around the outer pools of the complex. Where available, wetland delineation data were used to draw the boundaries around complexes. This mapping methodology is based on the vernal pool complex description from the Science Advisory Team: Definitions (2009).

Once the land-cover and vernal pool complexes were digitized, specific characteristics were attributed to each polygon. These attributes included land-cover type, density and disturbance of vernal pool complexes.

Vernal pool complexes were classified according to the following four categories:

- Leveled landscapes, no vernal pools;
- Low density vernal pool complexes 0-1percent wetted area;
- Intermediate density vernal pool complexes , 1-5 percent wetted area; or
- High density vernal pool complexes, >5 percent wetted area.

Highly altered landscapes that may have previously supported vernal pools but have been altered beyond any historic landform were scored or categorized as 0. These landscapes were typically leveled irrigated pasture. In general, ricelands were assumed to no longer support vernal pools and vernal pool complexes. Some fallow ricelands, or ricelands no longer in production, show residual topography and vernal pool signatures and were included as vernal pool complexes demarcated as grassland land cover.

Air photo interpretation for vernal pools produced a reproducible identification of vernal pool complexes based on density. Hydrological information sufficient to identify linked vernal pools complexes could be inferred in some locations but is not intended to be definitive. The portion of the general vernal pool landscape that has higher density and its contributing hydrology (i.e., surrounding upland that serves as part of the watershed for the complex) was defined in GIS by taking the high density vernal pool complex and extending the polygon outward by a 250 foot

buffer where it fell on land identified as either low or intermediate density. The result is termed a Vernal Pool Complex Area and was used to define an element in take assessment and mitigation.

The 250 foot buffer is the default definition of the area contributing to the hydrology of the complex. It is expected that on-the-ground assessment could refine that boundary outward or inward based on actual conditions. It is noted in particular that farm roads follow most of the parcel boundaries in the valley agricultural lands and these roads are paralleled by at least a crude drainage ditch and sometimes by agricultural irrigation or irrigation drainage. Thus much of the original hydrology is altered at parcel lines today.

## **Accuracy Assessment**

GIS data was used to guide the development of the mitigation program and must be supported by in-field surveys at a later date for the following reasons: 1) the GIS data are largely based on interpretation of air photos or other remote data; 2) the various layers suffer from sufficient misregistration (up to 300 feet) so that an individual parcel cannot reliably be characterized by GIS; 3) conditions change from the base year (2002 for non-vernal pool land-cover types; 2007-2008 for vernal pool land-cover) to the present; and 4) some important biological resource information cannot adequately be assessed at the scale of the GIS.

The estimates of take and effectiveness of mitigation are based on a combination of GIS analysis, economic and demographic projections, and quantitative estimates of the application of the mitigation protocol.

## Fish Habitat and Occurrence Data Sources

The following sources were used to characterize fish habitat and fish populations in the Plan area:

- Bailey, Randy. 2003. Streams of Western Placer County Aquatic Habitat and Biological Resources Resource Assessment. Prepared for the Placer County Planning Department. Bailey Environmental: Lincoln, CA.
- JSA. 2004. Placer County Natural Resources Report, A Scientific Assessment of Watershed, Ecosystems, and Species of the Phase I Planning Area. Prepared for the Placer County Planning Department: Auburn, CA.
- JSA. 2005. Assessment of Habitat Conditions for Chinook Salmon and Steelhead in Western Placer County, California. Prepared for the Placer County Planning Department.
- Navicky, James. 2008. Summary of 2004 and 2005 fish community surveys in Auburn Ravine and Coon Creek (Placer County).

Memorandum to Fish Files. California Department of Fish and Game Region II Office: Rancho Cordova, CA.

# 3.3.3 Covered Species

# **Ecology and Distribution**

Detailed species accounts for each of the 31 covered species (Table 1-3) are provided in Appendix D. These accounts summarize ecological information, distribution, status, population trends, and threats to each covered species in the Plan area and outline the conservation and management strategies proposed in the Plan. The accounts represent the best available scientific data for each species. The species accounts are not intended to summarize all biological information known about a species. Rather, each account summarizes scientific information that is relevant to this Plan. The biological data in these accounts form the basis for the impact analysis (Chapter 4) and conservation strategy (Chapter 5) in this Plan.

## **Habitat Distribution Models**

#### Overview

Regional HCP/NCCPs are required to assess the impacts of covered activities on covered species and identify the amount (or habitat, as a proxy for occurrence of covered species) of take of covered species that will be permitted. Take of covered species is assessed in acres of modeled habitat for each covered species (see Chapter 4, Impact Assessment and Level of Take). Modeled habitat identifies habitat suitable for each covered species, and may or may not be occupied. Because not all modeled habitat will be occupied by covered species, the assumption of take may result in mitigation for impacts to habitat in which covered species are not present.

The habitat distribution models were used to analyze impacts on covered species and help develop the conservation strategy. Land-cover types (Table 3-2) are the basic unit of evaluation for modeling habitat, analyzing potential impacts, and developing conservation strategies for covered species. Most covered species are associated with one or more land-cover types (Table 3-3 for birds, Table 3-4 for all other species). These land-cover associations, plus other habitat features (e.g., elevation), were used to develop habitat distribution models for the 31 covered species.

Habitat distribution models were developed for all covered species to predict where within the Plan area covered species occur or could occur based on known habitat requirements. These models were used to assist in quantifying impacts of covered activities on covered species and to

assist in developing the conservation strategy<sup>1</sup>. Take of covered species habitat will be mitigated with acquisition, enhancement, restoration, and creation of land-cover types at the natural community-level. Habitat distribution models are described in detail in the respective species accounts (Appendix D). Methods used for all models are described below.

## **Model Structure and Development Methodology**

The habitat models described in the species accounts were designed to estimate the extent and location of key habitat characteristics of each species and to be repeatable and scientifically defensible, while remaining as simple as possible. The models are spatially-explicit, GIS-based "expert opinion models" based on identification of PCWHR land-cover types that provide important habitat for these species. Land-cover types were identified as suitable habitat based on the known or presumed habitat requirements and use patterns of each species. When supported by appropriate data, the models also incorporate physical parameters such as elevational limitations and distances from wetland or open water habitats that reflect an estimated extent of habitat use (e.g. the extent of upland habitat use by California red-legged frog, defined within a certain distance from aquatic habitat).

Primary and secondary habitats for wildlife were designated according to type of habitat use. Land-cover types used for breeding were designated as primary habitat. Secondary habitat includes other important habitats used for foraging, aestivation, migration, movement, or dispersal. This secondary habitat is no less important for the species than primary habitat, but merely characterizes different habitat function for the species. Habitat functions were divided into five general categories: upland habitat; foraging habitat; movement habitat; overwintering habitat, and year-round habitat. Upland habitat indicates upland habitats used by species that are also associated with aquatic habitats. For example, northwestern pond turtle dig nests in the ground on unshaded slopes in sunny upland habitats, generally within 1,400 feet of aquatic habitats. Foraging habitat is used by individuals to acquire food. Movement habitat characterizes habitat used by individuals for movement between habitats. Individuals may also forage in movement habitat. For example, yellow warblers use oak woodland savanna and valley foothill riparian in the valley floor as stop-over sites for foraging and resting during migration; and California red-legged frog move through oak woodland land-cover types to disperse between aquatic habitats. Overwintering habitat generally includes foraging and movement habitats used during the non-breeding season for that species. Some bird species (e.g., ferruginous hawk) migrate to the Plan area after their breeding season to overwinter. Year-round habitat

<sup>&</sup>lt;sup>1</sup> Habitat distribution models have been developed on a regional scale using regional data. The models are intended for use in regional planning and do not necessarily provide accurate site-specific species information. For project planning, model results must always be field-verified.

characterizes habitats where individuals of a covered species can be found year-round. Individuals may breed and forage in these habitats.

Determinations of suitable land-cover types and additional physical parameters were based on available data from peer-reviewed scientific literature, survey reports, and environmental documents. Local survey data were used whenever possible to evaluate model parameters; however, local occurrence data are generally sparse for most species. When data were inconclusive or contradictory, conservative values were assumed in estimating suitable habitat.

## **Covered Species Locations**

There is little information on the precise occurrence of most covered species in the Plan area. When available, these data were used to inform the development of the covered species models, the impact analysis, and guide the development of the conservation strategy. The more generalized covered species-habitat relationships (based on land-cover types) were used in lieu of more detailed, precise occurrence data for covered species. The following sources provided data on the occurrences of covered species in and adjacent to the Plan area:

- California Natural Diversity Database (2009 data).
- Triennial tricolored blackbird (*Agelaius tricolor*) survey provided locations of tricolored blackbirds in the Plan area. Data accessed from the Tricolored Blackbird Portal website (http://tricolor.ice.ucdavis.edu/) July, 2009.
- ECORP Consulting. 2003. Dry Creek Watershed Coordinated Resource Management Plan. Available at: http://www.drycreekconservancy.org/.
- County of Placer. 2002. Auburn Ravine/Coon Creek Ecosystem Restoration Plan. Available at <a href="http://www.placer.ca.gov">http://www.placer.ca.gov</a>.
- County of Placer. 2007. Final Environmental Impact Report: Patterson Sand and Gravel Mine Expansion Project. Prepared by Resource Design Technology, Inc., El Dorado Hills, CA. Available at <a href="http://www.placer.ca.gov/Departments/CommunityDevelopment/EnvCoordSvcs/EIR/Patterson.aspx">http://www.placer.ca.gov/Departments/CommunityDevelopment/EnvCoordSvcs/EIR/Patterson.aspx</a>.
- JSA. 2005. Assessment of Habitat Conditions for Chinook Salmon and Steelhead in Western Placer County, California. Prepared for the Placer County Planning Department.
- Incidental sightings by TRA biologists.

The majority of the records come from the CNDDB (California Natural Diversity Database 2009). Occurrences that have been documented

since 1990<sup>2</sup> were assumed to be extant unless they were on sites that have obviously been converted to other land uses. These recent occurrences were used to evaluate habitat models. These occurrences are displayed as either precise locations or general locations, described in more detail in Occurrence Data Precision below. Any occurrence before 1990 is considered a historical location and is not shown on the habitat model, with a few exceptions.

#### **CNDDB Data Limitations**

CNDDB records represent the best available statewide data, but are limited in their use for conservation planning. CNDDB records rely on field biologists to voluntarily submit information on the results of surveys and monitoring. As a result, the database is biased geographically toward areas where surveys have been conducted or survey efforts are greater (many areas have not been surveyed at all and this is not reflected in the database). The database may also be biased toward species that receive more survey effort. For example, there have been more surveys for California red-legged frog than other special-status wildlife because it is a listed species. Plants typically receive less survey effort than wildlife.

#### Occurrence Data Precision

Data that are reported to the CNDDB are done so with varied precision. Some occurrences are very well documented with explicit locations (e.g., GPS coordinates) while others are reported with more general location information. CNDDB staff qualitatively categorize each occurrence record into one of two categories: specific and non-specific (California Natural Diversity Database 2003).

A specific occurrence has sufficient information to be located on a standard USGS 7.5-minute quadrangle map. These occurrences are mapped by CNDDB as points with an 80-meter radius or as specific polygons when information allows. For the purposes of this Plan, specific occurrences were mapped as precise locations on the species occurrence maps in the species accounts (Appendix D).

A non-specific occurrence is a species occurrence that has been documented in very general terms. These occurrences may be mapped by CNDDB as circles with a radius ranging from 0.1, to 1.0 mile, or, they may be mapped with nonspecific polygons, such as the boundary of a park where an occurrence is known to occur. For the purposes of this Plan, non-specific occurrences are mapped as points and are labeled as general location on the species occurrence maps in the species accounts.

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<sup>&</sup>lt;sup>2</sup> The year 1990 was selected as a somewhat arbitrary cutoff date. We assume that before this year occurrence records are more likely to be inaccurate or no longer present than occurrence records after this year.

# 3.3.4 Natural Communities and Land-Cover Types

The NCCP Act requires that natural communities within the Plan area that could be affected by Plan implementation be identified in an NCCP. A natural community is a vegetation type or in the case of this Plan, a CWHR type, adapted for application to Placer County.

This Plan includes six natural communities, summarized in Table 3-2:

- Vernal pool grassland complex and non-vernal pool grassland;
- Oak woodland;
- Chaparral;
- Riverine and riparian forest;
- Wetland; and
- Open water.

In addition, a semi-natural land-cover type includes

Agricultural;

The balance is urban/suburban and the developed portion of rural residential.

Urban and Rural Residential (Developed).

The area and distribution are shown for the Valley in Figure 3-2 and Table 3-5 and for the Foothills in Figure 3-3 and Table 3-6. This distribution is termed the "baseline" for the purpose of estimating future take and for setting conservation objectives.

Other land-cover types mapped by JSA were not readily classified within a natural community, such as Mehrten and Serpentine Soil Formations and the barren land-cover type. See Soils, Serpentine and Mehrten Soil Formations, Section 3.2.4 for discussion about these land-cover types. The barren land cover-type is discussed within the Oak Woodland and Chaparral Section and Developed Section, below.

# Vernal Pool Grassland Complex and Non-vernal Pool Grassland

In the Plan area, vernal pool complex and non-vernal pool grassland communities are in two land-cover types:

- Annual grassland
- Pasture (non-irrigated).

These two land-cover types are discussed together because vernal pool complexes are often interspersed with annual grasslands. As described above, vernal pool complex density and level of disturbance was mapped in 2009 by NFA. Vernal pool characteristics are considered an attribute of grassland and the landcover analysis in the Valley expands the designation of grassland to distinguish the NFA density classes. Figure 3-4 depicts the density mapping for grassland. Table 3-7 shows the area of the density classes and the corresponding level of disturbance.

## **Land-Cover Descriptions and Locations**

#### **Vernal Pool and Vernal Pool Complex**

Vernal pools form in seasonally flooded depressions in annual grasslands under a combination of specific climatic, soil, hydrologic, and topographic conditions. These conditions include a Mediterranean climate, a restrictive subsurface layer impermeable to water infiltration on which a shallow water table is perched during the wet season, and a microtopographic pattern of shallow depressions in a level landscape. This set of characteristics distinguishes vernal pools from other seasonal wetlands and perennial wetlands (Jokerst 1990, as cited in JSA 2004).

Vernal pools occur in undulating topography and may be isolated from one another, but more often they are interconnected by swales or ephemeral drainages in vernal pool complexes that may extend for hundreds of acres. These swales are part of the vernal pool complex, although often they do not remain saturated long enough to develop the unique plants and animals that characterize vernal pools. Pools may also be hydrologically connected by subsurface water flows. Direct rainfall is the primary water source but overland runoff and groundwater may also contribute to vernal pool hydrology (Jokerst 1990, as cited in JSA 2004). Size and depth of vernal pools vary. Vernal pools are ecologically integrated with the surrounding uplands, typically annual grassland habitats that form the watershed of the complex.

Vernal pools are classified on the basis of physical, geographical, and biological factors (Sawyer and Keeler-Wolf 1995, as cited in JSA 2004). Several types of restrictive soil layers have been described (Smith and Verrill 1998, as cited in JSA 2004), two of which occur in western Placer County: hardpans and volcanic flows. Hardpans are formed when silica minerals are leached, redeposited, and then cemented lower down the soil profile. They occur on alluvial terraces on the east side of the Central Valley. Northern Hardpan Vernal Pools are most common in the Southeastern Sacramento Valley Vernal Pool Region, where they occur in complexes of many small pools and swales among mima mounds on soils of the Pentz-Pardee-Red Bluff, Redding-Corning, and San Joaquin

series (USFWS 2005). Northern Volcanic Mudflow Vernal Pools (Holland 1986; Sawyer and Keeler-Wolf 1995, as cited in JSA 2004) occur on the Exchequer soils that formed on the lahars (mudflows) of the Mehrten Formation. Placer County contains most of the small number of Volcanic Mudflow Vernal Pools in the southeastern portion of the Sacramento Valley (California Department of Fish and Game 2001a, as cited in JSA 2004; USFWS 2005).

The strong seasonal rainfall of a Mediterranean climate, concentrated in the winter and spring months, fills the pools for a portion of winter and spring. The pools dry out in summer, and the prolonged dry period prevents the establishment of species typical of permanent wetlands and marshes. The mild winter and spring temperatures allow plants and animals to grow and reproduce when the pools are full. As such, vernal pools support a distinctive community of plants adapted to the annual cycle of flooding and desiccation; a number of plant species are endemic to vernal pools in California.

Pools are typically dominated by short-lived annual native plants (Holland 1976, as cited in JSA 2004) that can complete their lifecycles during the inundation and drying phases that characterize the habitat. Seeds remain dormant throughout the dry summer and germinate after winter rains. Vernal pool plant species differ in their tolerance to inundation; this varying tolerance causes the characteristic zoning evident as concentric rings around vernal pools. Species that are tolerant of longer periods of inundation occur in the centers of pools, while less tolerant species grow around the margins. Because of the extreme growing conditions in vernal pools, few non-native plants are able to survive, and 75–95 percent of plant species in vernal pools are native (Holland and Jain 1978; Jokerst 1990, as cited in JSA 2004). In contrast, non-native species dominate the surrounding annual grasslands, comprising 90 percent of the biomass (U.S. Fish and Wildlife Service 2003, as cited in JSA 2004).

Native plants typical of vernal pools include several species of downingias (*Downingia* spp.), goldfields (*Lasthenia* spp.), popcornflowers (*Plagiobothrys* spp.), and clovers (*Trifolium* spp.), as well as gratiola, coyote thistle (*Eryngium castrense*), spike-rush (*Eleocharis spp.*), woolly marbles (*Psilocarphus spp.*), buttercups (*Ranunculus* spp.), pogogyne (*Pogogyne* sp.), quillwort (*Isoetes* spp.), purslane speedwell (*Veronica* sp.), and white navarretia (*Navarretia* sp.). Non-native species found in vernal pools in western Placer County include Italian ryegrass (*Lolium perenne*), small quaking grass (*Briza minor*), soft chess (*Bromus hordeaceus*), lesser hawkbit (*Leontodon taraxacoides*), hyssop loosestrife (*Lythrum hyssopifolium*), and cut-leaved geranium (*Geranium dissectum*) (JSA 2002, as cited in JSA 2004).

In California, vernal pools occur in the Central Valley, in coastal valleys and terraces, the Modoc plateau, and on coastal mesas of southern California. The largest concentration of vernal pools is found along the

eastern edge of the Central Valley. In the Plan area, vernal pool complexes typically occur at elevations of 30–300 feet.

#### **Annual Grassland**

Foothill areas are mostly comprised of open annual grassland–oak woodland/savanna with widely scattered blue oaks (*Quercus douglasii*), interior live oaks (*Quercus Wislizeni*), and valley oaks (*Quercus lobata*). Annual grasslands occur in the understory of open mixed oak, blue oak, interior live oak, and valley oak woodlands, in openings in oak–foothill pine woodland and foothill chaparral land-cover types. Remnant examples of native valley grasslands, which are often found around the edges of wetlands or moist bottomlands, are patchy and generally have poorly defined boundaries. Native foothill grasslands of upland perennial bunchgrasses are better represented on poor soils than on deeper agricultural soils.

Species characteristic of annual grassland include slender wild oat (*Avena fatua*), ripgut brome, soft chess, medusa-head (*Taeniatherum caput-medusae*), and foxtail barley (*Hordeum jubatum*). Red-stemmed filaree (*Erodium* sp.) is a dominant non-native forb that was introduced to California by Spanish missionaries in the sixteenth century. Other dominant non-native forbs include rose clover (*Trifolium hirtum*), bur clover (*Medicago polymorpha*), little hop clover (*Trifolium dubium*), storksbill (*Erodium botrys*), and dovefoot geranium (*Geranium molle*).

Despite the dominance of introduced species, dry annual grasslands are still home to many native plant species, particularly native bulbs and early- or late-season annual wildflowers, such as California poppy (Eschscholzia californica), popcornflower, rancher's fire, common brodiaea, Ithuriel's spear (Triteleia laxa), winecup clarkia (Clarkia purpurea), johnny-tucks (Triphysaria eriantha), common madia (Madia elegans), cream cups (Platystemon californicus), and gold nuggets (Delosperma congestum). On poor, rocky soils, both native foothill bunchgrasses and forbs are more abundant than in the long-grazed open grasslands of the County's lowest elevations. Characteristic grasses here include natives such as California melic (Melica californica), squirreltail (Elymus elymoides), one-sided bluegrass (Poa secunda), purple needlegrass (Nassella pulchra), and blue wildrye (Elymus glaucus), as well as non-natives such as soft chess, hedgehog dogtail (Cynosurus echinatus), and ripgut brome.

While the original native grassland prairies have been greatly reduced throughout their range, non-native annual grasslands remain common both locally and throughout most of lowland California. They are most extensive in the Central Valley, but also occur in low valleys or gentle slopes of the Sierra Nevada, Coast Ranges, Transverse Ranges, and Peninsular Ranges (Mayer and Laudenslayer 1988, as cited in JSA 2004).

Annual grassland dominates undeveloped areas at low elevations. Open annual grasslands are most common below 1,600 feet elevation on gentle slopes and in valleys of western Placer County. In western Placer County, non-native annual grasslands and grassland-savanna communities occur at elevations of approximately 38–1,400 feet.

## **Historical Extent and Composition**

## **Vernal Pool and Vernal Pool Grassland Complex**

It is estimated that more than 90 percent of California's vernal pools have been lost to agricultural development and urbanization (Holland 1976, as cited in JSA 2004). Vernal pools are often in areas where livestock have grazed for many decades; California ranchers and vernal pools have coexisted for centuries, with several generations of ranchers utilizing the landscape (CWIS 2009).

#### **Annual Grassland**

At low elevations, grassland was likely always the dominant vegetation community, kept open by native grazers such as tule elk (Cervus elaphus) and pronghorn (Antilocapra americana), drought, and fire (Barry et al 2006). Prior to European settlement, native grasslands in western Placer County occurred largely as treeless prairies dominating the floor of the Central Valley (Mayer and Laudenslayer 1988, as cited in JSA 2004). Open grassland/oak savannas in Placer County were once dominated by perennial bunchgrasses such as purple needlegrass (Nassella pulchra). with other native annual and perennial forbs (Bartolome 1981, as cited in JSA 2004), but today these areas are overwhelmingly dominated by introduced annual grasses, and native perennial bunchgrasses have become quite rare. In some areas, woodland and chaparral have been cleared to create grazing land and are now annual grassland. Consequently, the boundaries of the grassland ecosystem have shifted from those of the original prairie in the low foothills of western Placer County (Ornduff 1974, as cited in JSA 2004).

#### **Common Wildlife Associations**

Vernal pools are important habitat for migratory birds, including sandpipers and herons, as well as waterfowl (Jokerst 1990; Silveira 1998, as cited in JSA 2004), and vernal pool complexes are important to the continuity of wetland habitats along the Pacific Flyway (U.S. Fish and Wildlife Service 2003, as cited in JSA 2004). Other birds, such as raptors (hawks, falcons, and kites) and a variety of songbirds, use vernal pool complexes for foraging and as water sources. Burrowing owls (*Athene cunicularia*) may use burrows in mima mounds in the surrounding annual grasslands (U.S. Fish and Wildlife Service 2003, as cited in JSA 2004). Many wildlife species use both the vernal pools and the surrounding annual grassland habitat of the vernal pool complex. For example, many of the typical vernal pool annual plants are pollinated by bee species that

nest in the surrounding uplands and forage in annual grasslands when the pools dry out.

Vernal pools provide habitat for animals that can tolerate the extreme range of conditions that characterize these ecosystems. Many are specialized animals that are able to complete their life cycles in the short period during which pools are wet; these include crustaceans such as fairy shrimp, clam shrimp, tadpole shrimp, seed shrimp, and daphnia (Order: Cladocera); and other invertebrates such as water beetles, water boatmen (Family: Corixidae), and aquatic larvae of fly and dragonfly (Order: Odonata) species. Vernal pool invertebrate communities have evolved in the absence of aquatic predators such as fish and non-native bullfrogs (*Rana catesbeiana*), which cannot survive in vernal pools because of the long period of desiccation. Pacific tree frogs (*Hyla regilla*) and western toads (*Bufo boreas*) may be common in vernal pool complexes.

Annual grasslands provide abundant food and cover for high numbers of rodents and other small mammals. Consequently, several raptors, including red-tailed hawk (Buteo jamaicensis), red-shouldered hawk (Buteo lineatus), Swainson's hawk (Buteo swainsoni), and American kestrel (Falco sparverius), thrive in annual grasslands. Other characteristic wildlife species include western yellow-bellied racer (Coluber constrictor mormon), California whipsnake (Masticophis lateralis), gopher snake (Pituophis catenifer), western kingbird (Tyrannus verticalis), western bluebird (Sialia mexicana), western meadowlark, black-tailed jackrabbit (Lepus californicus), California ground squirrel (Spermophilus beecheyi), Botta's pocket gopher (Homomys bottae), and American badger (*Taxidea taxus*). Exotic and invasive animal species that are characteristic of annual grasslands in the County include wild turkey (Meleagris gallopavo), European starling (Sturnus vulgaris), house mouse (Mus musculus), black rat (Rattus rattus), and wild pig (Sus scrofa).

# **Covered and Special-Status Species**

#### **Vernal Pool and Vernal Pool Complex**

Five special-status plants—Bogg's Lake hedge-hyssop (*Gratiola heterosepala*), legenere (*Legenere limosa*), dwarf downingia (*Downingia pusilla*), Ahart's dwarf rush (*Juncus leiospermus*), and Red Bluff dwarf rush (*Juncus leiospermus*)— are known to occur in vernal pools in western Placer County and are covered by this Plan. Other special-status plants that may occur in vernal pools, but that are not covered, are depauperate milk-vetch (*Astragalus pauperculus*), pincushion navarretia (*Navarretia myersii*), and Henderson's bent grass (*Agrostis hendersonii*).

Vernal pool ecosystems provide breeding habitat for a variety of specialstatus animal species that are covered by this plan, including Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), and western spadefoot (*Scaphiopus hammondii*). These shrimp species have evolved accelerated reproductive maturity and high reproductive rates in response to the extreme environmental conditions that occur in vernal pools. They can survive the desiccation phase in the form of cysts, which can withstand high temperatures during the summer and remain viable in the soil for more than 10 years (Belk 1998, as cited in JSA 2004).

Other special-status animals that may visit vernal pool complexes and that are covered by this plan are bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), American peregrine falcon (*Falco peregrinus*), and tricolored blackbird. One special status species that has the potential to occur in vernal pools of western Placer County, but that is not covered by this plan, is the California tiger salamander (*Ambystoma tigrinum californiense*).

#### **Annual Grassland**

Two state-listed species, Red-Bluff dwarf rush and Ahart's dwarf rush, have limited potential to occur in seasonally moist sites in annual grasslands in western Placer County and are covered by this Plan. Other special-status plants that may potentially occur in annual grasslands, but that are not covered by this Plan, are depauperate milk-vetch, big-scale balsamroot (*Balsamorhiza macrolepis var. macrolepis*), hispid bird's-beak (*Cordylanthus mollis* ssp. *hispidus*), stinkbells (*Fritillaria agrestis*), sylvan microseris (*Microseris Sylvatica*), and hoary navarretia (*Navarretia eriocephala*).

Special-status animals that may use annual grasslands for breeding or as visitors, and that are covered by this Plan, are western spadefoot, northwestern pond turtle (*Actinemys marmorata marmorata*), giant garter snake (*Thamnophis gigas*), northern harrier, Swainson's hawk, ferruginous hawk (*Buteo regalis*), American peregrine falcon, western burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), bank swallow (*Riparia riparia*), grasshopper sparrow (*Ammodramus savannarum*), and tricolored blackbird. California tiger salamander has the potential to occur in annual grasslands as visitors, but is not covered by this plan.

## **Ecosystem Functions**

#### **Vernal Pool and Vernal Pool Complex**

Like other wetlands, vernal pools moderate seasonal flooding during storm events by collecting water (California Natural Resources Agency 2009). Also, like other wetlands, vernal pools remove contaminants from the water, including dissolved elements and compounds from agricultural and urban runoff (Leidy and White 1996; California Natural Resources Agency 2009). Although depressional wetlands without inlets and outlets, such as vernal pools, may be hydrologically isolated through

obvious surface-water connections, most appear to be linked to other waters and wetlands through groundwater or, especially in the case of vernal pools, periodic surface flows (Winter et al. 2001; Whigham and Jordan 2003) and slow-moving shallow soil-water flows (Leibowitz 2003).

As previously noted, vernal pools are important habitat for migratory birds, and in the spring, migrating waterfowl are often observed feeding and resting in Central Valley vernal pools. Recent studies suggest that the protein-rich invertebrates and crustaceans, as well as the roots and leaves of vernal pool plants provide important seasonal food sources for waterfowl as well as non-migratory bird species (CWIS 2009). The large freshwater branchiopods serve as an especially important source of protein and energy for migratory waterfowl (Eriksen and Belk 1999, as cited in JSA 2004).

Other birds, such as raptors (hawks, falcons, and kites) and a variety of songbirds, use vernal pool complexes for foraging and as water sources. Burrowing owls may use burrows in mima mounds in the surrounding annual grasslands (U.S. Fish and Wildlife Service 2003, as cited in JSA 2004). Many wildlife species use both the vernal pools and the surrounding annual grassland habitat of the vernal pool complex. For example, many of the typical vernal pool annual plants are pollinated by bee species that nest in the surrounding uplands and forage in annual grasslands when the pools dry out.

Fish cannot occur in vernal pools because vernal pools are dry for part of the year. This reduced-predator environment is essential for breeding and foraging success of many native amphibian species, which feed on the invertebrates that can live in the vernal pools.

#### **Annual Grassland**

Grasslands in Placer County function as a dominant natural community, linking small and large patches of all other natural communities in the landscape such as oak woodland, riparian and aquatic communities. Vernal pools, cliffs, and seeps are contained within the larger matrix of grasslands, and in some cases, the functions and threats to the integrity of these land-cover types depends on the integrity of the grasslands.

Grasslands provide important upland habitat for a variety of amphibians dependent on adjacent aquatic habitats such as ponds and seasonal wetlands. These amphibians move through grasslands during the rainy season to disperse to other aquatic sites, and may aestivate within grasslands during the dry season.

Grasslands are important for burrowing rodents such as ground squirrels and gophers. Rodent burrows, in turn, provide habitat for a variety of other species, including burrowing owls. The diverse and abundant rodent community supports an assemblage of raptors that feed on them.

Grasslands also help maintain water quality through soil retention and by filtering out sediment and nutrients from run-off. The key characteristics of grassland habitat that contribute to its ecosystem functions are a high cover of herbaceous vegetation and a low to absent cover of woody vegetation.

#### **Natural Disturbance**

Domestic grazing animals may provide the same ecological functions as the native grazing animals (e.g., deer, elk, and pronghorn antelope) that formerly grazed the Central Valley in pre-European times. Grazing can reduce cover of non-native grasses, impair invasive plants, and reduce thatch. Some vernal plants such as Bogg's Lake Hedge-hyssop have been observed aggregated in groups in cattle hoof prints (Mason and Bacigalupi 1954, as cited in JSA 2004).

Flooding is an important disturbance that not only fills vernal pools, but also temporarily links them. Seed capsules of some vernal pool plant species such as legenere may disperse by floating to hydrologically connected areas (Holland 1983, as cited in JSA 2004).

The origin of mima mounds that characterize some of the hardpan vernal pool complexes in western Placer County is controversial, but many theories point to natural disturbances such as erosion, deposition, clay swelling, or soil movement by fossorial rodents (Cain 1974, Collins 1975, Hallsworth et al 1955, and Reed 2007).

Ground squirrels provide important natural disturbances by creating burrows that are used by several amphibian species, as well as burrowing owls.

Wild fires are a predominant disturbance in vernal pool-grassland settings. Both communities are adapted to periodic, low intensity fire. Figure 3-5 Plan Area Wildfire Locations shows the frequent, large fires in the Valley.

#### **Threats**

#### Vernal Pools and Vernal Pool Complexes

Threats to vernal pools include development and fragmentation, modification to inundation and hydro-period due to changes in the hydrology of surface flows and perched groundwater flows, non-native vegetation (including annual grasses and noxious weeds), impacts from recreational use, impacts to water quality, non-native predators, and decreased pollination and dispersal of vernal pool species due to impacts on adjacent uplands.

Vernal pool complexes are extremely vulnerable to development and fragmentation because they occur on level or gently rolling terrain that is

accessible and suitable for development (Cheatham 1976, as cited in JSA 2004). Although agricultural conversions—including conversion to orchards, vineyards, rice "ranchettes", "hobby farms"), fallow agricultural land, irrigated pasture--account for most of the total loss of vernal pool throughout the Valley, in Placer County there is a relatively high proportion of loss due to conversion to urban development (Holland 2009).

Surface flows to and from vernal pools can be impacted by manipulation of nearby terrain due to land disturbance. If poorly planned, such manipulations can result in the loss of hydrological connections that sustain the vernal pools, and can lead to hydroperiod reduction. Reduced hydroperiods can cause decreased native plant and invertebrate taxa richness. This is because pools with short hydroperiods tend to be occupied solely by species with rapid development cycles; the pools dry up before longer-lived species are able to complete their life cycles (King et al. 1996). This shift in hydrology can also have important implications for the endangered species that might otherwise inhabit the vernal pools. For example, vernal pool tadpole shrimp requires habitats that are wet for at least seven weeks (Gallagher 1996, as cited in JSA 2004); adult tadpole shrimp are left exposed to predation and desiccation when their habitat dries up before they are able to complete their life-cycle. Western spadefoot toads could also be negatively affected by reduced hydroperiods, as they require pools with on average 80 days of inundation (Morey 1998).

Alternatively, vernal pools can be subject to increased periods of inundation due to nearby irrigation, outfall discharge, or runoff from development (CNDDB 2007). Increased periods of inundation can reduce habitat suitability for the vernal pool fairy shrimp as they are commonly found in only the smaller shorter-lived pools (Eriksen and Belk 1999).

In many vernal pool habitats, especially those on duripan or claypan in the Central Valley, perched aquifers keep most water on or near the surface. These perched aquifers buffer the vernal pools against water loss due to evapo-transpiration (Williamson et al. 2005, Rains et al. 2006, as cited in USFWS 2007). In these vernal pools, the perched groundwater and the seasonal surface water hydrologically connect the uplands, vernal pools, and streams at the catchment scale. These vernal pools have naturally longer hydroperiods, meaning that they remain inundated for longer periods, than if they were recharged only by precipitation. In fact, for some vernal pools, the greater watershed can supply 25 to 60 percent of the water needed to fill pools to the margin. Accordingly, changes in adjacent land use may have considerable impacts on vernal pools by impacting both surface flows and the perched groundwater, although the degree to which such changes affect pools is poorly understood (Rains et al. 2006, as cited in USFWS 2007).

Vernal pool hydrology can be altered by non-native grasses and invasive plants. Non-native annual grasses and invasive plants reduce the cover of native vernal pool plants, most of which are forbs. When non-native grasses and invasive plants dominate pool edges, they sequester light and soil moisture, promote thatch build-up, and shorten hydroperiods. As the increased thatch layer decomposes, oxygen becomes depleted and sediment toxicity can increase (Lee 2007, as cited in USFWS 2007). Depletion of dissolved oxygen can cause complete mortality of gill-breathing aquatic organisms (Horne and Goldman 1994, as cited in USFWS 2007; Rogers 1998).

Although the mechanism responsible for hydroperiod reduction due to non-native grasses and invasive plants is not documented, it is thought to be due to the overall increase in vegetative matter, and a subsequent increase in evapo-transpiration (Marty 2005). Livestock grazing, as a substitute for grazing by native wildlife, is an important tool for reducing the cover of non-native grasses, invasive plants, and the resulting thatch—as well as for decreasing evapo-transpiration. However, in many areas, cattle-grazing has been discontinued in anticipation of land use changes (C. Martz, CDFG, pers. comm. 2006, as cited in USFWS 2007). Vernal pool inundation has been reduced by 50-80 percent in the southeastern Sacramento Valley when grazing is discontinued (Marty 2005). Therefore, the change in vernal pool hydroperiod due to loss of grazing is noted as an emerging threat for vernal pool species, especially in the Sacramento Valley (C. Martz, CDFG, pers. comm. 2006, as cited in USFWS 2007).

Although grazing is an important tool for vernal pool management, overgrazing can threaten vernal pools by increasing sedimentation and nutrient inputs (USFWS 2007). The proportion of non-native plants may be higher in vernal pools subject to heavy livestock grazing (JSA 2002, as cited in JSA 2004). In addition, excessive organic waste oxidizes the water, which can reduce the amount of oxygen available for gill-breathing invertebrates (Rogers 1998, as cited in USFWS 2007). Cattle can trample rare vernal pool plants (Griggs 2000) and vernal pool fairy shrimp, which appear to be easily crushed (Hathaway et al. 1996). The impacts of overgrazing seem to be greatest in the warm spring months, when the cattle walk into the drying pools to soak their hooves in the mud and escape the bites of the heel-fly (Griggs 2000), and when the cattle may be attracted to the green plants in and around a vernal pool after the upland grasses have begun to turn brown (Barry 1998).

Prescribed fire is being employed at some sites to substitute for, and supplement, prescribed grazing to reduce invasive plants and non-native annual grasses. However, the benefits of prescribed burning can be ephemeral (Marty 2005). In vernal pools where vegetative material is relatively sparse, fairy shrimp cysts do not appear to be negatively affected by fire, but in regions where thatch has built up or vegetative material is dense, fire may have deleterious effects on cyst viability (Wells et al. 1997, as cited in USFWS 2007). In addition, application of fire

retardant can contaminate pools, leading to temporary losses of chydorids, daphnids, ostracods, and rotifers within vernal pools (Angeler et al 2006).

Water quality in vernal pools may be degraded over large portions of the Central Valley due to pesticide overspray and residues. The runoff and precipitation that fill the pools can include pesticides (i.e., herbicides, insecticides, fungicides). Toxic levels of some compounds accumulate in aquatic stream sediments within the Central Valley (Weston et al. 2004; Amweg et al. 2005), so may also be a problem in vernal pools. In addition, herbicides are sometimes used on some preserved vernal pool habitats to control invasive plant species (e.g., CNLM 2004a).

Pesticides that are found in vernal pools due to atmospheric deposition have been found to be toxic to some vernal pool crustaceans (USFWS 2007). Herbicide formulations, although presumably less toxic to invertebrates than insecticides, may lead to retarded growth and concomitant reductions in fecundity for exposed wildlife, particularly fairy shrimp (Brausch et al. 2006). Pesticide effects can beaccentuated by the effects of the surfactants formulated with the active ingredient (USFWS 2007).

Bullfrogs, fish, and cravfish (Families: Astacoidea and Parastacoidea) have been noted as potential threats to vernal pool species at several national wildlife refuge holdings (CNDDB 2007). Predation of vernal pool crustaceans by non-native bullfrogs potentially increases the threat of predation beyond that found naturally. Bullfrogs require permanent water for breeding; however, during the rainy season juvenile bullfrogs disperse readily into vernal pool complexes from permanent waters and can spend several weeks or more at pools consuming aquatic invertebrates. In such cases. bullfrogs have been documented to selectively prey on macrocrustaceans (e.g. vernal pool tadpole shrimp, and clam shrimp, [Cyzicus californicus]) and coleopterans (beetles), even when other prey is more abundant (Service 1994; Balfour and Morey 1999). Under natural conditions. California streams and rivers sustained wide annual fluctuations in water volume and generally were not permanent in nature, thereby preventing influxes of non-native aquatic species (Moyle and Light 1996). Opportunities for bullfrog dispersal into vernal pool ecosystems have increased as additional permanent-water habitat has been created in canals, in streams augmented by urban runoff and irrigated agriculture, and in stock ponds and other impoundments. All of the major stream drainage systems in western Placer County contain irrigation water, urban runoff or a combination of the two. Vernal pool crustaceans lack predator-avoidance mechanisms and are continuously moving their phyllopods, so they may be particularly susceptible to predation by bullfrogs and other visual predators. Bullfrogs also prev upon adult and tadpole-stages of native amphibians, including those of endangered species. Vernal pools in reserves that are close to permanent waters may be invaded by other non-native predators, such as mosquitofish and non-native game fish.

Off-trail use, which crosses through vernal pools and the uplands around the pools (hiking, bicycling, horse-back riding, and vehicle-use) can damage vernal pools by causing erosion and crushing or displacing organisms in the pools. In some areas, vernal pool wetlands are used for "mud bogging", where off road vehicles are driven around and through a pool. This activity is especially damaging since it alters pool topography and hydrology, destroys vegetation and crushes organisms in the pools. Because fairy shrimp cysts appear to be easily crushed (Hathaway et al. 1996), that species is particularly susceptible to off-trail vehicle disturbance (USFWS 2007). While these activities are not prevalent in western Placer County today, they have contributed to the overall decline of the species.

Some protected lands may be affected by management decisions that could favor one federally-listed vernal pool species over another. One example is the interaction between the vernal pool tadpole shrimp and the vernal pool fairy shrimp. Tadpole shrimp prey upon fairy shrimp, but require large and deep pools with long hydroperiods. Large vernal pools with long hydroperiods may support large populations of vernal pool tadpole shrimp.

#### **Annual Grassland**

Grasslands continue to be altered in California as a result of agricultural, residential, and industrial development. Where remnant native perennial grasslands occur within annual grasslands, they should be managed to prevent their conversion to annual grasslands. In the absence of grazing, or as a result of discing or very heavy grazing, weedy, non-native annual grasses can out-compete the desired native species (Freckman et al. 1979, as cited in JSA 2004).

Heavy grazing by domestic livestock has shifted the species composition and extent of grasslands in the Sierra Nevada foothills. Year-round heavy grazing favors introduced annual grasses at the expense of native perennial bunchgrasses (Heady 1977, as cited in JSA 2004). It has been estimated that non-native species constitute 70–80 percent of the biomass of California's pastures and annual grasslands (Ornduff 1974, as cited in JSA 2004).

The dominance of annual grasses has also changed the fire and moisture regime in many areas, because annual grasses dry earlier and burn hotter and more frequently than native perennial bunchgrasses. Large amounts of standing dead material can be found in late summer in years of abundant rainfall and under light to moderate grazing pressure (Mayer and Laudenslayer 1988, as cited in JSA 2004). Little soil moisture remains available for native perennial species after seed set in annual grasslands (Heady 1977, as cited in JSA 2004).

Noxious weeds that occur in annual grasslands of western Placer County include yellow star thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*), and medusa-head. Other invasive plants that may occur

include barbed goatgrass (*Aegilops triunciali*), tree-of-heaven (*Ailanthus altissima*), spotted knapweed (*Centaurea stoebe*), artichoke thistle (*Cynara cardunculus*), wild fennel (*Foeniculum vulgare*), perennial pepperweed (Lepidium sp.), Italian ryegrass, Russian thistle (*Salsola spp.*), and puncture vine (*Tribulus terrestris*). Exotic and invasive animal species that are characteristic of annual grasslands in the County include wild turkey, European starling, house mouse, black rat, and wild pig.

# Oak Woodland and Chaparral

The oak woodland land-cover types are arrayed along an elevation gradient from the Central Valley floor to the foothills where they grade into conifer forests dominated by ponderosa pine (*Pinus ponde*rosa), to the east of the Plan area.

The main sources of information about Placer County's oak woodlands are JSA (2004) and the County's Oak Woodland Management Plan (County of Placer 2003). County of Placer (2003) classifies oak woodlands in the County into four CWHR types (Mayer and Laudenslayer 1988) including Blue Oak Woodland, Valley Oak Woodland, Montane Hardwood, and Valley Foothill Riparian Woodland, JSA (2004) identified six vegetation types dominated by oak species including:

- Oak woodland savanna
- Blue oak woodland
- Valley oak woodland
- Mixed oak woodland
- Interior live oak woodland
- Oak-foothill pine woodland

Ponderosa pine woodlands, chaparral and barren land-cover types are often interspersed and closely associated in the Plan area.

For purposes of this Plan and for evaluation of land use impacts, the types identified by JSA (2004) have been adopted to maintain consistency with the GIS-based land-cover mapping. Blue oak woodland and valley oak woodland classified by JSA (2004) correspond directly to the Blue Oak Woodland and Valley Oak Woodland CWHR types designated in County of Placer (2003). The land-cover types identified by JSA as interior live oak woodland, oak woodland savanna, and mixed oak woodland are variants within these broader CWHR oak woodland vegetation types. Valley foothill riparian woodland, which also supports oaks, is discussed in the Riverine and Riparian section below. Barren, disturbed land is discussed in the Developed section below.

## **Land Cover Descriptions and Locations**

#### Oak Woodland Savanna

Oak woodlands with less than 30 percent canopy cover were mapped as oak woodland savanna. There are two types of oak woodland savanna in western Placer County. On upland hillsides and broad ridges, the dominant oak species is blue oak. Associated trees and shrubs include California buckeye (*Aesculus californica*) toyon and poison oak (*Toxicodendron diversilobum*). This blue oak-dominated savanna commonly occurs within a diverse mosaic composed of other oak woodlands, riparian woodlands, and annual grassland land-cover types. On valley floodplains and terraces, oak woodland savanna is dominated by valley oak. In both types, community structure is characterized by limited shrub cover and an under-story comprised of annual grasses and forbs.

Oak woodland savanna ecosystems occur in a ring around the Central Valley in the foothills of the Sierra Nevada (Allen et al. 1989, as cited in JSA 2004). In the Plan area, oak woodland savanna occurs at elevations of about 70–1,500 feet.

#### Blue Oak Woodland

Oak woodlands dominated by blue oak were mapped as blue oak woodland when they had greater than 30 percent canopy-cover, were not associated with perennial streams, had less than 10 percent canopy cover of foothill pine, and could be distinguished by aerial photograph interpretation or field assessments. Additional oak woodlands dominated by blue oak do occur in western Placer County; they were mapped as oak woodland savanna when there was less than 30 percent canopy-cover, as valley foothill riparian when they were associated with perennial streams (see section below regarding the Riverine and Riparian community), as oak foothill pine woodland when foothill pine exceeded 10 percent of the total canopy cover, and as mixed oak woodland when the dominant species could not be distinguished on the basis of aerial photograph interpretation or field assessments.

In blue oak woodlands, blue oak generally dominates the tree layer, often in association with widely scattered, emergent foothill pines. On some soils, blue oak and interior live oak occur as co-dominants. The shrub layer in blue oak woodland is generally sparse, except for scattered poison oak, coffeeberry (Rhamnus californica), buckbrush, California buckeye, and whiteleaf manzanita (Arctostaphylos manzanita) that generally occur only on rock outcrops or poor soils where trees are often very small. Dominant species in the understory include non-native grasses such as wild oat, soft chess, ripgut brome (Bromus diandrus), foxtail barley, hedgehog dogtail, and rattail fescue (Vulpia myuros), and forbs such as rose clover, hedge parsley (Torilis arvensis), and winter vetch (Vicia villosa). Common noxious weeds include vellow star thistle. Italian thistle, and medusa-head, as well as many invasive non-native annual grasses. Characteristic native species include California poppy, common brodiaea, fiddleneck (Amsinckia spp.), popcornflower, winecup clarkia, soap plant (Chlorogalum pomeridianum), Ithuriel's spear, and

gold nuggets. The understory of blue oak woodlands in western Placer County can also support a wide variety of colorful native perennial and annual wildflowers.

Blue oak woodland is the dominant interior foothill woodland, forming an almost continuous belt around the Central Valley (Holland 1986; Mayer and Laudenslayer 1988, as cited in JSA 2004). CDFG considers blue oak woodland a sensitive biotic community (California Department of Fish and Game 2007). Blue oak woodland dominates the lower elevations of western Placer County. In the Plan area, it occurs at elevations of 90–1,600 feet. Above elevations of approximately 1,500 feet in Placer County, blue oak woodland occurs mainly on gently sloping, well-drained, nutrient-poor dry sites where trees grow slowly. On nutrient-poor soils, blue oaks eight inches in diameter may be up to 100 years old (McCreary pers comm., as cited in JSA 2004). Blue oak woodland intergrades with annual grassland at lower elevations and with oak–foothill pine woodland, foothill chaparral, or ponderosa pine forest at higher elevations.

## Valley Oak Woodland

Oak woodlands dominated by valley oak were mapped as valley oak woodland when they had greater than 30 percent canopy-cover, were not associated with perennial streams, and could be distinguished by aerial photograph interpretation or field assessments. Oak woodlands dominated by valley oak were mapped as oak woodland savanna when there was less than 30 percent canopy-cover, as valley foothill riparian when they were associated with perennial streams (see section below regarding the Riverine and Riparian community), and as mixed oak woodland when the dominant species could not be distinguished on the basis of aerial photograph interpretation or field assessments.

In valley oak woodlands, large and broad-crowned valley oak trees occur in stands and blend into riparian woodlands of valley oak or mixed tree species along streamcourses and on active floodplains. The shrub layer, if present, contains bird-dispersed native species such as poison oak, coffeeberry, and toyon. Himalayan blackberry (*Rubus armeniacus*), a noxious weed species, may be common. The understory is often grazed and consists of a thick carpet of non-native annual grasses and forbs. Occasional native forbs and grasses found in the understory of valley oak woodlands in western Placer County include blue wild rye, western buttercup (*Ranunculus occidentalis*), and popcornflower.

Although valley oak woodland was formerly extensive in the Sacramento and San Joaquin Valleys (Holland 1986, as cited in JSA 2004), most of the historical stands have been cleared for agriculture, flood control, and urban expansion. In western Placer County, as in other Central Valley and Sierra foothill counties, valley oak woodland has a very limited distribution, occurring where soils are deep and contain some subsurface soil moisture. Valley oak woodland is restricted to about 670 acres in Placer County. These stands occur at elevations of about 50–800 feet. Most valley oak woodlands in the Plan area are on private land. Large

stands (>40 acres) of valley oaks are nearly absent from the valley-foothill bioregion (Greenwood et al. 1993). Valley oak woodland intergrades with blue oak woodland or oak–foothill pine woodland on shallower or drier sites (Griffin 1977; Mayer and Laudenslayer 1988, as cited in JSA 2004).

#### Interior Live Oak Woodland

Oak woodlands dominated by interior live oak were mapped as interior live oak woodland when they had greater than 30 percent canopy-cover, were not associated with perennial streams, had less than 10 percent canopy cover of foothill pine, and could be distinguished by aerial photograph interpretation or field assessments. Additional oak woodlands dominated by valley oak occur in western Placer County; they were mapped as oak woodland savanna when there was less than 30 percent canopy-cover, as valley foothill riparian when they were associated with perennial streams (see section below regarding the Riverine and Riparian community), as oak-foothill pine woodland when there was greater than 10 percent canopy cover of foothill pine, and as mixed oak woodland when the dominant species could not be distinguished on the basis of aerial photograph interpretation or field assessments.

Directly under the oak canopy, dense shade and a thick, persistent layer of leaf litter typically precludes development of an herbaceous layer. Few weedy annual grasses are present, and the shrub layer is often sparse or absent. Where light permits development of an herbaceous layer, dominant species in the understory of interior live oak woodland include non-native species that are somewhat shade tolerant, such as hedgehog dogtail, hedge parsley, chickweed (Cerastium spp.), and the noxious weed Italian thistle. Common native species include blue wild rye, miner's lettuce (*Claytonia perfoliata*), foothill sanicle, hairy wood rush (Luzula pilosa), and western buttercup. At woodland edges or in openings of the tree canopy, such as rock outcrops, common shrubs include coffeeberry, whiteleaf manzanita, poison oak, toyon, and hoary honeysuckle (Lonicera hispidula var. vacillans). In these canopy openings, common non-native herb associates include slender wild oat (Avena barbata), yellow star thistle, and ripgut brome, in addition to those mentioned above. Native forbs and bunchgrasses are best represented on poor, rocky soils, and include white globe lily (Calochortus albus), twining brodiaea (Dichelostemma volubile), common brodiaea (Brodiaea sp.), round-tooth ookow (Dichelostemma sp.), soap plant, California melic, one-sided bluegrass, purple needlegrass, common madia, and goldback fern (Pentagramma spp.).

Interior live oak woodland is widespread throughout the foothill region surrounding the Central Valley, from Shasta County south to the Kern River (Holland 1986, as cited in JSA 2004). However, interior live oak woodland has a restricted distribution in western Placer County, occurring at elevations of about 300- 600 feet. Interior live oak woodland typically occurs on north-facing slopes and in drainages and stream canyons. Steep terrain and limited forage often reduces the potential for grazing in

live oak woodland. In the Granite Bay and Folsom Lake area, interior live oaks are common on flat terrain. At elevations above approximately 1,500 feet in Placer County, they occur in a wider variety of settings, from steep, rocky canyon slopes to gentle slopes or ridges on nutrient-poor soils. The vegetation type is considered to be resilient to wild fire because of its ability to stump-sprout after fire. Live oak will often replace blue oak after catastrophic fire because it is a more successful sprouter (Griffin 1977, as cited in JSA 2004), and interior live oak woodland is typically interspersed with blue oak woodland.

#### **Mixed Oak Woodland**

JSA (2004) mapped a large proportion of the planning area as foothill hardwood woodland (FFH) in JSA 2004 Figures XI-1 XI-39, but as mixed oak woodland (FHM) in JSA 2004 Table 5 and page 55. In this type, canopy cover exceeded 30 percent, there was less than 10 percent canopy cover of foothill pine, and the woodlands were not associated with perrenial streams. There was no single clearly dominant oak species that could be discerned through aerial photograph interpretation. To evaluate the composition of this vegetation type, CALVEG land-cover data for Placer County (http://www.fs.fed.us/r5/rsl/projects/classification) were overlain on polygons classified as foothill hardwood woodland/mixed oak woodland. Results indicated that 64 percent of the foothill hardwood woodland was classified by CALVEG as blue oak woodland. Another 26 percent was classified as non-forested e.g., open water, residential development, etc. On the basis of this analysis and data presented in JSA (2004), it was concluded that the principle oak species present in mixed oak woodland is blue oak. In mixed oak woodland, blue oak occurs in association with a variety of other trees including interior live oak, canyon live oak (Quercus chrysolepis), Pacific madrone (Arbutus spp.), tanoak (Lithocarpus sp.), big leaf maple (Acer macrophyllum) and foothill pine.

Mixed oak woodland occurs throughout the foothills of the Sierra Nevada and Coast Ranges and is widespread in western Placer County, occurring at elevations of about 70 - 1600 feet.

#### Oak- Foothill Pine Woodland

Oak–foothill pine woodland is distinguished from other oak woodland types by having a component of foothill pine that exceeds 10 percent of the total canopy cover (Mayer and Laudenslayer 1988, as cited in JSA 2004).

On gentle, grassy slopes at lower elevations in the County, oak-foothill pine woodlands occur as open park-like stands that are usually dominated by scattered blue oak, with foothill pine occurring sparsely on the more shallow and rocky soils (Mayer and Laudenslayer 1988, as cited in JSA 2004). At higher elevations, interior live oak replaces blue oak, especially on steep, rocky soils on north-facing slopes. At these higher elevations, and in river canyons, foothill pine becomes more abundant.

Oak-foothill pine woodland usually has an understory of shrubs and an herbaceous layer dominated by non-native annual grasses. Where the woodland is a dense mix of foothill pine, interior live oak, blue oak, and black oak (Quercus velutina), the shrub layer is more developed and the herbaceous layer sparser. In western Placer County, common shrubs in such habitats include whiteleaf manzanita, buckbrush, deer brush (Ceanothus integerrimus), poison oak, hoary coffeeberry (Rhamnus tomentella), bush penstemon (Penstemon fruticosus), silver bush lupine (Lupinus albifrons), hoary honeysuckle, chaparral honeysuckle (Lonicera interrupta), California buckeye, and western redbud (Cercis sp.). Native perennial bunchgrasses such as California melic, one-sided bluegrass. blue wild rye, and purple needlegrass are usually present in canopy openings. Shade-tolerant forbs and grasses are often sparse in the shade of the oaks; these species include miner's lettuce, western buttercup, foothill sanicle, goldback fern, and non-natives hedgehog dogtail and hedge parsley. Native forbs are usually sparse and best represented on rock outcrops. The shrub and herbaceous layers of open oak-foothill pine woodland at low elevations in western Placer County are characterized by foothill chaparral species, including shrubby California buckeye, whiteleaf manzanita, buckbrush, toyon, hoary coffeeberry, and poison oak. Dominant species in the herbaceous layer include non-native wild oat, slender wild oat, ripgut brome, and rose clover. Widely scattered native forbs include common brodiaea, Ithuriel's spear, fiddleneck, and California poppy. Noxious weeds are most common along road edges and other disturbed or ruderal areas. The most frequent noxious weed and invasive non-native species include yellow star thistle. Italian thistle. medusa-head, woolly vetch (Vicia sp.), black mustard (Brassica nigra), and Klamath weed (Hypericum perforatum).

In California, oak–foothill pine woodland forms a nearly continuous ring around the Central Valley. It is also found in the Pit River drainage of the Cascade Range, in the foothills of the Klamath Range, widely scattered on the east slopes of the Coast Ranges, and in central San Bernardino County (Mayer and Laudenslayer 1988, as cited in JSA 2004). In the Plan area, oak–foothill pine woodland occurs at elevations of about 190–1600 feet. At the lowest elevations, oak-foothill pine woodland intergrades with annual grassland and oak woodland savanna. At mid to high elevations, it intergrades with blue oak woodland. At higher elevations, oak–foothill pine woodland merges with foothill chaparral or ponderosa pine forest.

#### Foothill Chaparral

Foothill chaparral ecosystems in western Placer County are characterized by high topographic and geologic diversity. For the Plan, foothill chaparral is defined as shrub-dominated habitat with less than 10 percent cover of trees. In the Plan area, foothill chaparral ecosystems include successional habitats in mixed oak woodland or lower-elevation ponderosa pine forest, as well as persistent chaparrals on poor soils (e.g., serpentine-derived soils).

Foothill chaparral often occurs in settings that are too hot, dry, rocky, and steep to support tree-dominated habitats (Holland 1986, as cited in JSA 2004). It generally occurs on south-facing slopes, transitioning to interior live oak woodland or ponderosa pine forest on north-facing slopes. Foothill chaparral ecosystems occur on a wide variety of rock types, including granite, recent volcanic rocks with little soil development, serpentinite, slates, and metamorphosed volcanic rock; they do not occur on alluvial soils. Parent material, particularly serpentine, often influences species composition.

Foothill chaparral may be sparse on serpentine, with a total cover ranging from 30 to 60 percent (Mayer and Laudenslayer 1988, as cited in JSA 2004). Chaparral does not seem to occur on serpentine soils in western Placer County. On other soils it often forms dense, impenetrable thickets 6–24 feet high (Holland 1986, as cited in JSA 2004). Early successional chaparral and chaparral on serpentine soils may be much lower, generally ranging from three to six feet high. Chaparral shrubs have thick, stiff, leathery evergreen leaves, called sclerophylls, an adaptation to heat and drought. In fire-adapted chaparral communities, many species respond to fire by stump-sprouting or by enhanced seed germination following burns (Holland 1986, as cited in JSA 2004).

Chamise (*Adenostoma* spp), whiteleaf manzanita, buckbrush, and shrubby interior live oas are the dominant species in foothill chaparral ecosystems of western Placer County. Sites that have experienced considerable soil disturbance may contain only a few shrub species; on these sites, whiteleaf manzanita is usually dominant. On serpentine soils, buck brush (*Ceanothus cuneatus*) is often the dominant shrub. Under most other circumstances, particularly on shallow or rocky soils, foothill chaparral ecosystems in western Placer County may exhibit a wide diversity of native shrubs, including hoary coffeeberry, western redbud, birchleaf mountain mahogany (*Cercocarpus* spp.), Lemmon's ceanothus (*Ceanothus lemmonii*), Sierra plum, yerba santa (*Eriodictyon* spp.), Fremont silk-tassel (*Garrya* sp.), western service berry (*Amelanchier* sp.), deerbrush (*Ceanothus integerrimus*), Brewer's white oak (*Quercus garryana*), shrubby interior live oak, chaparral honeysuckle, chaparral clematis (*Clematis lasiantha*), and poison oak.

Chamise is a dominant species of chaparral communities throughout the foothills of both the northern and southern Sierra Nevada (Mayer and Laudenslayer 1988, as cited in JSA 2004). In western Placer County, chamise-dominated chaparral communities occur on the slopes of the American River canyon. In openings of foothill chaparral (e.g., rock outcrops, road cuts), common plants in the herbaceous layer include creeping sage (*Salvia sonomensi*), climbing bedstraw (*Galium nuttallii*), American vetch, Sierra milkwort, *Watson's wild cucumber* (*Marah fabaceus*), common brodiaea, coyote mint (*Monardella villosa*), California helianthella (*Helianthella californica*), spiked rosinweed (*Calycadenia spicata*), bladder parsnip (*Lomatium utriculatum*), and purple sanicle;

several native bunchgrasses, such as California melic, squirreltail, and one-sided bluegrass, can also occur in these areas.

In early successional stages, the herbaceous layer of foothill chaparral may be dense until it is crowded out by the developing shrub species. In older stands that have not burned in several decades, the ground is often covered with a thick layer of leaf litter. Widely scattered emergent pines or oaks are common but generally represent less than 10 percent of the overall cover as mapped by JSA. Foothill chaparral ecosystems may persist for many years as successional stages to foothill hardwood woodlands, until the slow-growing oaks begin to shade or compete with the shrub species; this shift may take at least 50 years in blue oak woodlands (Mayer and Laudenslayer 1988, as cited in JSA 2004).

The California distribution of foothill chaparral includes a fairly continuous band through the Transverse, Peninsular, and South Coast Ranges and large areas of the interior slopes of the North Coast Ranges. In the Sierra Nevada, foothill chaparral occupies a narrower and broken band along the middle and lower elevations of the western slope. Large intermittent patches also occur in the Klamath, Siskiyou, and Cascade Ranges. The species composition of chaparral varies widely throughout California, and many different types of foothill chaparral are recognized (Holland (1986, and Sawyer and Keeler-Wolf 1995, as cited in JSA 2004). In the Plan area, foothill chaparral ecosystems occur at elevations of about 460–1,500 feet, and they are most common between mixed oak woodland and ponderosa pine forest. The largest stands of foothill chaparral in western Placer County are on the slopes of the American River canyon and north and east of Auburn.

#### **Barren (Rock Outcrop and Cliff)**

Barren areas comprise natural features such as rock outcrops and cliffs. In all cases, barren rock or soil dominates the ground layer, and tree and shrub cover is typically sparse or absent. Pockets of foothill chaparral and annual grassland may be present within natural barren areas.

Shrubs range from one to six feet in height, and dominant species usually include chamise, whiteleaf manzanita, buckbrush, and shrubby interior live oak. Small, scattered stands of conifer forest within barren areas are dominated by foothill pine and incense cedar.

Approximately 500 acres of rocks and cliffs exist in western Placer County, constituting less than one percent of the Plan area. In the Plan area, rock outcrops and cliffs are most common in the American River canyon south of Auburn and along the shore of Folsom Lake.

#### Oak Woodland Historical Extent and Composition

Since European settlement, oak woodlands in California have been managed primarily for livestock production. Historically, losses of oak woodlands occurred because of clearing for range improvements and agriculture (JSA 2004). Frequent fires historically occurred in oak

woodlands, and fire suppression has affected regeneration negatively in both valley and blue oak woodlands (JSA 2004).

Blue oak woodland was more affected than any other woodland type in California by livestock grazing and firewood cutting during the 1960s to the early 1980s. A relatively recent trend towards rural-residential development in the foothills has replaced agriculture as the primary reason for conversion. Additionally, the introduction and dominance of Mediterranean annual grasses and forbs has had a profound effect on the regeneration of oaks. Although blue oak woodlands still cover a large area in California, they are threatened by rangewide fragmentation and a lack of regeneration (The Nature Conservancy 1999, as cited in JSA 2004).

Valley oak woodland was formerly extensive in the Sacramento and San Joaquin Valleys (Holland 1986, as cited in JSA 2004). Over 90 percent of pre-European settlement valley oak stands were cleared for agriculture, flood control projects, and urban expansion. Few large stands still exist.

Other oak woodlands identified by JSA (2004) experienced varying degrees of impact due to historical land uses. Mixed oak woodland, which is comprised of mixed oak species but is mainly dominated by blue oak (see discussion, below) and the oak-foothill pine woodland have been affected by grazing and land use conversions, but not large-scale clearing for agriculture, at least not for the past 50-60 years. During the turn of the 19th century until midway through the 20th century mixed oak woodlands were impacted, primarily in the Newcastle, Ophir and Loomis Basin regions for orchard production. The majority of oak woodlands in these areas today have regenerated as a consequence of the abandonment or displacement of orchards by rural residential development or pasture lands. In other areas, predominately in the foothills, oaks were cleared for firewood and to maximize grassland production for grazing. Many of these oak woodlands have regenerated, but the regeneration has occurred simultaneously with the development of rural residential subdivisions. Consequently, these regenerated woodlands exist in a highly fragmented condition.

Interior live oak woodland has always been limited in distribution due to its dependence on wild fire as a mechanism to maintain its dominance. Oak woodland savanna has historically been susceptible to clearing for enhancing forage production.

#### **Common Wildlife Associations**

#### Oak Woodland

The mosaic of communities across the landscape creates linkages between the oak woodland and vegetation types that are not dominated by oaks, such as annual grassland, riparian woodland associated with perennial and intermittent streams, and at the eastern portion of the PCCP boundary, conifer forests. As a result, many of the wildlife species associated with these other vegetation types utilize oak woodlands at least in part to meet their habitat requirements.

Amphibians and reptiles in blue oak woodland and valley oak woodland are mostly those of open annual grassland ecosystems: California slender salamander (Batrachoseps attenuatus), western toad, western yellow-bellied racer, common garter snake (Thamnophis sp.), California whipsnake, gopher snake, western and Gilbert's skinks (Plestiodon gilberti), southern alligator lizard (Gerrhonotus multicarinatus), and western fence lizard (Sceloporus occidentalis). The grassland component attracts bird species such as American kestrel, lark sparrow (Chondestes grammacus), western meadowlark, and Bullock's oriole (Icterus bullockii), while oaks provide food for various songbirds and nesting sites for cavity nesters such as woodpeckers, oak titmouse (Baeolophus inornatus), ash-throated flycatcher (Myiarchus cinerascens), house wren (Troglodytes aedon), Bewick's wren (Thryomanes bewickii), and violet-green swallow (Tachycineta thalassina). Mammals typical of these ecosystems include mule deer (Odocoileus hemionus), California ground squirrel, and western gray squirrel (Sciurus griseus).

Interior live oak woodland often supports many of the wildlife species associated with foothill chaparral as the two land-cover types are often intermixed on the same hillsides. The primary distinction between the two habitats is the presence, in Interior live oak woodland, of larger trees, which offer a more complex structural framework and cavities for nesting by larger birds such as red-tailed hawk and great horned owl (*Bubo virginianus*).

In oak-foothill pine woodlands, grass seeds, fruits of various shrubs, oak acorns, and foothill pine (Pinus sabiniana) seeds all provide nutritious food sources for a wide variety of rodents, squirrels, larger mammals, and granivorous birds. Western scrub-jays (Aphelocoma californica), acorn woodpeckers (Melanerpes formicivorus), western gray squirrels, and other acorn specialists may be common in these mixed woodlands. Newly emerged oak leaves in the spring support an abundance of insects that attract large numbers of migrating and nesting flycatchers, vireos, warblers, and other insectivorous birds. In areas where shrubs are present, birds such as spotted towhee (Pipilo maculatus), California towhee (*Pipilo crissalis*), white-crowned sparrow (*Zonotrichia leucophrys*), golden-crowned sparrow (Zonotrichia atricapilla) (winter only), wrentit (Chamaea fasciata), and blue-gray gnatcatcher (Polioptila caerulea) may occur. Characteristic amphibians and reptiles include California slender salamander, western toad, western yellow-bellied racer, common garter snake, California whipsnake, gopher snake, western rattlesnake (Crotalis viridis), western and Gilbert's skinks (Eumeces skiltonianus and Plestiodon gilberti), southern alligator lizard, and western fence lizard.

Non-native animals that may occur in the oak woodlands of western Placer County are European starling, wild turkey, Virginia opossum (*Didelphis virginiana*), and wild pig.

#### Chaparral

Many animal species frequent foothill chaparral ecosystems because they provide abundant food supplies, shelter, and nesting sites; some species can be found in their highest abundance in these communities. Approximately 120 vertebrate species—53 breeding species and 67 visitors—occur in these ecosystems in the Plan area.

Dusky-footed woodrats (Neotoma fuscipes) and deer mice (Peromyscus maniculatus), both very common in foothill chaparral, provide abundant food for snakes and carnivorous mammals. A number of other mammals occupy these dense thickets, where they can avoid human disturbance. Mountain lion (Felis concolor), black bear (Ursus americanus), coyote, gray fox (Urocyon cinereoargenteus), and ringtail (Bassariscus astutus) are among the larger mammals that frequent these habitats. Other common mammals include western gray squirrel, California ground squirrel, and brush rabbit (Sylvilagus bachmani). Gopher snake, California whipsnake, western rattlesnake, and California kingsnake (Lampropeltis getulus) are commonly found in foothill chaparral ecosystems, along with smaller snakes such as western yellow-bellied racer, ringneck snake (Diadophis spp.) and sharp-tailed snake (Contia tenuis). Western skink (Eumeces skiltonianus), Gilbert's skink, southern alligator lizard, and western fence lizard are also common to abundant in these communities. The most common amphibian is California slender salamander, which can be readily found during the rainy season but retreats far underground in summer.

Numerous bird species either nest in foothill chaparral ecosystems or use them seasonally. Common breeding species include Anna's hummingbird (Calypte anna), western scrub-jay, blue-gray gnatcatcher, wrentit, spotted towhee, California towhee, and lazuli bunting (Passerina amoena). Birds can be particularly abundant in foothill chaparral in winter, perhaps because the ecosystem lies below the snow zone and because many native shrubs, such as toyon (Heteromeles spp.), produce fruits that attract species such as American robin (Turdus migratorius), cedar waxwing (Bombycilla cedrorum), Townsend's solitaire (Myadestes townsendi), and hermit thrush (Catharus guttatus). Ruby-crowned kinglet and Hutton's vireo (Vireo huttoni) are typical wintering and resident insectivorous birds that primarily forage in evergreen foliage.

#### **Barren (Rock Outcrop and Cliff)**

Despite their steep gradients and lack of vegetation, cliffs and rock outcrops are surprisingly rich in wildlife values. A variety of birds and mammals find safety and breeding sites within rocky crevices. Typical rock and cliff birds include white-throated swift (*Aeronautes saxatalis*), canyon wren (*Catherpes mexicanus*), rock wren (*Salpinctes obsoletus*), common raven (*Corvus corax*) (nesting), and an assortment of nesting

raptors. A variety of snakes and lizards, including western fence lizard, sagebrush lizard (*Sceloporus graciosus*), and western rattlesnake, favor rocky cliffs and outcrops. Most amphibians in the County avoid dry, barren habitats.

## **Covered and Special-Status Species**

#### Oak Woodland

Special-status plants that are not covered by this Plan, but that could occur in the oak woodlands of Placer County, especially in canopy openings, include: Sanborn's onion (*Allium sanbornii* var. *sanbornii*), depauperate milk-vetch, big-scale balsamroot, Red Hills soaproot (*Chlorogalum grandiflorum*), Brandegee's clarkia, tripod buckwheat (*Eriogonum tripodum*), stinkbells, Butte County fritillary (*Fritillaria eastwoodiae*), dubious pea (*Lathyrus sulphureus*), Humboldt lily (*Lilium humboldtii*), sylvan microseris, Sierra monardella (*Monardella candicans*), and yellow bur navarretia (*Navarretia prolifera*). Several of these species occur on specific microhabitat sites within the woodland, such as seasonally moist sites, serpentine soils, or small canopy openings.

One special-status species that is covered by this Plan, Red Bluff dwarf rush, has limited potential to occur in seasonally moist sites in oak woodland-savanna.

Special-status wildlife species that are known to occur in oak woodland-savanna of Plan area, but that are not covered by the Plan, are white-tailed kite, rough-legged hawk, long-eared owl, purple martin, ringtail, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis).

Special-status wildlife species that are covered by the Plan and that are known to occur in oak woodland-savanna of Plan area include valley elderberry longhorn beetle, California tiger salamander, northern harrier, Swainson's hawk, ferruginous hawk, Cooper's hawk (*Accipiter cooperii*), burrowing owl, bank swallow, grasshopper sparrow, and tricolored blackbird.

Special-status wildlife species that are known to occur in blue oak woodland, valley oak woodland, and interior live oak woodland in the Plan area—but that are not covered by this Plan—are California horned lizard, white-tailed kite, golden eagle (*Aquila chrysaetos*), purple martin, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis).

Special-status wildlife species that are covered by this Plan and that are known to occur in blue oak woodland, valley oak woodland, and interior live oak woodland are valley elderberry longhorn beetle (especially in valley oak woodland or in adjacent valley foothill riparian), western pond turtle (if suitable aquatic habitats are present), Cooper's hawk, and yellow

warbler (*Dendroica petechia*). One special status wildlife species that is covered by this Plan, Swainson's hawk, is known to occur in valley oak woodland.

Special-status wildlife species that are known to visit oak–foothill pine woodland of the Plan area, but that are not covered by this Plan, are Yuma myotis, long-legged myotis, pale Townsend's big-eared bat, and ringtail.

Special-status wildlife species that are covered by this Plan and known to visit oak–foothill pine woodland are western pond turtle (near permanent water) and yellow warbler (nonbreeding).

#### Chaparral

Foothill chaparral ecosystems support many special-status plants. Red Bluff dwarf rush, which is covered by this Plan, has limited potential to occur on seasonally moist sites within foothill chaparral. Serpentine soils in foothill chaparral may support many species that are not covered by this Plan, including Congdon's onion (*Allium sanbornii* var. *congdonii*), Sanborn's onion, dissected-leaved toothwort (*Cardamine pachystigma* var. *dissectifolia*), and Red Hills soaproot. In addition, non-serpentine soils may support many special status species that are not covered by this Plan, including True's manzanita (*Arctostaphylos mewukka* ssp. *truei*), depauperate milk-vetch (*Clarkia biloba* ssp. *brandegeae*), tripod buckwheat, stinkbells, Butte County fritillary, Humboldt lily, sylvan microseris, and Sierra monardella.

Special-status animal species that are known to visit foothill chaparral ecosystems of the Plan area, but that are not covered by this Plan include three bat species (long-eared myotis, long-legged myotis, pale Townsend's big-eared bat) and ringtail.

Special-status animal species that are covered by this Plan and are known to visit foothill chaparral ecosystems of the Plan area include northern harrier and yellow warbler.

#### Barren Cliff (Rock Outcrop and Cliff)

Several special-status plants are known to occur or could potentially occur on barren rock outcrops in river canyons of the Plan area: Congdon's onion, Sanborn's onion, depauperate milk-vetch, and Red Hills soaproot.

Special-status bird species that might nest on canyon walls and rock faces of the Plan area, but that are not covered by this Plan, include golden eagle and prairie falcon (*Falco mexicanus*). Northern harrier and American peregrine falcon are covered by this Plan, and may occur as visitors.

# **Ecosystem Function**

In oak-foothill pine woodlands, grass seeds, fruits of various shrubs, oak acorns, and foothill pine seeds all provide nutritious food sources for a wide variety of rodents, squirrels, larger mammals, and granivorous birds. In the spring, newly emerged oak leaves support an abundance of insects that attract large numbers of migrating and nesting flycatchers, vireos, warblers, and other insectivorous birds. Oak woodlands perform a variety of ecological functions, including nutrient cycling, water storage and transport, and wildlife habitat (Giusti et al. 2004). Oak woodlands share many of the same functions as the adjacent grassland and chaparral communities. However, the structure and food provided by the dominance of oak trees in this community distinguish it from the other natural community types. Large acorn crops and a diverse insect fauna provide high-quality food for a wide variety of amphibians, reptiles, birds, and mammals. Dense oak woodlands provide cool, shady refugia for wildlife during the hot, dry summer, and more sparse oak woodlands provide raptors with hunting perches. These oak woodlands also provide nesting and foraging habitat for a variety of bird species. The grassland understory provides habitat for fossorial rodents such as ground squirrels and gophers, which are prey for red-tailed hawks, coyotes, and great horned owls. Rodent burrows, in turn, provide habitat for a variety of other species, including burrowing owls.

### **Natural Disturbance**

Oak woodland, ponderosa pine forest and chaparral are all fire-adapted ecosystems, and fire has played a large role in maintaining these communities. Fire creates the vegetation structure and composition typical of oak woodlands, and this natural community historically experienced frequent, low-severity fires that maintained woodland or savanna conditions. In the absence of fire, the low or open understory that characterizes the land-cover type is lost. Fire suppression in the foothills has reduced the recent extent of fire (Figure 3-5). Ultimately, closed-canopy oak forests are replaced by shade-tolerant species because oaks cannot regenerate and compete in a shaded understory. Soil drought may also play a role in maintaining open-tree canopy in dry woodland habitat. Grazing, including precolonial grazing by deer and elk, may also have helped to maintain a more open understory that favors oaks and grasses. Many chaparral species depend on fire to regenerate.

#### **Threats**

#### **Oak Woodland**

Threats facing the oak woodland communities vary by community type. Due to the rarity and slow regeneration of some species of oak, several oak dominated land-cover types are considered sensitive communities by CDFG. Additionally, when urban, suburban, and rural residential land uses are in close proximity to these land-cover types, there is a

considerable reduction in habitat value. For example, noise, light, irrigation, and frequent discing for fire protection can substantially degrade habitat conditions. Predators of birds and their nest contents (i.e., eggs, nestlings) such as raccoons and jays may be more attracted to, and more abundant in, surburban areas and can move into adjacent woodlands.

The two main processes influencing the prevalence of oak woodlands in California are land conversion (for development and intensive agriculture) and the parcelization of large blocks of contiguous habitat for urban, suburban, an rural residential development (Giusti et al. 2004).

A lack of oak regeneration, which may be related to development pressures, is also a serious threat. Regeneration is typically low, and seedlings are rare. This seems to be the trend, especially for valley oak and blue oak regeneration, throughout much of California over the past 75–125 years (Pavlik et al. 1991). Research on the causes of this decline has yet to identify a particular causal mechanism. Potential interacting mechanisms include overgrazing, fire suppression, noxious weed invasion, and the dominance of annual grasses over native perennial grasses.

Poor regeneration of blue oak is well documented (White 1966; Holland 1976; Griffin 1977; Baker et al. 1981, as cited in JSA 2004) and is evident in western Placer County. Most blue oak stands exist as medium or large tree stages with few or no young trees present. Age studies in the southern Sierra Nevada indicate that most blue oak stands are currently 80–120 years in age (Brooks 1969, as cited in JSA 2004). The absence of regenerating blue oak may be related to competition for soil moisture from introduced and weedy annual grasses and the consumption of acorns and seedlings by insects, domestic livestock, and wildlife. Blue oak is somewhat intolerant of shade, and disturbances producing openings in the canopy may be necessary for seedling growth and survival in denser stands.

In valley oak woodland, few young trees grow in open, dry sites, although reproduction of valley oak near streams with floodplain development can be good, especially following flood events. The lack of valley oak regeneration at most sites seems to be related to competition for soil nutrients and moisture between oak seedlings and introduced annuals, consumption of acorns and seedlings by wild and domestic animals, and disking or plowing (Holland 1976, as cited in JSA 2004). In the Central Valley, flood control projects may also play an important role in the reduced regeneration of valley oak.

Recent research on the effects of wild pigs in California show that they can disturb up to 35–65 percent of the ground annually where they occur in high densities, and that they significantly reduce acorn survival (Sweitzer and Van Vuren 2002).

In addition to feral pigs, a high density of invasive weeds and non-native plants in the understory affect oak regeneration. The common noxious weeds in blue oak woodland include yellow star thistle, Italian thistle, and medusa-head, as well as many invasive non-native annual grasses. In valley oak woodland, Himalayan blackberry, a noxious weed species, is common in the Plan area. Typical non-native species also in the understory of valley oak woodlands include Italian ryegrass, wild oat, Italian thistle, foxtail barley, yellow star thistle, soft chess, and winter vetch. Other invasive non-native species that may occur in valley oak woodlands include tree-of-heaven, black locust (Robinia pseudoacacia), ripgut brome, poison hemlock (Conium spp.), and French broom (Genista monspessulana). For interior live oak woodland, where light permits development of an herbaceous layer, dominant species in the understory include non-native species that are somewhat shade tolerant, such as hedgehog dogtail, hedge parsley, chickweed, and the noxious weed Italian thistle. At woodland edges or in openings of the tree canopy. common non-native herb associates include slender wild oat, yellow starthistle, and ripgut brome in addition to those mentioned above. In oakfoothill pine woodland, noxious weeds are most common along road edges and other disturbed or ruderal areas. The most frequent noxious weed and invasive non-native species include yellow star thistle, Italian thistle, medusa-head, woolly vetch, black mustard, and Klamath weed.

The main threats to mixed oak woodland are wild fire and fragmentation caused by rural residential development. Figure 3-5 Plan Area Wildfire Locations shows the limited extent of large fires in the Foothills, mainly due to fire suppression.

Inaccessibility and generally poor site conditions have limited the development of agriculture in this type. Occasionally, logging and excessive grazing impact mixed oak woodlands. Commercial logging is non-existent with the Plan area although some amount of oak woodland is harvested for firewood.

Much oak woodland savanna has been cleared for range improvement for livestock grazing. Long-term livestock grazing reduces survival of oak seedlings and saplings, resulting in a lack of recruitment of oaks (Adams et al. 1991, as cited in JSA 2004).

Researchers have expressed concern about the future of oak-foothill pine woodland because there has been relatively little oak regeneration in the past 100 years. Most of the acorn crop each year is eaten by livestock, deer, birds, insects, and rodents (Holland 1976; Mayer and Laudenslayer 1988, as cited in JSA 2004).

Non-native animals that may occur in oak woodlands of western Placer County are European starling, wild turkey, and wild pig. European starlings (*Sturnus vulgaris*) can displace native cavity-nesting birds (Beedy and Granholm 1985; Gaines 1992, as cited in JSA 2004).

There is physical evidence of this disturbance throughout the more remote and roadless areas of the Plan area. Some studies have found browsing by deer, livestock, or other large mammals to be an important factor negatively impacting recruitment (Borchert et al. 1989; Bartolome et al. 2002). Grazing by small mammals may also be very detrimental to oak recruitment (Tyler et al. 2002). Recruitment in many tree species, particularly oaks, can be highly cyclical and dependent on long-term rainfall patterns.

Sudden oak death caused by the introduced pathogen *Phytophthora ramorum*, has recently emerged as an important cause of mortality of oaks in California. The disease was first identified in 1995 and has since spread to 12 counties and killed tens of thousands of oaks. Research indicates that coast live oaks and black oaks appear to be the most susceptible to this disease (Rizzo et al. 2003). Sudden oak death is a serious threat to oak woodlands and mixed evergreen forests in northern California. The pathogen can kill adult oaks and madrone; California bay (*Umbellularia californica*), buckeye, and maple host the pathogen without being killed by it. Blue oak and valley oak have not shown symptoms of the pathogen. It has not yet been identified in the Sierra Nevada foothills and its spread there may be limited due to climatic conditions.

#### Chaparral

Relatively few non-native invasive plant species occur in foothill chaparral ecosystems, but abundant and widespread species, such as yellow star thistle, cheat grass (*Bromus tectorum*), Klamath weed, and medusa-head, may occur in disturbed areas.

#### **Barren (Rock Outcrop and Cliff)**

By virtue of their steep rocky slopes, cliff habitats in western Placer County and throughout the state are relatively protected from human disturbance. In general, the County limits land disturbing activities on property with a slope greater than 30%. However, barren areas can be affected indirectly through erosion of disturbed soils above them or by the introduction and spread of noxious weeds (Sierra Nevada Ecosystem Project 1996, as cited in JSA 2004).

# Riverine Systems and Riparian Woodland

Riverine systems and associated riparian forests consist of ecosystems explicitly related to streams and rivers. There are two riverine and riparian land-cover types in the Plan area:

- Riverine; and
- Valley foothill riparian.

## **Riverine and Riparian Land-cover Types**

#### Riverine

Riverine systems occurring in western Placer County include perennial, intermittent, and ephemeral streams (Figure 3-1). As the term implies, perennial streams sustain flows year round. The larger streams in the Plan area and vicinity such as the Bear River and American River are perennial and always have been. Intermittent streams receive some input from groundwater discharge in addition to precipitation runoff and seasonal flow. They typically do not flow in the late summer and fall. Some streams in the Plan area were historically intermittent but have been changed to perennial because of inter-basin water transfers and inputs of water destined for downstream uses (e.g., Auburn Ravine, Coon Creek, etc.). Ephemeral streams receive no input from groundwater and flow only during and following storm events in response to precipitation runoff. The flow regime in a stream profoundly affects its ecology, in particular its ability to support fish and other aquatic organisms.

#### **Valley Foothill Riparian**

Valley foothill riparian woodland was defined for the purposes of this study to include all stands of deciduous trees near perennial streams in western Placer County.

These water-dependent ecosystems include widely distributed riparian habitats dominated by white alder (*Alnus rhombifolia*), willows (*Salix* spp.), and Fremont cottonwood (*Populus fremontii*), as well as stands of valley oak. Interior live oak can be an important associated species in some valley foothill riparian woodland ecosystems. Other associated species include bigleaf maple, incense-cedar, black oak, or blue oak. Two or more age classes may be present in valley oak, Fremont cottonwood, or mixed riparian forests. Age classes and structural diversity are reduced in riparian forests that are heavily grazed by livestock, impacted by development adjacent to the stream, or dominated by noxious weeds such as Himalayan blackberry, tree of heaven or giant reed.

Species composition in a riparian corridor is largely determined by the depth of the summer water table and the frequency of flooding. On frequently flooded low terraces at or near the active channel, common riparian species in western Placer County include sandbar willow (*Salix interior*), mannagrass, water smartweed (*Polygonum amphibium*), ciliate willowherb (*Epilobium cilatum* ssp. *cilatum*), tall nutsedge (*Cyperus eragrostis*), torrent sedge (*Carex nudata*), horsetail (*Equisetum* spp.), Pacific rush (*Juncus effusus*), occasional white alder and, at the lowest elevations, mulefat (*Baccharis salicifolia*).

Higher floodplain surfaces and terraces may support more diverse riparian woodland. The tall, dense canopies of mature valley oak and Fremont cottonwood riparian forest in the Central Valley and Sierra

Nevada foothills typically have a subcanopy tree layer of white alder, Oregon ash (*Fraxinus latifolia*), several species of willow, and California black walnut (*Juglans* californica). Occasionally, lianas of wild grape (*Vitis vinifera*) up to 50 feet high contribute further to the habitat values (Mayer and Laudenslayer 1988, as cited in JSA 2004). White alder is a common subcanopy component of mixed riparian forests of western Placer County, but at higher elevations it frequently occurs in pure stands. Where interior live oaks are dominant, common understory species include poison oak, California buckeye, hoary coffeeberry, blue elderberry (*Sambucus nigra*), and coyote brush (*Baccharis pilaris*). Two non-native cottonwood species, silver poplar (*Populus* sp.) and Lombard poplar (*Populus nigra*), can be abundant in riparian habitats in urbanized stream reaches and near old town or mining sites.

Common shrubs associated with multi-layered valley foothill riparian woodland include the noxious weed. Himalayan blackberry, as well as native species such as snowberry (Gaultheria spp.), wild rose (Rosa spp.), blue elderberry, poison oak, spice bush (Calycanthus occidentalis), western ninebark (Physocarpus capitatus), California blackberry (Rubus ursinus), and shrubby willows. Characteristic forbs and grasses include Douglas's mugwort (Artemisia douglasiana), Santa Barbara sedge (Carex barbarae), clustered field sedge (Carex praegracilis), blue wild rye, deer grass (Muhlenbergia rigens), common yarrow (Achillea millefolium), bracken fern (Pteridium aquilinum), and stinging nettle (Urtica dioica), as well as weedy non-native species such as western vervain (Verbena lasiostachys), velvet grass (Holcus lanatus). Bermuda grass (Cynodon dactylon), and pennyroyal (Mentha pulegium). The herbaceous layer of valley foothill riparian woodland is often sparse due to a well-developed and sometimes diverse shrub layer, often containing quantities of downed wood and debris from previous flood events. In areas where the shrub layer has been removed or grazed, these ecosystems may have a grassy understory of both native and non-native grasses, sedges, rushes (Juncus spp.), and forbs.

Riparian ecosystems are recognized throughout California as important natural communities because of their limited extent compared to historical distributions, their importance to dependent plant and wildlife species, and the threats facing remaining stands. Valley foothill riparian woodlands occur along rivers and creeks in the Central Valley and lower foothills of the Sierra Nevada, Cascades, Coast Ranges, and Transverse Ranges (Mayer and Laudenslayer 1988, as cited in JSA 2004).

In western Placer County, valley foothill riparian woodland occurs on the American and Bear River corridors and along Coon Creek and lower Auburn Ravine (Figure 3-1). Significant stands are generally restricted to low-gradient depositional reaches with some floodplain development. Along most other creeks in western Placer County, this ecosystem occurs as narrow and generally discontinuous bands of trees, rarely occurs on intermittent streams, and never occurs on ephemeral streams that only flow during storm events. On high-energy, bedrock-constrained river

systems, the riparian corridors are patchy and quite narrow, limited laterally by steep side slopes, and usually not exceeding one tree canopy in width. Willow scrub is generally persistent, but is also an early successional stage that is eventually over-topped by valley oak, cottonwood, or alder in mature riparian woodland (Mayer and Laudenslayer 1988, as cited in JSA 2004).

## **Riverine Historical Extent and Composition**

Rivers and creeks are among the most altered ecosystems in the Sierra Nevada. Two major impacts are the more than 400 dams and associated impoundments (25 feet or more in height) present on rivers and creeks and the significant amounts of hydraulic mining debris that passed through these systems in the 1800's up until the early 1900's (Kattelmann 1996, as cited in JSA 2004). All riverine systems within the Plan area have been further altered by creation of permanent or temporary barriers (e.g. road crossings), authorized and unauthorized water diversions, channelization, flood control projects, loss of riparian vegetation, and increased rates of sedimentation. These impacts reduce habitat complexity and habitat quality, affecting ecosystem characteristics such as pool/riffle relationships, level of dissolved oxygen, and substrate composition.

Valley foothill riparian woodland has been adversely affected by land development, water diversions and grazing. Flood control activities, cultivated agriculture, aggregate mining, and urban development have all significantly reduced the extent of this land-cover type.

## **Common Wildlife Associations**

#### Riverine

Invertebrates that might be found in the County's rivers and creeks include mayflies (Order: Ephemeroptera), alderflies, stoneflies (Order: Plecoptera), dragonflies (Order: Odonata), damselflies (Order: Odonata), water striders (Family: Gerridae), and caddisflies (Family: Trichoptera). These provide food for fish and other aquatic wildlife. Emerging aquatic insects are a major food source for many bird and bat species that forage over open waters.

Fish-eating birds such as ospreys (*Pandion haliaetus*) and bald eagles forage for fish near the surface of pools and shallow waters along the Bear River. Belted kingfishers (*Ceryle alcyon*), double-crested cormorants (*Phalacrocorax auritus*), and common mergansers (*Mergus merganser*) also forage for fish in streams and reservoirs. Many amphibians and reptiles depend on riverine ecosystems; these include California newt (*Taricha torosa*), western toad, foothill yellow-legged frog, western terrestrial garter snake (*Thamnophis elegans*), western aquatic garter snake (*Thamnophis couchii*), and northwestern pond turtle.

Characteristic mammals in riverine ecosystems include northern river otter, American mink, muskrat (*Ondatra zibethicus*), and American beaver.

Riverine ecosystems in western Placer County support a diverse fish fauna. Western Placer County fish assemblages are characterized below using the classification system of Moyle (2002) for Central Valley streams in the Sacramento–San Joaquin Province. Each assemblage of fish species is characteristic of stream systems that have distinct physical, chemical, and biological characteristics. This method of stream classification assumes some overlap of species will occur between assemblage categories.

Rainbow trout assemblage streams are low-order, cold, high-gradient, high-elevation streams. The current is swift and flow is permanent. Water temperature is usually much less than 70°F. Bottom substrates are dominated by cobble, boulder, and bedrock, and aquatic plants are sparse or absent. The dominant native fish are rainbow trout (Oncorhynchus mykiss), riffle sculpin (Cottus gulosus), Sacramento sucker (Catostomus occidentalis), speckled dace (Rhinichthys osculus), and California roach (Hesperoleucus symmetricus). In western Placer County, the upstream reaches and tributaries of the Bear River, North Fork American River, and Middle Fork American River, Auburn Ravine, and Coon Creek support the rainbow trout assemblage.

California roach assemblage streams are small, warm tributaries of larger streams that usually support the pikeminnow-hardhead-sucker assemblage. California roach assemblage streams are usually intermittent in summer, but have constant flow during winter and spring. Summer water temperatures in isolated pools may exceed 86°F. California roach is the main permanent, resident native fish in these streams. Other native species may include Sacramento sucker and Sacramento pikeminnow (*Ptychocheilus grandis*). The non-native green sunfish (Lepomis cyanellus) may displace roach in some areas. In western Placer County, streams of this type may include tributaries of the Bear River (upstream of Camp Far West Reservoir), Coon Creek, Doty Ravine, Auburn Ravine, Antelope Creek, Secret Ravine, and Miners Ravine, as well as intermittent reaches of Doty Ravine, Secret Ravine, and Miners Ravine. Although surveys to accurately characterize fisheries in the major basins and sub-basins in western Placer County have not been conducted, California roach are known to occur in Auburn Ravine and Coon Creek (Bailey 2003).

*Pikeminnow-hardhead-sucker assemblage streams* are low- to midelevation streams with deep rock pools and broad, shallow riffles. Water is usually clear, with high dissolved oxygen levels, low conductivity, and moderate summer water temperatures 66–72°F. Substrates may include bedrock, rock, cobble, sand, and clay. Sacramento pikeminnow and Sacramento sucker are generally the most abundant fishes, along with hardhead in cooler reaches. Other native fishes may include speckled

dace, California roach, riffle sculpin, and rainbow trout; downstream of permanent barriers, anadromous species such as Central Valley steelhead, Central Valley fall-run Chinook salmon, and Pacific lamprey (*Lampetra tridentata*) are also known to occur.

Fall-run Chinook salmon adults spawn in the fall, and juveniles leave the streams in the spring. Steelhead and rainbow trout may occupy the cool upper reaches year-round. Non-native species such as green sunfish, smallmouth and largemouth bass (Micropterus salmoides and Micropterus dolomieui), carp, and black bullhead (Ameiurus melas) may dominate the fish community, especially in the lower reaches near the valley floor. In western Placer County, streams of this type include the lower reaches of the North and Middle Forks of the American River above Folsom Reservoir, the Bear River upstream and downstream of Camp Far West Reservoir, Coon Creek, Doty Ravine, Auburn Ravine, Antelope Creek, Secret Ravine, Miners Ravine, and Dry Creek, Markham Ravine, Pleasant Grove Creek, and Curry Creek may also support species of the pikeminnow-hardhead-sucker assemblage. Navicky (2008) found steelhead trout. Sacramento sucker and pikeminnow to generally be the dominant species in Auburn Ravine. Sacramento sucker and pikeminnow were dominantspecies in Coon Creek but, very few steelhead trout were found (Navicky 2008). Nearly 10 percent of the total catch on Auburn Ravine was non-native during winter 2004 and spring 2005 sampling events (Navicky 2008). Coon Creek had a much larger proportion of nonnative species; nearly 20 percent of the total catch was non-native in winter of 2004 and over 30 percent was non-native during spring and summer sampling efforts in 2005 (Navicky 2008). This is likely due to the higher temperatures and lower flows found in Coon Creek.

Deep-bodied fishes assemblage streams are low-gradient, warm waterways of the valley floor. Native resident fishes include Sacramento pikeminnow, Sacramento sucker, and hitch. Anadromous species, including fall-run Chinook salmon and steelhead, pass through these reaches to spawning areas upstream. Non-native species, including largemouth bass, white and black crappie (*Pomoxis annularis* and *Pomoxis nigromaculatus*), black bullhead, red shiner (*Cyprinella lutrensis*), threadfin shad (*Dorosoma petenense*), and carp dominate the fish community. Streams of this type include the lower reaches of the Bear River upstream of the confluence with the Feather River, the Cross Canal, and the lower reaches of Dry Creek.

## Valley Foothill Riparian Woodland

Birds are found in particularly high diversity and numbers in valley foothill riparian woodlands of western Placer County. Characteristic breeding birds include belted kingfisher, downy woodpecker (*Picoides pubescens*), black phoebe (*Sayornis nigricans*), warbling vireo (*Vireo gilvus*), western scrub-jay, bushtit (*Psaltriparus minimus*), Bewick's wren, house wren, American robin, orange-crowned warbler (*Vermivora celata*), yellowbreasted chat (*Icteria virens*), black-headed grosbeak (*Pheucticus melanocephalus*), lazuli bunting, spotted towhee, song sparrow

(*Melospiza melodia*), house finch (*Carpodacus mexicanus*), and lesser goldfinch (*Carduelis psaltria*). Riparian areas are also attractive to migratory species including a variety of flycatchers, vireos, warblers, tanagers, and grosbeaks.

Most amphibians, reptiles, and mammals use riparian corridors for cover, shade, and as a source of water. Amphibians and reptiles in valley foothill riparian woodlands include Ensatina (*Ensatina eschscholtzii*), California slender salamander, Pacific treefrog, western toad (*Bufo boreas*), western yellow-bellied racer, common garter snake, California whipsnake, gopher snake, western rattlesnake, western and Gilbert's skinks, southern alligator lizard, and western fence lizard. Bats frequently forage for insects over riparian areas in river canyons, and many individuals may roost in riparian trees. Some bat species may also use abandoned mine shafts and tunnels as roosts. Valley foothill riparian Woodlands are especially important for migratory mule deer (Zeiner et al. 1990).

## **Covered and Special-Status Species**

#### Riverine

Special-status animal species that are known to visit riverine systems (or valley foothill riparian woodlands) in the Plan area, but that are not covered by this Plan, include osprey, white-tailed kite (*Elanus leucurus*), long-eared owl, willow flycatcher (*Empidonax traillii*), ringtail, purple martin and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanenesis*). Special status species associated with riverine habitats that are covered by the Plan are Chinook salmon and steelhead.

#### Valley Foothill Riparian Woodland

Two special-status plants—hoary navarretia and yellow bur navarretia—could occur in valley foothill riparian woodland, but are not covered by this Plan.

Special-status animal species that are known to visit valley foothill riparian woodlands in the Plan area, but that are not covered by this Plan, include osprey, white-tailed kite, long-eared owl, willow flycatcher, purple martin, ringtail, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis).

Special-status animal species that are covered by this Plan and known to visit valley foothill riparian woodlands in the Plan area include valley elderberry longhorn beetle, foothill yellow-legged frog, northwestern pond turtle, giant garter snake, bald eagle, Swainson's hawk, Cooper's hawk, bank swallow, yellow warbler, yellow-breasted chat, Modesto song sparrow, and tricolored blackbird.

# **Ecosystem Function**

Riverine and riparian ecosystems occupy a relatively small proportion of the total landscape, but are disproportionately important for the ecological processes of entire watersheds. Myriad invertebrate and vertebrate species rely on these ecosystems in western Placer County.

Riparian areas perform vital ecological functions, such as dissipating stream energy associated with high water, filtering sediment, capturing bedload, aiding floodplain development, and improving groundwater recharge (Gregory et al. 1991, as cited in JSA 2004). Many species, including a large number of special-status species, are dependent on valley foothill riparian woodland during some or all of their life cycles. Research has repeatedly demonstrated a link between the condition of riparian habitat and fish habitat quality, and riparian ecosystems play a crucial role in maintaining fish habitat. Streamside riparian woodland with cover provided by overhanging vegetation benefits fish by providing shade to cool the water as well as instream woody debris and root masses for escape cover and breeding sites. Leaf drop is also an important nutrient input to streams (Moyle et al. 1996, as cited in JSA 2004). Valley foothill riparian woodlands provide food; water; migration and dispersal corridors; and escape, nesting, and thermal cover for a high diversity of wildlife species. These ecosystems may support up to 193 vertebrate species—133 breeding species and 60 visitors—in the Plan area.

#### **Natural Disturbance**

Erosion and sedimentation processes are forms of natural and artificial disturbance affecting riverine and riparian areas. Flood and drought cycles of natural streams tend to result in a mosaic of structure and composition in riparian plant communities (this mosaic may be lost in altered flow regimes downstream of reservoirs).

Riparian communities are shaped by their proximity to water and by periodic flooding that maintains the structure and composition of this land-cover type. Wet-season flooding replenishes alluvial soils that are deficient in minerals and organic matter. Flooding also subjects riparian forest to frequent disturbance that benefits regeneration of certain species, including California sycamore, white alder, and black willow. Seeds for many riparian species are dispersed during flood events, and regeneration from seed appears to occur in pulses correlated with large flood events (Shanfield 1984). Additionally, trees that are damaged by flooding can resprout from the roots and trunks (Shanfield 1984). The flowing nature of streams encourages regular mixing as water flows over rocks, tree stumps, and changes gradient. Depending on other environmental influences, including temperature and dissolved oxygen levels, mixing may also trigger the hatching of larvae that will become food for fish, birds, and bats.

#### **Threats**

#### Riverine

The decline and loss of riverine ecosystems are a primary cause of the decline of many species of aquatic invertebrates, fish, and amphibians in the Sierra Nevada and Central Valley (Moyle 1996, as cited in JSA 2004). Factors contributing to the deterioration of riverine ecosystems include changes in the timing and volume of stream flows (e.g., effects of reservoir operations, surface water diversions, groundwater pumping, urban and agricultural runoff), dams impeding movement of fish, changes in water quality, reduction in riparian and stream channel structural complexity (e.g., loss of riparian trees and stream channelization), siltation, and invasions of non-native species (Meehan 1991, as cited in JSA 2004). Loss of riparian vegetation results in decreased shading. increased water temperatures, reduced cover, and decreased input of nutrients. Trash and other pollutants that are washed into streams may degrade water quality to the point that aquatic life cannot persist. Aquatic invertebrates, often sensitive to water quality, may die off, thus disrupting the food chain.

High flows cause erosion, unless channels have been armored. To control flooding and erosion, channels are modified (i.e., placement of rip rap, lined with concrete), resulting in a decrease of riparian vegetation and aquatic habitat for fish and other species. Additionally, pollution sources along the channels can degrade water quality within riverine systems.

Dams alter flow and sediment transport regimes, adversely affecting the amount of habitat for some species (e.g., spawning gravel) and habitat quality (e.g., water temperature and fine sediment loading). Dams block upstream and downstream movement and migration to spawning and rearing habitat. The in-stream reservoirs commonly found in western Placer County (including smaller in-stream ponds) can flood stream reaches, changing environmental conditions necessary to support stream-dependent native species. In addition to loss of habitat, fish populations may become isolated, fragmenting populations and adversely affecting their genetic integrity. Reservoirs may also increase human use, affecting populations of native species within reservoirs and in adjacent areas. Dams on major rivers have blocked access by spring-run Chinook salmon to more than 95 percent of historic spawning and holding habitat, and have greatly reduced access to spawning habitat of other runs of salmon, steelhead, and Pacific lamprey (Moyle et al. 1996, as cited in JSA 2004).

Reservoirs are also sediment sinks, obstructing the natural sediment transport of streams. Through natural processes, streams erode sediment from stream banks and move it downstream. In an unimpeded setting, sediment carried from the upper watershed is deposited along the length of the stream. When a dam is built across a stream, all but the

finest sediment transported from the upper watershed drops out of suspension in the reservoir, where velocities are too low to maintain the sediment load. The result is that downstream reaches are sediment starved, and no new sediment is available to replace eroded sediment downstream of the dam. This triggers downcutting and deepening of the stream channel and also results in a reduction in gravels suitable for steelhead and salmon spawning downstream of reservoirs. In addition, large reservoirs fill with and store large amounts of turbid storm runoff. Settling of the finer clay and silt particles may take months, resulting in persistent releases of turbid water in winter and early spring. The slowly settling materials may also result in much higher turbidities near the bottom outlet valve than in the surface waters. While the natural streams upstream of reservoirs rapidly clear between storms, the streams downstream of reservoirs may be persistently turbid and interfere with feeding by steelhead and salmon in winter and spring, reducing their growth and potential survival once they reach the ocean. Slow release of fine sediments may result in silty substrate below the reservoirs, reducing survival of eggs in spawning gravels and affecting the abundance of insects.

Reservoirs also disrupt the natural flow cycle of streams by releasing water during the summer and fall to augment dry season base flows. Because the reservoirs are deep and store cool winter runoff, the water released out of the bottom of the reservoir can be much cooler than the surface water and also cooler than the stream upstream of the reservoir in late spring and summer.

Rivers and streams altered by human disturbance tend to be more likely to become dominated by non-native fish species (Baltz and Moyle 1993, as cited in JSA 2004). Reservoirs provide environmental conditions that generally favor non-native species. Established non-native species can then invade stream reaches both upstream and downstream of the reservoir.

Non-native and invasive species are often introduced to and concentrate in the vast network of ponds, reservoirs, and associated canals throughout western Placer County. These include many aquatic invertebrates (e.g., insects, snails, clams, and crayfish), non-native fish species, and bullfrog. During times of high rainfall or stream flow, non-native species can be flushed from ponds and reservoirs into stream and river systems where they can colonize and compete with or prey upon native species. Bullfrogs and several species of bass are known to prey upon the eggs and tadpoles of foothill yellow-legged frog, California redlegged frog, and northwestern pond turtles as well as northwestern pond turtle hatchlings or juveniles (Moyle 1973; Holland 1991, as cited in JSA 2004). Hatchlings of wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), and Canada geese (*Branta canadensis*) often fall prey to largemouth bass.

#### **Valley Foothill Riparian**

Seedling establishment and growth in valley foothill riparian systems are heavily dependent on access to surface water or shallow groundwater during the majority of the year (Sacchi and Price 1992). As such, water operations and land alterations that result in reduced stream baseflows and/or increased depth to the water table will have a significant negative effect on this land-cover type.

Non-native animals that may occur in these woodlands include European starling, wild turkey, Virginia opossum, and wild pig. Livestock operations attract brown-headed cowbirds (*Molothrus ater*), a native North American species that expanded its range in California in the early 1900s. Brown-headed cowbirds parasitize the nests of other native songbirds and reduce their reproductive success (Grinnell and Miller 1944; Beedy and Granholm 1985; Gaines 1992, as cited in JSA 2004). In valley foothill riparian woodlands of western Placer County, brown-headed cowbirds are most common in disturbed areas and in early successional stands, especially where livestock are present within about four miles of breeding areas (Rothstein et al. 1984, as cited in JSA 2004).

Livestock grazing can substantially degrade riparian woodland and scrub communities when cattle and other livestock have unrestricted access to stream systems and stocking rates are high. Riparian systems that have been disturbed by historical or current grazing also have a significantly higher proportion of noxious weeds in the understory. Himalayan blackberry, in particular, forms a dense blanket that can dominate many miles of a stream and river corridor, crowding out native vegetation and reducing its diversity and wildlife habitat values.

In addition to Himalayan blackberry, which is a dominant species in many riparian areas of the foothills, other noxious weeds and non-native plants in valley foothill riparian woodlands in western Placer County include black locust, tree-of-heaven, periwinkle (*Catharanthus spp.*), English ivy (*Hedera helix*), poison hemlock, bull thistle (*Cirsium vulgare*), red sesbania, pampas grass (*Cortaderia Stapt*), edible fig (*Ficus carica*), giant reed (*Arundo* spp.), spotted knapweed, Canada thistle (*Cirsium arvense*), wild fennel (Foeniculum vulgare), velvet grass, red sesbania (*Sesbania punicea*), and purple loosestrife (*Lythrum salicaria*).

# **Wetland and Open Water**

The open water and seasonal wetland communities consist of vegetation and wildlife that is aquatic, but not necessarily riverine or associated with vernal pools. In the study area, the open water and wetland communities consist of four land-cover types:

- Fresh emergent wetland;
- Seasonal wetland:

- Spring and seep; and
- Lacustrine.

## **Open-water and Seasonal Wetland Land-Cover Types**

### Fresh Emergent Wetland

Fresh emergent wetland is distinguished from deepwater aquatic habitats and wet meadows or grassland habitats by the presence of tall, perennial, grass-like plants rooted in soils that are permanently or seasonally flooded or inundated. The boundary between fresh emergent wetland and deepwater (i.e., lacustrine and riverine) habitats is at a depth of 6.6 feet (Cowardin et al. 1979, as cited in JSA 2004). Fresh emergent wetland ecosystems can occur in basins or depressions at all elevations, aspects, and exposures, but they are most common on level to gently rolling topography (Mayer and Laudenslayer 1988, as cited in JSA 2004). They are often associated with small human-made ponds and natural drainageways that are enhanced by intentional or unintentional releases of irrigation water. Fresh emergent wetland can also occur as a fringe around reservoirs where the slopes are gentle enough to create a rim of shallow water and where water levels do not fluctuate widely. Unmaintained roadside and agricultural ditches can also support these ecosystems. Small marshes can also be found along low-gradient reaches of rivers and streams in backwater areas or ponded overflow channels.

The hydric soils that characterize fresh emergent wetlands are typically clayey, silty, or peaty, and often have a sulphur-like odor caused by the anaerobic conditions that result from saturated soil conditions (Environmental Laboratory 1987, as cited in JSA 2004). Cattail (*Typha* spp.) and bulrush (*Blysmus* spp.) marshes often exhibit this characteristic.

Plant species composition of fresh emergent wetland ecosystems can vary both between marshes and within a given marsh depending on the basin contours that influence the depth and duration of flooding (Mayer and Laudenslayer 1988, as cited in JSA 2004). For example, deeper portions of a marsh are generally dominated by taller species, primarily cattails and bulrushes. Near the upper edge of the marsh zone, grasses, sedges, and rushes 1–3 feet tall and occasional tree or shrub species are more common. In western Placer County, characteristic species include broadleaf cattail (*Typha latifolia*), common bulrush (*Schoenoplectus* sp.), creeping spikerush (*Eleocharis fallax*), Pacific rush, Baltic rush (*Juncus balticus*), mannagrass (*Glyceria* sp.), floating water-primrose (*Ludwigia peploides*), water-plantain (*Alisma lanceolatum*), and swamp smartweed (*Polygonum hydropiperoides*). Goodding's willow (*Salix gooddingiill*) and sandbar willow are woody plants that tolerate flooding and are occasionally found around the margins of fresh emergent wetlands.

Fresh emergent wetlands are found throughout California at all elevations, but they are most common below about 7,500 feet. Fresh

emergent wetland ecosystems are recognized throughout California as important natural communities because of their limited extent compared to historical distributions, their importance to dependent plant and wildlife species, and threats facing remaining wetland areas. The state's most extensive wetlands are in the Sacramento Valley, San Joaquin Valley, Klamath Basin, Sacramento–San Joaquin Delta region, and Imperial Valley–Salton Sea (Holland 1986; Mayer and Laudenslayer 1988, as cited in JSA 2004).

In western Placer County, fresh emergent wetland occurs at elevations of about 50–1,765 feet. These ecosystems occupy about 1,280 acres, or less than 1% of Plan area. Approximately 98% of this habitat is on private land. Most individual occurrences of fresh emergent wetland in the county are less than 1 acre in extent; some larger, restored fresh emergent wetlands exist in the northwestern part of the Plan area near Sheridan.

#### **Seasonal Wetland**

Seasonal wetlands are defined as isolated wetlands and swales that pond water during the rainy season, but that lack the distinctive flora and many of the physical characteristics that characterize vernal pools. Seasonal wetlands are typically not found in well-defined depressions but occur in a variety of topographic situations, such as shallow basins in annual grassland or along ephemeral drainageways and swales. They may also occur as transitional zones between freshwater emergent wetland and annual grassland in small shallow valleys.

Seasonal wetlands support a lower diversity of plant species than vernal pools, with a much higher proportion of non-native species. Typical plant species characteristic of seasonal wetland ecosystems in western Placer County include Mediterranean barley (Hordeum marinum), Italian ryegrass, curly dock (Rumex crispus), Baltic rush, and hyssop loosestrife. During the summer, seasonal wetlands may support late-season upland plants such as common spikeweed (Centromadia sp.), tarweed (Hemizonia spp.), vinegar weed (Trichostema lanceolatum), and doveweed (Croton setigerus). Seasonal wetlands occur throughout the Plan area of western Placer County. Individual seasonal wetlands are typically small, and most occur within grazed annual grassland and irrigated pasture ecosystems. Some larger areas occur adjacent to fresh emergent wetlands in agricultural settings in the western part of the Plan area. In the Plan area, seasonal wetlands are found at elevations of 50-1,906 feet. These ecosystems occupy approximately 1,338 acres, or <1% of the Plan Area; about 90% of these lands are on private land.

#### Lacustrine

Lacustrine ecosystems are defined as inland, natural ponds and lakes, as well as artificial features such as reservoirs that are formed by dammed river channels. In the PCCP, lacustrine features as small as 0.1 acre or as large as hundreds of acres were mapped in the Plan area. Aquatic features less than 0.1 acre, such as small stock ponds, are found

throughout the Plan area; however, most of these shallow features were not mapped as lacustrine ecosystems due to limitations of scale in the aerial photography. Although many are named as lakes, it is important to recognize that reservoirs are different from natural lakes in their physical and biological characteristics. Most reservoirs fluctuate on an annual basis, being gradually drawn down in summer to supply water for irrigation, power generation, or agriculture. However, even a fluctuation of as little as three to six feet can prevent plants from establishing at the shoreline or aquatic plant beds from developing. Large reservoirs are usually built in steep-sided canyons with only small areas of shallowwater habitat. Water level fluctuation and limited shallow-water habitat area both result in a lack of cover for young fishes in shallow water and a lack of habitat diversity for adult fishes. The fish fauna at the dam end of a reservoir is often different from the fauna at the mouth of the river that supplies the reservoir (Moyle 1993, as cited in JSA 2004). The dam end is usually deep and stratifies in summer, with a warmer layer near the surface and a cooler cold layer at the bottom. Stratification also characterizes deep natural lakes.

The relatively calm waters of lakes and ponds contrast sharply with those of riverine ecosystems. The oxygen content of lakes is relatively low compared to that of running water due to a combination of decomposition occurring at the bottom of lakes and the comparatively smaller quantity of water in direct contact with air. The gradations of oxygen, light, and temperature in lakes, along with currents and wave-action (seiche), greatly influence the vertical distribution of lake and reservoir organisms (Mayer and Laudenslayer 1988, as cited in JSA 2004).

Phytoplankton are the tiny suspended plants, such as diatoms, desmids, and filamentous green algae, that dominate deepwater (6 feet deep) aquatic habitats (i.e., too deep for emergent plants). Because these tiny plants alone carry on photosynthesis in open water, they are the basis upon which the rest of limnetic life depends (Mayer and Laudenslayer 1988, as cited in JSA 2004). The plants found in the littoral zone vary with elevation and water depth, with a distinct zonation apparent from the shoreline to the deeper water of the littoral zone.

Most large reservoirs lack a well-developed fringe of wetland and riparian plants due to their steep-sided slopes and fluctuations in water level. However, where shallow water does occur in smaller ponds and reservoirs in the foothills of western Placer County, common aquatic and emergent plants include mosquito fern, gibbous duckweed, Canadian waterweed, common bulrush, and broadleaf cattail. Common woody shoreline plants include the noxious weed Himalayan blackberry as well as native species such as Fremont cottonwood, white alder, sandbar willow, arroyo willow, and Goodding's willow.

Lacustrine ecosystems, including reservoirs, are found throughout California at virtually all elevations, but they are less abundant in arid regions. Approximately 4,790 acres of lacustrine ecosystems were

mapped in western Placer County; these are widespread across the Plan area. Many artificial reservoirs and agricultural or residential ponds exist in the Plan Area. The two largest reservoirs, Camp Far West on the Bear River and Folsom Lake on the American River, border Placer County on the north and south, respectively. They were created by public agencies for a combination of flood control, power generation, and water storage; both are also used for recreational purposes.

#### **Springs and Seeps**

This category includes permanent, intermittent, and ephemeral springs and seeps. Seeps are characterized by a slow, diffuse emergence of water from the ground, while springs are generally more localized and exhibit higher flow rates.

Seeps on rock outcrops typically occur on slopes greater than 70% that have little soil. Plant species composition varies with aspect and elevation and, to a lesser degree, substrate. Some common plant species encountered in springs and seeps include seep-spring monkeyflower (*Mimulus guttatus*), fragile fern (*Cystopteris fragilis*), ciliate willow herb (*Epilobium cilatum* ssp. *cilatum*), water chickweed (*Montia fontana*), California maidenhair fern (*Adiantum jordanii*), western bittercress (*Cardamine* sp.), liverworts, and a wide variety of mosses.

Springs and seeps are rare in western Placer County and are encountered on the north-facing cliffs of metamorphic rocks in the major river drainages and on hillsides in the lower foothills. These ecosystems occur at elevations of about 170–1,315 feet. Only about 2 acres of springs and seeps were mapped in the Plan area; 100% of these ecosystems are on private land.

# **Historical Extent and Composition**

Fresh emergent wetlands have decreased dramatically since the turn of the century due to drainage and conversion to other uses, primarily agriculture (Mayer and Laudenslayer 1988, as cited in JSA 2004).

Natural lakes did not occur in the foothill and Central Valley region of the Sierra Nevada due in large part to the absence of glaciated landscapes; essentially all the deepwater lakes and ponds in the foothills are artificial (Mayer and Laudenslayer 1988, as cited in JSA 2004).

## **Common Wildlife Associations**

## Fresh Emergent Wetland

Compared to some other terrestrial, large-patch ecosystems in western Placer County, fresh emergent wetlands support a relatively low number of vertebrate species. This is because most reptiles and small mammals (i.e., most rodents) avoid flooded areas and permanently saturated soils. In contrast, many species and large numbers of waterbirds are drawn to

marshes, mudflats, and other wetland habitats (Zeiner et al. 1990, as cited in JSA 2004).

Characteristic waterbirds that nest in fresh emergent wetlands in western Placer County include Canada goose, mallard, cinnamon teal (Anas cyanoptera), gadwall (Anas strepera), Virginia rail (Rallus limicola), sora (Porzana carolina), American coot (Fulica americana), common moorhen (Gallinula chloropus), killdeer (Charadrius vociferus), and Wilson's snipe (Gallinago delicata). These species are joined by a host of migratory waterfowl in fall and spring, with many remaining in the County throughout the winter and spring. Typical migratory and wintering waterfowl include American widgeon (Anas americana), northern shoveler (Anas clypeata), northern pintail (Anas acuta), green-winged teal (Anas crecca), ring-necked duck (Aythya collaris), bufflehead (Bucephala albeola), common goldeneye (Bucephala clangula), and ruddy duck (Oxyura jamaicensis). Amphibians in these habitats include long-toed salamander (Ambystoma macrodactylum), California newt, western toad, and Pacific treefrog. Northwestern pond turtle, giant garter snake, common garter snake, and western aquatic garter snake are the only reptiles that regularly occur in fresh emergent wetlands of western Placer County. The most common mammals in these habitats are a variety of foraging bats, vagrant shrew (Sorex vagrans), dusky shrew (Sorex monticolus), ornate shrew (Sorex ornatus), American beaver (Castor Canadensis), and muskrat.

#### **Seasonal Wetland**

Like fresh emergent wetlands, seasonal wetlands support a relatively low number of vertebrate species compared to many other land-cover types in western Placer County. This is because many small mammal species (e.g., most rodents) avoid flooded areas and saturated soils. In contrast, many species and large numbers of waterbirds are drawn to seasonal wetland ecosystems (Zeiner et al. 1990, as cited in JSA 2004). Characteristic waterbirds that visit seasonal wetlands in western Placer County include snowy egret (*Egretta thula*), black-crowned night-heron (*Nycticorax nycticorax*), white-faced ibis (*Plegadis chihi*), Canada goose, mallard, cinnamon teal, American widgeon, gadwall, killdeer, and Wilson's snipe.

### **Springs and Seeps**

Common wildlife species in springs and seeps are deer and other browsers, bats, violet-green swallows (*Tachycineta thalassina*), tree swallows (*Tachycineta bicolor*), and other insectivorous birds.

#### Lacustrine

Seasonally, reservoirs, irrigation and stock watering ponds, and other artificial water bodies provide important habitat for many wildlife species, especially waterfowl, shorebirds, and other migratory waterbirds (JSA 2003, as cited in JSA 2004). Lacustrine ecosystems in western Placer County are used as wintering grounds or temporary stopover for resting and foraging during migration. Typical waterfowl species include Canada

goose, snow goose (Chen caerulescens), white-fronted goose (Anser albifrons), mallard, northern pintail, American widgeon, gadwall, cinnamon teal, green-winged teal, canvasback (Aythya valisineria), and ruddy duck. Other waterbirds that frequent lacustrine ecosystems include great blue heron (Ardea herodias), green heron (Butorides virescens), great egret (Ardea alba), snowy egret, pied-billed grebe (Podilymbus podiceps), western grebe (Aechmophorus occidentalis), common loon (Gavia immer), and American white pelican (Pelecanus erythrorhynchos). Shorebirds (such as spotted sandpiper (Actitis macularia), western sandpiper (Calidris mauri), least sandpiper (Calidris minutilla), killdeer, and Wilson's phalarope (*Phalaropus tricolor*)) and swallows—such as northern rough-winged swallow (Stelgidopteryx serripennis), tree swallow (Tachycineta bicolor), violet-green swallow, and cliff swallow (Petrochelidon pyrrhonota)—are also common visitors to lacustrine ecosystems. The large reservoirs, including Camp Far West and Folsom Lake, annually attract large concentrations of wintering gulls that roost along their shorelines. The largest gull roost in the Plan area is near Granite Bay on the Placer County side of Folsom Lake (JSA 2003).

## **Covered and Special-Status Species**

## Fresh Emergent Wetland

Two special-status plants—slender-leaved pondweed (*Potamogeton filiformis*) and Sanford's arrowhead (*Sagittaria sanfordii*)—may occur in fresh emergent wetlands in the Plan area but are not covered by this Plan.

Special-status animals that may visit fresh emergent wetlands in the Plan area, but that are not covered by this Plan, include American white pelican, white-faced ibis, redhead (*Aythya americana*), white-tailed kite, and black rail (*Laterallus jamaicensis*).

Special-status animals that are covered by this Plan, and that may visit fresh emergent wetlands in the Plan area, include northwestern pond turtle, giant garter snake, bald eagle, northern harrier, American peregrine falcon, bank swallow, Modesto song sparrow, and tricolored blackbird.

#### **Seasonal Wetland**

Special-status plants that may occur in seasonal wetlands of the Plan area, but that are not covered by this Plan, include hispid bird's-beak, Sanford's arrowhead, pincushion navarretia, and Henderson's bent grass.

Special-status plants that are covered by this Plan, and that may occur in seasonal wetlands of the Plan area, include Bogg's Lake hedge-hyssop, legenere, dwarf downingia, Ahart's dwarf rush, and Red Bluff dwarf rush.

One special-status animal that breed in seasonal wetlands in the Plan area, but is not covered by this Plan: California linderiella (*Linderiella* 

occidentalis). California linderiella is not a protected species, but is on the Placer County protected list and is tracked in the CNDDB database.

Special-status animals that are covered by this Plan, and that breed in seasonal wetlands in the Plan area, include vernal pool fairy shrimp, vernal pool tadpole shrimp, western spadefoot, giant garter snake, northwestern pond turtle, northern harrier, Modesto song sparrow, and tricolored blackbird. Other special-status species that are covered by this Plan, and that may visit these ecosystems are bald eagle, American peregrine falcon, and bank swallow.

## Springs and seeps

No special-status plants or animals are known to be associated with seeps or springs in the Plan area.

#### Lacustrine

Two special-status plants—slender-leaved pondweed and Sanford's arrowhead—may be associated with shallow-water habitats in the Plan area, but are not covered by this Plan.

Of the reptile and amphibian species associated with lacustrine habitats, three are special-status species and covered by this Plan: western spadefoot, northwestern pond turtle, and giant garter snake. Three other special status species that are covered by this Plan—bald eagle, American peregrine falcon, and bank swallow—are attracted to large reservoirs.

# **Ecosystem Function**

Wetland land-cover types provide drinking water, as well as foraging, breeding, and resting habitat for many fish and wildlife, including birds, amphibians, reptiles and mammals. Wetlands provide stopover habitat for migratory waterfowl and songbirds. Many wildlife species, particularly invertebrates, spend their entire lives in wetlands. Perennial wetlands are important habitat for a wide variety of wildlife species.

Perennial and seasonal wetlands function as essential habitat for amphibians that depend on aquatic environments for reproduction and juvenile development. These wetlands also support high levels of insect production, which in turn creates a major food source for amphibians, birds, and other insectivorous species. Perennial wetlands are permanent water sources during the dry season in an otherwise arid landscape and thus function as essential habitat for a wide variety of water-dependant wildlife. Mammals, birds, reptiles, and amphibians from adjacent habitats are likely to use ponds en route to surrounding areas. Many upland species rely on streams and ponds as water sources, especially during the dry summer months.

Springs and seeps enhance the wildlife value of the surrounding area by providing water and lush vegetation growth that attract deer and other

browsers. They can also support an abundant supply of insects for bats, violet-green swallows, tree swallows, and other insectivorous birds.

#### **Natural Disturbance**

Fresh emergent wetlands are transitory, eventually succeeding to upland habitat through gradual siltation. The speed at which this occurs varies with the rate of sedimentation, frequency of flooding, and rate of soil development, but the process usually occurs slowly and fresh emergent wetlands often appear relatively stable for many decades (Mayer and Laudenslayer 1988, as cited in JSA 2004).

Seasonal flooding is a key natural disturbance in seasonal wetlands. Fresh emergent wetland and other wetland plant species must tolerate flooding during the growing season and thus be able to tolerate anoxic conditions. Prolonged flooding can kill off wetland plants if the shoots have been destroyed by grazing or fire prior to the flood event (Keddy 2000). Extended dry periods can function as a disturbance as well, as many wetland plants are adapted to wet conditions. Sediment deposition is a key feature of wetland communities. Seedlings are sensitive to sediment burial, which can prevent or reduce germination (Keddy 2000). As a fresh emergent wetland ages, vegetation accumulates and may fill the pools of open water present which can eventually lead to meadow creation (Faber 1982).

Mixing of the water column of ponds, lakes, and reservoirs is also a form of natural disturbance. Wind contributes heavily to mixing of water in ponds and lakes. Mixing brings oxygen to the bottom of ponds and lakes while releasing nutrients into the water column that will feed plants and invertebrates. This sudden release of nutrients to the photic zone can result in rapid algal and plant growth (eutrophication). Ultimately, heavy loads of decaying plant matter result in anoxic conditions, and subsequent reduced water quality.

### **Threats**

Fresh Emergent and Seasonal Wetland and Springs and Seeps Threats to wetland and spring and seep land-cover types include conversion to land uses such as agriculture or urban development, pollution, grazing, changes in hydrologic regime, non-native species invasion, and natural processes such as fire or flood.

Wetlands, in western Placer County, especially seasonal wetlands, are vulnerable to destruction and/or fragmentation by urban and suburban development, agriculture or road maintenance.

Fertilizer, pesticides, and untreated sewage contribute to pollution and result in a decrease in oxygen, which can kill vegetation within wetlands.

Grazing disturbs the vegetation around wetlands, springs, and seeps and can result in invasion of non-native plant species into wetlands (Holland and Keil 1995). Urban ornamental landscape species (e.g., weeping willow [Salix babylonica] and red sesbania and common aquarium species that are transported or reseeded within drainages and watersheds can establish and spread, ultimately finding their way into downstream wetlands. Construction of dams and weirs, extraction of groundwater, and the creation of artificial drainages can cause changes to hydrologic regimes. In addition, increased stormwater runoff from impermeable surfaces can flow so rapidly into adjacent wetlands that it causes excessive scour and loss of wetland habitat. Excessive sediment deposition following fire can fill in wetlands, burying vegetation.

In the Plan area, some fresh emergent wetland habitats are created by irrigation runoff. Many of the wetland habitats in the foothills of the Sierra Nevada used by California black rail (*Laterallus jamaicensis coturniculus*) are fed by leakage or runoff from irrigation canals (Richmond et al. 2008). The persistence of these habitats relies on a continuous supply of water. They are potentially threatened by canal lining, encasement and repairs.

Poison hemlock, Italian thistle, pampas grass, velvet grass, Italian rvegrass, and bulbous canarygrass (Phalaris aquatica) are invasive nonnative plants that often occur in or adjacent to fresh emergent wetlands. Noxious weeds that can colonize fresh emergent wetlands and that are known from within or near western Placer County include Himalayan blackberry, Bermuda grass, perennial pepperweed, hydrilla (Hydrilla spp.), purple loosestrife, Eurasian milfoil (Myriophyllum spicatum), water hyacinth (Eichhornia Kunth), giant reed, and parrot's feather (Myriophyllum aguaticum). The ability of these species to reproduce asexually by stolons or turions makes them particularly difficult to control or eradicate. Noxious and invasive species that may occur in seasonal wetlands include yellow star thistle, Himalayan blackberry, whitetop species (Cardaria spp.), bull thistle, pampas grass, velvet grass, perennial pepperweed, Bermuda grass, Harding grass (Phalaris aguatica), Johnson grass (Sorghum halepense), and woolly mullein (Verbascum sp.).

Non-native bullfrogs can be common in non-native shallow ponds and other permanent wetlands of western Placer County. Bullfrogs, along with introduced bass and signal crayfish (*Pacifastacus leniusculus*), can displace or prey upon many native aquatic species (Zeiner et al. 1990; Jennings and Hayes 1994, as cited in JSA 2004).

#### Lacustrine

Heavy grazing by livestock can degrade ponds quickly by trampling and grazing vegetation, increasing turbidity, and increasing the nutrient load of water from urine and feces. Increased nutrient load can cause eutrophication, a process where excess nutrient load causes rapid plant and algae growth. Eutrophication reduces dissolved oxygen in the water as anaerobic microbes break down dead plant material. Reduced levels

of dissolved oxygen, as well as reduced penetration of sunlight into the water, often lead to the die-off of other aquatic organisms. Eutrophication eventually leads to the filling in of the lacustrine basin by sedimentation of organic matter. Both ponds and reservoirs are susceptible to rapid eutrophication. In urbanized areas, or in areas with septic tanks, this process is enhanced by excess nutrient input. Reservoirs may also suffer from a lack of mixing surface waters with water at deeper depths. Mixing distributes oxygen to the reservoir floor, preventing anaerobic conditions that may reduce the dissolved oxygen in the reservoir. Maintaining appropriate levels of dissolved oxygen is important for aquatic life in the reservoir and downstream of the reservoir, as well as for drinking water supplies. Dissolved oxygen levels are also affected by water temperature. Warmer water contains lower levels of dissolved oxygen.

The vast network of ponds, reservoirs, and associated canals throughout western Placer County support concentrations of non-native species. These include many aquatic invertebrates (e.g., insects, snails, clams, crayfish), many non-native fish species, and bullfrogs. During times of high rainfall or stream flow, non-native species can be flushed from ponds and reservoirs into stream and river systems where they compete with or prey upon native species. Bullfrogs and several species of bass are known to prey upon the eggs or tadpoles of foothill yellow-legged frog, as well as northwestern pond turtle hatchlings and juveniles (Moyle 1973; Holland 1991, as cited in JSA 2004). Hatchlings of wood ducks, mallards, and even Canada geese often fall prey to largemouth bass (*Micropterus salmoides*). Several noxious aquatic weeds, including horticultural escapees such as water hyacinth, parrot's feather, hydrilla, and Eurasian milfoil, could potentially occur in the ponds and reservoirs of western Placer County.

# **Agricultural**

Rice is the single largest crop in western Placer County. Most of the remaining agricultural lands are irrigated and dryland pasture, but there are large areas of hay, grain, and vegetable crops (U.S. Department of Agriculture 1997, as cited in JSA 2004; Placer County 2001). The most fertile agricultural soils are often near or on the floodplains of streams. The majority of the county's croplands occur on soils that once supported either annual grasslands or mixed, blue, interior live, or valley oak woodlands (Rogers 1980, as cited in JSA 2004).

Seven major agricultural land-cover types were mapped:

- Rice;
- Irrigated pasture;
- Alfalfa:
- Row crop;

- Vineyard;
- Orchard; and
- Unidentified cropland.

The extent and relative habitat values of these semi-natural ecosystems are discussed below.

# **Agricultural Land-cover Types**

#### Rice

Rice fields mapped included fields under current cultivation and fields that were temporarily fallow but had water control structures in place. Rice is planted in April and May and harvested in September and October; fields are often flooded after harvest to control pests and to provide waterfowl habitat for hunting clubs. Rice is grown as a monoculture, using tillage or herbicides to eliminate unwanted vegetation; remaining vegetation is generally confined to the berms, ditches, and canals between and around fields and is dominated by wetland plants, both native and non-native. Typical plants found in uncleared ditches and canals include bulrush, cattail, nutsedge (Cyperus spp.), rushes, Harding grass, western vervain, and Bermuda grass.

Rice is grown on suitable soils throughout the Sacramento Valley and is the major crop in western Placer County. In the Plan area of western Placer County, rice fields lie at elevations of about 45–140 feet. These ecosystems occupy about 20,220 acres, or about 10% of the Plan Area; 100% of these ecosystems are on private land. Abandoned contoured rice fields established in historic vernal pool landscapes often retain remnant area of vernal pool vegetation and seasonal pools that can support listed vernal pool invertebrates, such as the vernal pool fairy shrimp.

## **Irrigated Pasture**

Vegetation in irrigated pasture is generally a mixture of perennial grasses and legumes that form a dense ground cover. Native plant species are nearly absent from irrigated pastures because they are unable to compete with the vigorous pasture species and non-native wetland species such as ryegrass (*Lolium* spp.), fescues (*Festuca* spp.), dallisgrass (*Paspalum dilatatum.*), orchard grass (*Dactylis glomerata*), velvet grass, Bermuda grass, curly dock, lady's-thumb (Polygonum sp.), barnyard grass (*Echinochloa crus-galli*), and white clover (*Trifolium repens*). Himalayan blackberry is common and invasive in irrigated pastures in western Placer County; other potentially occurring noxious weeds include bull thistle, Bermuda grass, perennial pepperweed, nimblewell (*Muhlenbergia schreberi*), and Johnsongrass. Native species in irrigated pastures are generally found only in wetland settings.

Irrigated pastures occur throughout western Placer County. In rural-residential areas in the foothills, they tend to be small irrigated fields for

small-scale livestock rearing. In the lower foothills and Valley areas they tend to be located on floodplains, are more extensive in size, and are used for intensive cattle rearing. In the Plan area, irrigated pastures are found at elevations of about 45–1,845 feet. These ecosystems occupy about 7,860 acres, or about 4% of the Plan area; 99% of this habitat is on private land.

#### Alfalfa

Small amounts of alfalfa are grown in western Placer County as a hay crop in irrigated fields. Alfalfa is a perennial plant that lives for 5 years or more and is harvested several times in the growing season. Herbicides are generally used to control weeds and eliminate unwanted vegetation; any vegetation remaining on field margins includes a variety of introduced grasses and legumes, but noxious weeds and other non-native invasive plants may also be present.

In the Plan area, alfalfa fields are found at elevations of about 70–135 feet. These ecosystems occupy about 250 acres, or less than 1% of the Plan area; 100% of this habitat is on private land.

#### **Row Crop**

Row crops are generally monotypic agricultural fields of herbaceous species varying in height from 1 to 6 feet. Most row crops are annual species, although a few (e.g., strawberries) are perennial. Major row crops in western Placer County are grain, vegetable crops, and miscellaneous crops (e.g., clover seed, corn, and oats) (U.S. Department of Agriculture 1997, as cited in JSA 2004). Most crops are planted in spring and harvested in summer or fall and grown using tillage or herbicides to eliminate unwanted vegetation (Mayer and Laudenslayer 1988, as cited in JSA 2004).

Row crops generally occur on deep, fertile soils in alluvial valley bottoms or gently rolling terrain in the low to mid-elevations of western Placer County. Alluvial soils are derived from a variety of parent rock types, including soil series derived from granitic and metamorphic parent rocks (Rogers 1980, as cited in JSA 2004).

The dominant species on the margins of row crops include a variety of introduced grasses and legumes; noxious weeds and other non-native invasive plants may also be present. The major noxious weeds subject to biological control measures in western Placer County are yellow starthistle, Italian thistle, Klamath weed, skeleton weed (*Chondrilla juncea*), and puncture vine (Placer County 2001); many other noxious and invasive plants have the potential to occur in and around row crops. In moist areas near irrigation ditches and farm ponds, noxious weeds such as Johnson grass and Bermuda grass are often present.

In California, croplands occur on about 8.5 million acres, and croplands are found in every county except for San Francisco (U.S. Department of Agriculture 1997). In the Plan area, row crops are found at elevations of

about 35–1,280 feet, but most are below about 200 feet. These ecosystems occupy about 4,935 acres, or about 2% of the Plan area; 100% of this habitat is on private land.

#### Vineyard

Rolling hills of deeper, well-drained soils in the middle elevations are the most likely setting for vineyards in western Placer County. Locally, they occur on soils derived from metamorphic rocks mapped as Sites loam, although other soils are also represented (Rogers 1980, as cited in JSA 2004).

Structurally, vineyards are composed of single species planted in rows and supported on wood and wire trellises. Vineyards are managed intensively: the soil under the vines is generally sprayed and barren to prevent the growth of grasses and other herbs, which may transmit pests and diseases to the grapevines. Forbs may be allowed to grow between the rows as a cover crop to control erosion; such cover crops usually consist of introduced clover and other legumes and annual winter grasses. Drip irrigation is often employed. The overall cover is somewhat sparse, composed of young to mature long-lived woody vines that may persist for more than 40 years, but are generally replaced earlier due either to fluctuations in product prices or decreases in productivity (Mayer and Laudenslayer 1988, as cited in JSA 2004).

Aside from the grape cultivars, the sparse herbaceous layer, if present, typically consists of introduced annual weeds, unless the areas between vineyard rows are specifically seeded with a cover crop. Typical species include soft chess, black mustard, annual ryegrass (*Lolium multiflorum*), wild oat, orchard grass, red-stemmed filaree (*Erodium cicutarium*), dovefoot geranium, little hop clover, and rose clover. Noxious weeds such as Bermuda grass and Johnson grass may also be present, particularly in moist areas.

Vineyards are found in nearly every California county except Alpine, Lassen, Modoc, Mono, Plumas, San Francisco, and Trinity (Mayer and Laudenslayer 1988). Vineyards have a more limited distribution in western Placer County than in many California counties that have experienced a dramatic increase in conversions to vinyards. Aerial photos from the late 1960s suggest that many vineyards in California have been developed on lands that previously supported either annual grasslands or foothill hardwoods (Rogers 1980). In the Plan area, vineyards are found at elevations of about 85–1,290 feet. These ecosystems occupy about 155 acres, or less than 1% of the Plan area; 100% of this habitat is on private land.

#### **Orchards**

Orchards in western Placer County are often found within annual grassland, mixed, blue, interior, and valley oak woodlands ecosystems. They are frequently adjacent to streams or irrigation canals. Deep, well-drained soils of volcanic origin and gently to moderately sloping hills in

the middle elevations are characteristic of orchards in western Placer County. Loamy soils are the most common or preferred substrate for orchards (Rogers 1980, as cited in JSA 2004).

Orchards are generally monotypic, tree-dominated habitats, although pruning to facilitate harvest results in trees that range in height from 15 to 30 feet (Mayer and Laudenslayer 1988, as cited in JSA 2004). The crowns do not overlap, and trees are uniformly spaced in straight rows. Most orchards are irrigated by sprinkler and intensively managed. Trees are replaced when they become old or diseased, generally by 35–40 years of age. There are many abandoned orchards in western Placer County, particularly around Ophir and Auburn in the Sierra Nevada foothills; some of these abandoned orchards are open and grassy, with scattered old fruit trees, while others contain dense shrubs and regenerating oak trees (predominately blue oak).

Walnuts, plums, peaches, oranges, apples, and pears are the most commonly planted crops in orchards in western Placer County (Placer County 2001). Below the fruit trees, the understory is either bare soil or a periodically mowed herbaceous layer of non-native species, such as soft chess, annual ryegrass, wild oats, orchard grass, winter vetch, black mustard, filaree, dove-foot geranium, little hop clover, bur clover, or rose clover. In moist areas near irrigation ditches and farm ponds, noxious weeds such as Johnson grass and Bermuda grass are often present.

Orchards are found in nearly every California county except Alpine, with only a few farms in Lassen, Modoc, Mono, Plumas, San Francisco, and Trinity Counties (U.S. Department of Agriculture 1997). In the Plan area, orchards are found at elevations of about 60–1,680 feet. These ecosystems occupy about 2,740 acres, or about 1% of the Plan area; 100% of this habitat is on private land.

#### **Unidentified Cropland**

Areas were mapped as unidentified croplands if they were plowed or fallow agricultural fields or if the crop could not be identified as one of the other subtypes. Most of these areas are likely to be a temporary habitat in the fallow or annual cycle of cultivation of row crops. The dominant plant species in temporary fallow croplands include a variety of introduced grasses and legumes, including noxious weeds and other non-native invasive plants, as listed in the description of row crops.

In the Plan area, unidentified croplands are found at elevations of about 47–1,368 feet. These ecosystems occupy about 8,660 acres, or about 4% of the Plan area; 100% of this habitat is on private land.

# **Common Wildlife Associations**

#### Rice

Flooded rice fields in the Plan area attract wintering and migrating waterfowl, waders, shorebirds, and gulls (JSA 2003). Large concentrations (more than 10,000 individuals) of northern pintails congregate in flooded rice fields prior to spring migration (Miller pers. comm., as cited in JSA 2003). In spring, these fields often support foraging resident species such as black-crowned night-heron, Canada goose, cinnamon teal, mallard, gadwall, and killdeer.

In winter, flooded rice fields support large numbers of overwintering killdeer, greater yellowlegs (*Tringa melanoleuca*), long-billed curlew (*Numenius americanus*), dunlin (*Calidris alpina*), least sandpiper, long-billed dowitcher (*Limnodromus scolopaceus*), Wilson's snipe, and American pipit (*Anthus rubescens*). During these winter months, especially after the hunting season, large flocks of waterfowl forage in flooded rice fields. These concentrations of shorebirds and waterbirds attract raptors, especially northern harrier, American peregrine falcon, and bald eagle. When rice fields are not flooded, rodent populations in the fields may also attract raptors, including white-tailed kite, red-tailed hawk, Swainson's hawk, American kestrel, and short-eared owl (*Asio flammeus*) (JSA 2003).

### **Irrigated Pasture**

Some birds that typically forage in the County's irrigated pastures include great blue heron, great egret, Canada goose, American kestrel, California quail (*Callipepla californica*), western kingbird, American crow (*Corvus brachyrhynchos*), western meadowlark (*Sturnella neglecta*), Brewer's blackbird, and red-winged blackbird (*Agelaius phoeniceus*).

#### Alfalfa

In the Plan area, alfalfa fields support about 58 vertebrate species—six breeding species and 52 visitors. Several open-country raptor species occurring in western Placer County (e.g., white-tailed kite, northern harrier, red-tailed hawk, and American kestrel) use alfalfa, where they forage on the abundant rodent prey. These populations are also augmented by the annual influx of migrating individuals. When flooded, these fields are used extensively by foraging waders and as nesting cover by several species of ducks.

#### **Row Crop**

Row crops support relatively few native wildlife species. In the Plan area, these ecosystems support about 47 vertebrate species—six breeding species and 41 visitors. Most of these species do not breed in active row crops, but a few mammals (e.g., black-tailed jackrabbit, desert cottontail (*Sylvilagus audubonii*), pocket gopher, and California ground squirrel) may have natal burrows along the margins of agricultural fields. Typical birds that forage in the County's row crops include great blue heron, great

egret, northern harrier, red-tailed hawk, American kestrel, California quail, mourning dove (*Zenaida macroura*), western kingbird, American crow, western meadowlark, Brewer's blackbird, and red-winged blackbird. Unlike other areas of the Central Valley, row crops are not a dominant landcover type on the valley floor of the Plan area. Instead, pasture, irrigated pasture, rice and some orchards are the dominant form of agricultural production in the valley. Row crop production is typically small in scale and is associated with organic farm operations.

#### Vinevard

In the Plan area, vineyards support about 52 vertebrate species—seven breeding species and 45 visitors. Native birds that typically forage in vineyards in western Placer County include mourning dove, western scrub-jay, American crow, western bluebird, white-crowned sparrow, golden-crowned sparrow, dark-eyed junco (*Junco hyemalis*), and house finch. Flocks of introduced European starlings may visit vineyards, especially in fall when they may cause damage to ripening grapes (Zeiner et al. 1990, as cited in JSA 2004). While there are relatively few acres of vineyard in production in 2010 (less than 500 acres), agricultural trends in western Placer County show that it is likely that the total amount of vineyard production will increase over the term of the PCCP permit.

#### **Orchard**

In the Plan area, orchards support about 55 vertebrate species—12 breeding species and 43 visitors. Most of these species do not breed in active orchards, but a few mammals (e.g., black-tailed jackrabbit, desert cottontail, pocket gopher, and California ground squirrel) may have natal burrows along the margins of orchards. Birds that typically visit orchards in western Placer County include white-tailed kite, red-tailed hawk, American kestrel, California quail, mourning dove, red-breasted sapsucker (Sphyrapicus ruber), western kingbird, yellow-billed magpie (Pica nuttalli), and American crow. Orchards were the dominated landcover type, particularly in the Newcastle, Ophir, Penryn, Loomis and Granite Bay areas for a number of decades. Total acreage of orchard production has declined significantly since the 1950's and has largely been replaced by rural residential landscapes where oak woodlands have regenerated. The water delivery infrastructure is still present and soil conditions are still conducive to orchard production and as a consequence, it is possible that smaller scale orchard production will increase (e.g., mandarins) resulting in a displacement of oak woodlands.

#### **Unidentified Cropland**

Common wildlife associations of unidentified cropland are generally similar to those found in row crops, orchards, vinyards, and alfalfa.

# **Covered and Special-Status Species**

#### Rice

No special-status plants are known to occur in rice fields in the Plan area, nor is suitable habitat present.

One special-status animal species that may visit rice fields in the Plan area, but that is not covered by this Plan, is white-tailed kite.

Special-status animal species that are covered by the Plan, and that may visit rice fields in the Plan area include giant garter snake, bald eagle, northern harrier, white-tailed kite, Swainson's hawk, ferruginous hawk, American peregrine falcon, burrowing owl, Modesto song sparrow, and tricolored blackbird.

### **Irrigated Pasture**

No special-status plants are known to occur in irrigated pastures in the Plan area, nor is suitable habitat present.

Special-status wildlife species that are covered by this Plan, and that may visit irrigated pastures in the Plan area, include giant garter snake, bald eagle, northern harrier, Swainson's hawk, ferruginous hawk, American peregrine falcon, burrowing owl, loggerhead shrike, and tricolored blackbird.

#### Alfalfa

No special-status plants are known to occur in alfalfa in the Plan area, nor is suitable habitat present.

Special-status wildlife species that are covered by this Plan, and that may visit alfalfa fields in the Plan area, include giant garter snake, northern harrier, Swainson's hawk, ferruginous hawk, burrowing owl, Modesto song sparrow, loggerhead shrike, and tricolored blackbird. The larger alfalfa fields in the Plan area, when bordered by suitable nesting trees, may support nesting Swainson's hawks, which are also covered by this Plan.

#### **Row Crops**

No special-status plants occur in row crops of the Plan area, nor is suitable habitat present for any of these species.

Special-status wildlife species that are covered by this Plan, and that may visit row crops of the Plan area, include giant garter snake, northern harrier, Swainson's hawk, golden eagle, merlin (*Falco columbarius*), prairie falcon, ferruginous hawk, American peregrine falcon, burrowing owl, loggerhead shrike, and tricolored blackbird. White-tailed kites (*Elanus leucurus*), which are not covered by this Plan, may forage in row crops.

#### Vineyard

No special-status plants are known to occur in vineyards of the Plan area, nor is suitable habitat present. No special-status animals are known to breed in vineyards of western Placer County, nor is suitable habitat present.

#### **Orchard**

No special-status plants are known to occur in orchards in the Plan area, nor is suitable habitat present.

No special-status species breed in orchards in the Plan area. White-tailed kites (*Elanus leucurus*), which are not covered by this Plan, may use orchards for communal roosting sites.

# **Unidentified Cropland**

No special-status plants are known to occur in unidentified croplands in the Plan area, nor is suitable habitat present.

No special-status species breed in unidentified croplands in the Plan area. Special-status species may forage in this habitat, and that are covered by this Plan, include northern harrier, Swainson's hawk, ferruginous hawk, loggerhead shrike, and tricolored blackbird.

# **Ecosystem Function**

Rice fields are important to the continuity of wetland habitats along the Pacific Flyway, as they attract wintering and migratory waterfowl, waders, shorebirds, and gulls (JSA 2003). The relative attractiveness of flooded rice fields to migratory and wintering birds depends on rainfall and on sitespecific flooding cycles and management practices. However, during fall migration (which begins in late June), flooded rice fields can provide prime habitat for a wide variety of shorebird species; hundreds or thousands of individuals of more than a dozen species forage for invertebrates during brief stopovers on their way south. During the winter months, especially after the waterfowl hunting season, large flocks of waterfowl forage in flooded rice fields. These concentrations of shorebirds and waterbirds attract raptors, especially northern harrier, American peregrine falcon, and bald eagle. When rice fields are not flooded, rodent populations in the fields may also attract raptors, including white-tailed kite, red-tailed hawk, American kestrel, and short-eared owl (Asio flammeus) (JSA 2003). In addition, many species of snake, such as the giant garter snake, prey on amphibians that occur in rice fields. When they flooded, alfalfa fields are used extensively by foraging waders and as nesting cover by several duck species.

In comparison with native large-patch ecosystems in the Plan area, row crops, irrigated pasture, vineyards, and orchards support relatively few native wildlife species. Nonetheless, these types of agriculture provide some benefit, although species composition depends heavily on the

planting cycle. For example, cropland has a higher value for herbivorous birds (e.g., tricolored blackbird) and raptors (e.g., Swainson's hawk) near harvest time, when the standing crop is mature and produces a quantity of food (e.g., fruit, seeds), than it does after the harvest when the cropland is fallow. Agricultural production methods can also have an impact on wildlife use. For example, production practices such as clean farming, where farm edges are maintained as vegetation-free areas, reduce cover and movement opportunities for wildlife; on the other hand, wildlife friendly farming, where native cover crops and hedge rows are used between crops and on farm edges, can increase foraging opportunities for wildlife use in croplands.

Agricultural lands often play a key role in providing connectivity between larger open space areas. Maintaining connectivity between open space patches that provide habitat helps to support diversified genetic pools by enabling populations to disperse and co-mingle.

Agriculture often is associated with streams, canals, and ditches used for irrigation that may support riparian vegetation, trees (planted as windbreaks), and shrubs. These areas may provide habitat to songbirds, raptors, amphibians and reptiles, as well as provide a movement corridor for other species.

#### **Threats**

The main threat to agricultural land is urban development. Secondarily, a loss of irrigation water through diversions to other jurisdictions or to municipal uses would have a significant impact on the viability of agricultural production. Orchards, vineyards, and row-crops occur mostly in the Valley floor and foothills. In these areas, the major threat to irrigated agriculture is land conversion to urban uses, often as residential housing.

# **Urban and Rural Residential**

# **Historical Extent and Composition**

Developed land-cover types were mapped and described for the study area in order to describe the extent and distribution of modified lands. Areas mapped as developed include commercial, high-density residential development, and the patchy mosaic of ornamental plantings, vacant lots, and remnant native habitats that occur between developed areas. The extent of landscape maintenance and the replacement of native plant species by ornamental plants usually dictate the habitat characteristics of urban vegetation (Mayer and Laudenslayer 1988, as cited in JSA 2004). Urban habitat is not limited to any particular physical setting; in western Placer County it often occurs on level agricultural lands, valleys, gently to moderately sloping areas, and level ridges. The habitat values of urban

ecosystems vary depending on the extent and type of development. The urban ecosystems recognized and mapped are based on the following zoning categories used by the Placer County Planning Department:

- Urban and suburban(greater than 1 dwelling unit/acre);
- Rural-residential (from 1-10 acres/dwelling unit);
- Rural-residential forested (from 1-10 acres/dwelling unit);
- Urban parks;
- Golf courses;
- Urban riparian;
- Urban woodland; and
- Urban wetland.

The following land-cover types were mapped in addition to those recognized as zoning categories by the Placer County Planning Department:

- Eucalyptus woodland;
- Landscape and golf course ponds; and
- Disturbed, barren land.

Urban areas occur throughout California and are not limited to any particular setting. In the foothill regions, newer residential developments in outlying areas most often replace oak woodland land-cover types or annual grassland, as well as areas that may have been previously modified for agricultural uses (Mayer and Laudenslayer 1988, as cited in JSA 2004).

In the Plan area, urban and suburban ecosystems occur at elevations 33–2,165 feet, but most occur below 1,000 feet. These ecosystems occupy about 77,047 acres or 36% of the Plan area; 96% of this habitat is on private land. The extent and relative habitat values of developed ecosystems are discussed below.

# **Developed Land-Cover Types**

#### **Urban and Suburban**

Urban and suburban areas were defined as areas developed with more than 1 dwelling unit per acre and a number of intensively developed non-residential land uses including commercial, industrial, office and related uses. These areas occupy about 34,180 acres, or about 16% of the Plan area. Ornamental plantings in the older neighborhoods of Auburn, Lincoln, and Roseville are often mature, introduced evergreen and deciduous trees that may be as old as 100 years. These ornamental species range from approximately 20 to 50 feet high at maturity and are typically much smaller and younger than the occasional remnant oaks

and pines in these neighborhoods. Urban neighborhoods that were built in the last 40 or 50 years tend to have younger or smaller trees and less structural diversity than older neighborhoods. In outlying suburban areas, mature native oaks and pines are also present between the buildings. Intensively developed areas with highly manicured yards typically have very low wildlife habitat values. Small lawns and mature hedges in urban and suburban areas include many introduced fruiting species that may be attractive to birds and other wildlife.

#### Rural-residential

Rural-residential areas were defined as areas developed with 0.1–1 dwelling unit per acre and less than 70% tree canopy cover. These areas occupy about 23,380 acres, or about 11% of the Plan area. Areas mapped as rural residential include small pockets of remnant oak woodland land-cover types, often with shrubs and lower branches cleared to reduce fuel loads and small paddocks grazed by a variety of livestock. Large residential lots may have most of the native vegetation removed and replaced with mowed annual grassland, lawns, and widely scattered trees; such management techniques are often intended to reduce the risk of fire.

Large ungrazed lots in rural-residential areas often become infested with weedy, non-native species, especially yellow star-thistle. Many of these invasive non-native plants are horticultural species that were introduced during the Gold Rush era; some are still commercially available. Characteristic horticultural and pasture species that are known to invade wildlands near rural-residential areas locally include French broom, treeof-heaven, black locust, English ivy, periwinkle, pampas grass, giant reed, scarlet wisteria, pennyroyal, wild oat, tall fescue (Schedonorus phoenix), and aquarium species such as parrot's feather and water hyacinth. Other less serious invaders include winter vetch, orchard grass, annual ryegrass, rose clover, and red-stemmed filaree. Many other unintentional introductions are also common in urban and rural-residential areas of the county. These include noxious weeds such as Himalayan blackberry, which can dominate large areas, Italian thistle, knapweeds (Centaurea spp.), Klamath weed, field bindweed (Convolvulus arvensis), bull thistle, medusa-head, and other invasive species such as fennel, black mustard, and woolly mullein. Other abundant non-native plants in these ecosystems include hedgehog dogtail, hedge parsley, dove-foot geranium, ripgut brome, red brome (Bromus rubens), velvet grass, dallisgrass, and many more.

#### **Rural-residential Forested**

Rural-residential forested areas were defined as areas developed with 0.1–1 unit per acre with more than 70% cover of large, mature trees. These areas occupy about 14,745 acres, or about 7% of the Plan area. Undeveloped lots in rural-residential forested areas may support remnant patches of mature oak woodland land-cover types or ponderosa pine forest unless they have been previously cleared. Urban vegetation is relatively short-lived compared to remnant pines and oaks, which may live

for centuries. However, some native species, particularly oaks, may die prematurely as a result of regular surface irrigation, grading near the base of trees, or root damage caused by trenching and excavation (Mayer and Laudenslayer 1988, as cited in JSA 2004).

#### **Urban Parks and Golf Courses**

Urban parks were defined as isolated city parks, playgrounds, and grass fields. These areas occupy about 1,610 acres, or less than 1% of the Plan area. Parks in the Plan area are found at elevations of about 87–1,880 feet. They range from large areas that may include remnant patches of valley oak woodland with a diverse and multilayered understory (e.g., Maidu Regional Park or Royer Park/Saugsted Park in Roseville) to small, heavily landscaped and managed playgrounds and ball fields. However, most developed parks in the Plan area are dominated by lawn grass and a few mature trees. Golf courses occupy about 2,180 acres, or about 1% of the Plan area, and are found at elevations of about 90–1,970 feet.

# **Urban Riparian**

Urban riparian areas are creeks and riparian woodlands (often occurring as greenbelts) that are surrounded by urban and suburban development. They are generally disturbed by human activities, including transportation and recreational uses. The creeks are often straightened and channeled, and the riparian habitat is generally traversed by footpaths and bicycle paths. Wooded riparian areas within or close to urban and suburban areas that appeared to be undisturbed and unused for recreation were mapped as valley foothill riparian woodland. Urban riparian areas occupy about 420 acres, or less than 1% of the Plan area.

Urban areas often have disproportionate effects on stream environments. Some development projects in western Placer County have been permitted to encroach into floodplain environments within 10–20 feet of active steam channels. Placement of bridges, roads, paved areas, and structures within the lower floodplains of perennial streams often result in the removal of native vegetation and unnaturally narrowed channels that make them more prone to flooding and erosion. The native riparian species in urban areas are frequently displaced by noxious weeds and other invasive non-native species, such as Himalayan blackberry, that can form a single-species monoculture over miles of affected stream corridor. In outlying communities, suburban developments often have more mature vegetation and greater wildlife species diversity (Mayer and Laudenslayer 1988, as cited in JSA 2004).

#### **Urban Woodland**

Urban woodland includes city parks with predominantly tree-dominated vegetation, windbreaks with mostly non-native trees, and remnant patches of the former tree cover, usually oak woodland land cover types, that are disturbed and surrounded by urban development. Urban woodland areas occupy about 480 acres, or less than 1% of the Plan area. Species composition of urban woodland often varies with the age

of the community, reflecting the changing preferences of homeowners and designers. Common landscape tree species include sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), deodar cedar (*Cedrus deodara*), linden tree (*Tilia* spp.), Modesto ash (*Fraxinus velutina*), Washington hawthorn (*Crataegus phaenopyrum*), and English holly (*Ilex aquifolium*). In newer developments, frequently planted trees include liquidambar (*Liquidambar* sp.), European birch (*Betula* sp.), weeping willow, coast redwood (*Sequoia sempervirens*), purple-leaf plum (*Prunus* spp.), and eastern dogwood (*Cornus florida*). Locally native oak and conifer species are rarely planted and are not widely available in local nurseries.

#### **Urban Wetland**

Urban wetland includes vernal pools, seasonal wetlands, and fresh emergent wetlands that are surrounded by urban and residential development. These areas occupy about 55 acres or much less than 1% of the Plan area.

# **Eucalyptus Woodland**

Eucalyptus groves have been planted as windbreaks and for firewood in various rural-residential forested and agricultural areas in western Placer County. Most of these groves are small (less than 5 acres), and their combined acreage is only about 60 acres in the Plan area.

### **Landscape and Golf Course Ponds**

Ponds mapped as landscape and golf course ponds were less than 1 acre in extent; larger ponds were mapped as lacustrine ecosystems. Many of these ponds were created by excavation and damming of seasonal creeks. These ponds are typically constructed for aesthetic purposes or to enhance golf course design; the surrounding vegetation is frequently maintained by mowing and trimming. Some ponds support a narrow fringe of fresh emergent wetland vegetation. Landscape ponds in rural-residential settings may be planted with horticultural plants that can become invasive (e.g., giant reed, pampas grass, yellow water iris). Landscape and golf course ponds occur at elevations of about 95–1,883 feet. About 125 acres of landscape and golf course ponds were mapped in the Plan area; 96% of these habitats are on private land.

#### **Disturbed Lands**

Disturbed lands are historically and recently disturbed sites such as landfills and graded nonagricultural lands. Barren rock or soil dominates the ground layer, and tree and shrub cover is typically sparse or absent. Vegetation is usually absent and wildlife values are low.

#### **Common Wildlife Associations**

Urban and suburban areas tend to support a low diversity of wildlife. However, some species thrive in urban and suburban areas and tend to be in greater abundance than in natural habitats. Urban and suburban areas in the Plan area support about 67 vertebrate species—25 breeding species and 42 visitors. Some wildlife typical of urban and suburban habitats include feral and free-ranging cats (*Felis catus*) and dogs (*Canis lupus familiaris*), raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), opossums, coyotes, western scrub-jays, Steller's jays (*Cyanocitta stelleri*), and American crows.

Rural-residential areas may support about 122 vertebrate species—65 breeding species and 57 visitors. Native species that may occur in rural-residential areas include yellow-billed magpie, American crow, western scrub-jay, house wren, and brown-headed cowbird. The high densities of exotic fruits and flowers, bird baths, and hummingbird and seed feeders attract Anna's hummingbird, rufous hummingbird (*Selasphorus rufus*), California towhee, spotted towhee, golden-crowned sparrow, white-crowned sparrow, and American goldfinch (*Carduelis tristis*). Likewise, produce from vegetable gardens and pet food put out overnight attract resident mammals such as Virginia opossum, Norway rat (*Rattus norvegicus*), black rat, house mouse, raccoon, and striped skunk.

Rural-residential forested areas support about 122 vertebrate species—70 breeding species and 52 visitors. Native species that may occur in unnaturally high densities in rural-residential forested areas include raccoon, Botta's pocket gopher, cliff swallow, yellow-billed magpie, American crow, Steller's jay, western scrub-jay, brown-headed cowbird, and Brewer's blackbird (*Euphagus cyanocephalus*). Non-native animals that frequent rural-residential forested areas of western Placer County include house sparrow, European starling, wild turkey, bullfrog, black rat, Norway rat, and house mouse.

Golf courses support about 131 vertebrate species—70 breeding species and 61 visitors. Wildlife species typically found in these areas are Canada goose, American coot, red-shouldered hawk, northern flicker (*Colaptes auratus*), black phoebe, white-breasted nuthatch (*Sitta carolinensis*), northern mockingbird (*Mimus polyglottos*), western tanager (*Piranga ludoviciana*), bobcat (*Lynx rufus*), and mule deer.

Despite their small size, urban riparian areas support about 137 vertebrate species—83 breeding species and 54 visitors. Urban riparian habitats usually support more species than other urban habitat types (Erlich et al. 1988, as cited in JSA 2004). Strips of habitat (greenbelts) along streams can make urban areas much more attractive to birds and other wildlife, as well as to people. Some typical native species that might be found in urban greenbelt areas of western Placer County include Anna's hummingbird, cedar waxwing, western bluebird, American robin, black-headed grosbeak, house finch, Bullock's oriole, Douglas squirrel (*Tamiasciurus douglasii*), western gray squirrel, and mule deer.

Urban woodland areas support many of the same vertebrate species that occur in urban riparian areas. Strips of urban woodland (greenbelts) can make urban areas much more attractive to birds and other wildlife, as well

as to people. Some of the native species that might be found in urban greenbelt areas of western Placer County include Anna's hummingbird, cedar waxwing, western bluebird, American robin, black-headed grosbeak, house finch, Bullock's oriole, Douglas squirrel, western gray squirrel, and mule deer.

Urban wetlands support about 34 vertebrate species—20 breeding species and 14 visitors. Native species that might be found in urban wetlands are California newt, Pacific tree frog, mallard, American coot, red-winged blackbird, and muskrat.

Eucalyptus trees (*Eucalyptus* spp.) flower in winter, producing large quantities of nectar, and are highly attractive to a variety of nectar- and insect-foraging birds. Anna's hummingbird, rufous hummingbird, ruby-crowned kinglet, bushtit, yellow-rumped warbler (*Dendroica coronata*), American goldfinch, and house finch are among the species that are especially abundant in eucalyptus groves of the Plan area. While eucalyptus groves provide an important food source for many birds, these introduced trees also produce a resin that coats birds' beaks and feathers and clogs their faces and bills, eventually causing them to suffocate or starve (Stallcup pers. comm., as cited in JSA 2004).

Despite their small size, managed vegetation, and human disturbance, landscape and golf course ponds provide a year-round water source for wildlife.

Artificially disturbed lands support only about 14 vertebrate species. Two breeding species and 12 visitors—occur in these areas. Local landfills may attract large numbers of foraging and roosting gulls, especially in winter.

# **Covered and Special-Status Species**

Few special-status species occur in the developed lands of the Plan area, likely due to the lack of suitable habitat, human disturbance, and the high numbers of native and introduced predators that thrive there (Erlich et al. 1988, as cited in JSA 2004).

#### **Urban and Suburban**

Special-status animal species that are known to visit urban and suburban habitats of the Plan area, and that are covered by this Plan, include yellow warbler (primarily stopping over during migration in all developed land-cover types) and Modesto song sparrow.

#### **Rural-residential**

Special-status animals that are known to visit rural-residential habitats of the Plan area, and that are covered by this Plan, include yellow warbler, Modesto song sparrow, and tricolored blackbird.

#### Rural-residential Forested

Special-status animals that are known to visit rural-residential forested habitats of the Plan area, and that are covered by this Plan, include Cooper's hawk, Swainson's hawk, yellow warbler, and Modesto song sparrow.

#### **Urban Parks Golf Courses and Landscape and Golf Course Ponds**

Special-status animals that are known to visit urban parks and golf courses and landscape and golf course ponds of the Plan area, and that are covered by this Plan, include northwestern pond turtle, yellow warbler, Modesto song sparrow, and tricolored blackbird.

## **Urban Riparian**

Special-status animals known to visit urban riparian areas of the Plan area, and that are covered by this Plan, include northwestern pond turtle, yellow warbler, and Modesto song sparrow.

# **Urban and Eucalyptus Woodland**

Special-status species that may visit urban and eucalyptus woodland areas of the Plan area, and that are covered by this Plan, include northwestern pond turtle, yellow warbler, Cooper's hawk, Swainson's hawk, and Modesto song sparrow.

#### **Urban Wetland**

One special-status plant species that is not covered by this Plan, Sanford's arrowhead, is known to occur in urban wetlands in Sacramento County very close to the Placer County line.

Special-status species that may visit urban and eucalyptus woodland areas of the Plan area, and that are covered by this Plan, include Modesto song sparrow and tricolored blackbird.

#### **Disturbed Land**

No covered species are known to occur on disturbed land in the Plan area.

# 3.4 Trends and Foreseeable Change

[Discussion from Chapter 10, Assurances, will be moved here. The intent is to place in Chapter 3 the reasonably anticipated trends, including catastrophic events such as fire and flood, which are incorporated in the planning basis for the PCCP.]