Chapter III:
Results of Watershed Analysis

CHAPTER III: RESULTS OF WATERSHED ANALYSIS

Phase I Planning Area Watersheds

The Phase I Planning Area comprises 38 watersheds totaling about 110,760 hectares (273,690 acres) (Figure 1, Table 5). Approximately 106,650 hectares (263,515 acres), or about 96% of the Phase I Planning Area, are in private ownership. Individual watersheds in this study varied from 1,395 to 5,984 hectares (3,446 to 14,787 acres) in area. A total of 34 large-patch ecosystems and land-cover types and six small-patch ecosystems were mapped and verified in the field (Appendix I, Tables 5 and 6).

Placer County spans a region from the southeastern portion of the Sacramento Valley and lower Sierra foothills to the Sierra crest and east to the Nevada state line in a transitional zone between the Great Basin and California Floristic provinces (Hickman 1993). Two geographic subdivisions of the California Floristic Province are found in the Phase I Planning Area: Sacramento Valley and Northern Sierra Nevada Foothills (Hickman 1993). Elevations in the Phase I Planning Area range from approximately 9 meters (30 feet) in the extreme western part of the county to 677 meters (2,220 feet) north of Auburn.

Plant Diversity

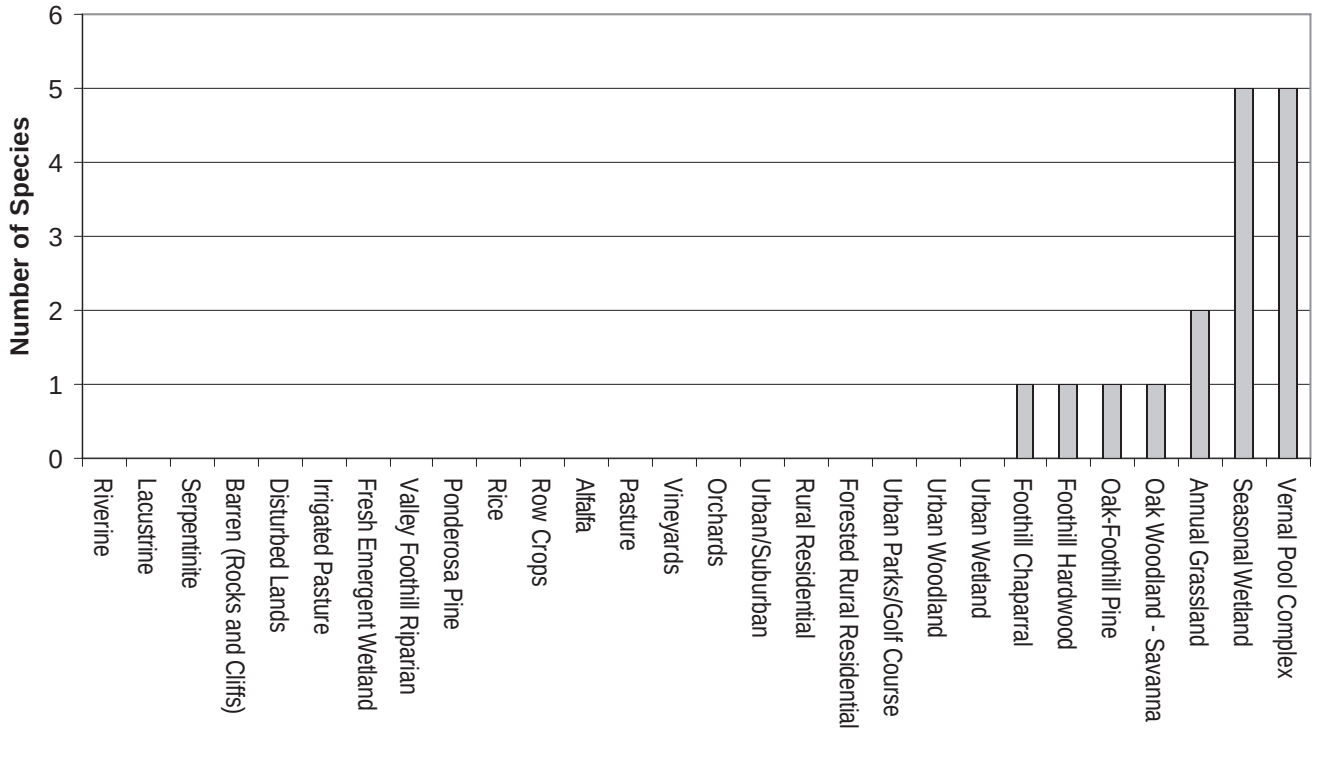
Placer County supports a rich flora, with 1,586 taxa (including subspecies and varieties) recorded or documented as occurring in the county (Appendix II). The flora comprises 525 genera of plants in 107 families. Flowering plants comprise 97% of the flora, of which 22% (346 taxa) are monocots (i.e., grasses, grass-like plants, orchids, and lilies) and 75% (1,191 taxa) are dicots (all other flowering plants). The remaining taxa are ferns and fern-allies, which make up 2% of the county's flora (32 taxa), and gymnosperms (conifers), which constitute only 1% of the total number (17 taxa). The most species-rich families are the Asteraceae (sunflower family) with 212 taxa, Poaceae (grass family) with 159 taxa, Scrophulariaceae (figwort family) with 100 taxa, and Fabaceae (the legume or bean family) with 95 taxa. These four families together account for more than a third of the total taxa listed for the county. In contrast, 40 families are represented by one or two species each. Of the 1,586 plant taxa found in Placer County, about 15% are naturalized nonnative species. These nonnative species have been introduced into California since colonization by Europeans (Hickman 1993).

The Phase I Planning Area lacks a comprehensive floristic treatment or checklist of vascular plants. Much early exploration and collecting in Placer County focused on higher regions of the Sierra Nevada, and especially the Tahoe Basin. Local floristic checklists and floras include the Norden area (Howell 1943), the headwaters basin of the North Fork American River (Palmer et al. 1983), and the Tahoe Basin (Smith 1973). Placer County appears to be undercollected in comparison to Nevada and El Dorado Counties, which are adjacent to Placer County and exhibit similar geography (U.S. Department of Agriculture 2002; CalFlora 2003). It is likely that many of the almost 1,000 taxa presumed to occur here on the basis of generalized distributional information in regional or statewide floras (CalFlora 2003) may be discovered or documented in the future.

Special-Status Plants

A total of 51 special-status plants are either known from Placer County or have high potential to occur there based on the presence of suitable habitat and occurrences in nearby areas (Appendix III). Two of these, Boggs Lake hedge-hyssop and Tahoe yellow cress, are listed as Endangered under CESA. Twenty-seven special-status plant species, including Boggs Lake hedge-hyssop, could occur in the Phase I Planning Area (Appendix IV). Five species (Boggs Lake hedge-hyssop, dwarf downingia, Ahart's dwarf rush, Red Bluff dwarf rush, and legenere) may be covered under the Phase I Planning Area NCCP/HCP (see Chapter 4. Species Accounts); all five are associated primarily with Vernal Pool ecosystems. There is little distributional information for several of the special-status plants that could potentially occur in the Phase I Planning Area. For example, True's manzanita, dissected-leaved toothwort, tripod buckwheat, and stinkbells may occur in the Phase I Planning Area, but apparently they have not been documented with specimen records. No surveys for special-status plant species were conducted for this report.

Figure 2. NCCP/HCP Special-Status Plants in Large-Patch Ecosystems in the Phase I NCCP/HCP Planning Area of Placer County.



Special-Status Plant and Habitat Relationships

A matrix of the special-status plant richness for the 34 PCWHR large-patch ecosystems and one small-patch ecosystem is provided in Appendix IV. The matrix shows that three large-patch ecosystems—Foothill Chaparral, Foothill Hardwood Woodland, and Oak–Foothill Pine Woodland—potentially support approximately half of the special-status plants in the Phase I Planning Area that are not Vernal Pool ecosystem associates. Three other ecosystems—Seasonal Wetlands, Serpentine Soils, and Oak Woodland-Savanna—provide suitable habitat for approximately 10 species. Most of the special-status plants that could occur in these ecosystems are associated with specific microhabitat conditions, such as small canopy openings, disturbed soils, or seasonally moist sites. Other species are geographically restricted in distribution; consequently, not all areas of a particular ecosystem have equal potential for occurrence of these species.

Large-patch ecosystems and land-cover types with little to no potential for special-status plants include all the anthropogenic habitats, such as Orchards, Vineyards, Croplands, and Urban areas. However, several small remnants of Serpentine Soils in urbanized areas of Auburn could support populations of special-status plants. Several natural ecosystems, such as Riverine, Lacustrine, Oak–Foothill Pine (except on serpentine soils), Fresh Emergent Wetland, and Foothill Riparian Woodland, have little potential to support these species (Appendix III).

Unique Features of Placer County Phase I Planning Area Plant Communities

Two ecosystems in the Phase I Planning Area support unique and distinctive plant communities: Vernal Pool Complexes and Serpentine Soils.

Western Placer County contains some large areas of intact Vernal Pool Complexes, an ecosystem that is becoming increasingly rare; it is estimated that more than 90% of California's Vernal Pools have been lost (Holland 1976). The Phase I Planning Area contains most of the Volcanic Mudflow Vernal Pools that remain in the southeastern portion of the Sacramento Valley

(California Department of Fish and Game 2001). Vernal Pools support a distinctive native plant community with a high level of endemism (Jain 1976) and a relatively large number of rare, threatened, or endangered species (Holland and Jain 1988; California Native Plant Society 2001; California Natural Diversity Database 2003). Five special-status plant species occur in Vernal Pools in western Placer County: Boggs Lake hedge-hyssop, legenere, dwarf downingia, Ahart's dwarf rush, and Red Bluff dwarf rush (Table 4).

Serpentine Soils also support a distinctive plant community with a high degree of endemism (Kruckeberg 1984). This ecosystem occupies approximately 340 hectares (840 acres) in the Auburn area. Serpentine substrates are less extensive in Placer County than in neighboring counties (Stebbins 1984), and no species or subspecies are known to be endemic to Serpentine Soils habitats in Placer County. Western Placer County serpentines may support several special-status plants: Congdon's onion, Sanborn's onion, dissected-leaved toothwort, Red Hills soapwort, tripod buckwheat, stinkbells, Butte County fritillary, sylvan microseris and, occasionally, bigscale balsamroot (Appendix IV).

Nonnative Invasive Plants

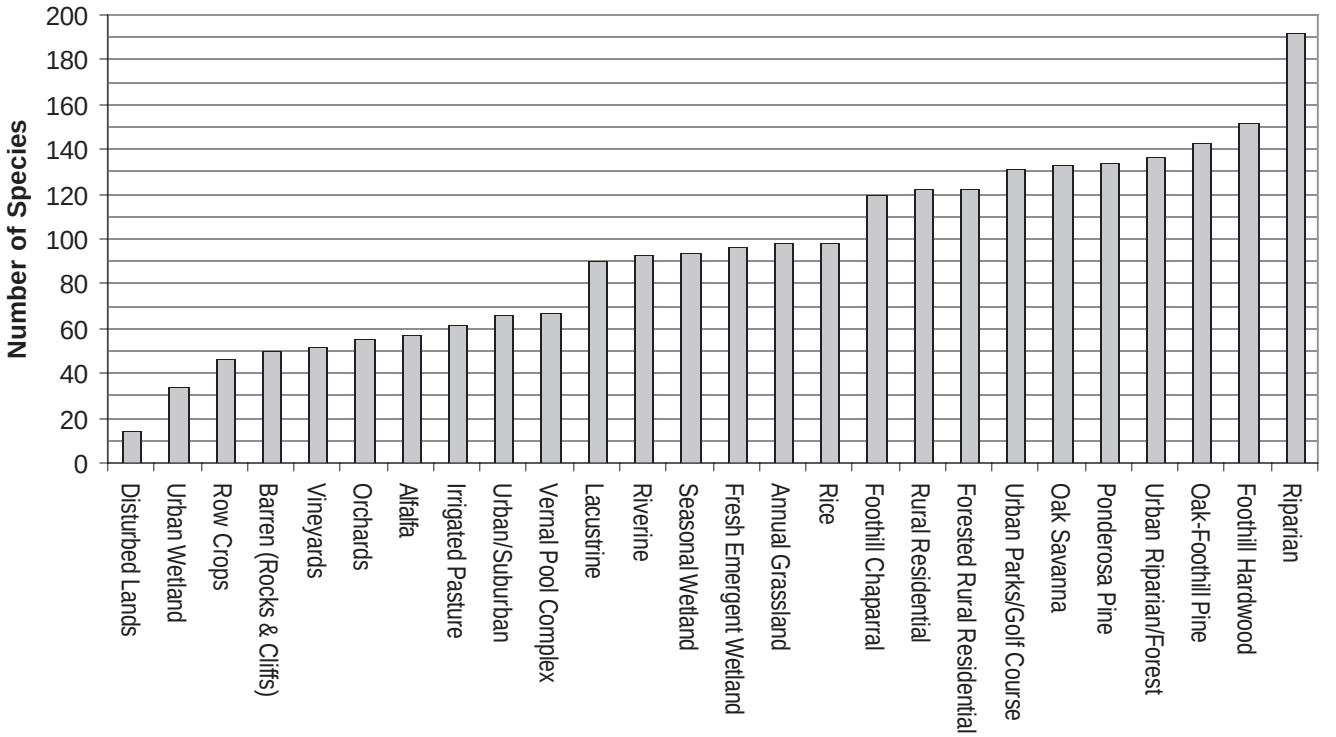
The flora of Placer County includes approximately 242 nonnative plant species that have become naturalized or that grow in uncultivated areas (CalFlora 2003). Ornamental species growing exclusively in gardens or other landscaped settings are not included in this total. Nonnative plants represent about 15% of the county's total flora, a figure slightly lower than the statewide average of 17.3% (Hickman 1993). Approximately 21% of monocots in Placer County are nonnative, a figure that reflects the large number of nonnative grasses (70 taxa) recorded in the county (Appendix II). Nonnative plants tend to be disregarded by most collectors, and are therefore less well documented than native plants (Hickman 1993); consequently, many nonnative species that are relatively common in Placer County are not represented by specimens in the large herbaria. The exceptions are primarily invasive species, which are of concern to agricultural, land, and resource management agencies, particularly CDFA.

Invasive nonnative plants are defined as plants that are able to proliferate and aggressively alter or displace indigenous biological communities (Schwartz et al. 1996). The most invasive nonnative plants degrade natural areas because they can exclude native species, displace natural communities, promote faunal change, reduce biological diversity, disrupt ecosystem processes, alter fire frequencies, restrict economic return on crops, reduce recreational values, threaten endangered species, and fundamentally alter the unique character of California (CalEPCC 1999). An informal analysis by DFG found that 23% of California's 280 plant communities are heavily affected by nonnative plants, and another 28% are moderately affected (Keeler-Wolf 1993).

The invasions of agricultural areas, ranch lands, and natural ecosystems by noxious weeds have caused agriculturalists and habitat conservationists to work cooperatively around the state. The major noxious weeds targeted for biological control in Placer County are yellow star-thistle, Italian thistle, Klamathweed, skeleton weed, and puncture vine (Placer County 2001); many other noxious and invasive plants also have the potential to occur and spread (Table 3).

In the Phase I Planning Area, the large-patch ecosystems and land-cover types most affected by invasive nonnative plants are Agricultural Areas, Foothill Riparian Woodland, and Rural/Residential areas, and the most widespread noxious weeds or invasive nonnative plants are yellow star-thistle, ripgut grass, medusa-head, Himalayan blackberry, and Italian thistle. Yellow star-thistle is common in Rural/Residential areas in the foothills, where it can form dense stands in undergrazed fields and roadsides. Himalayan blackberry is often the dominant understory shrub in Riparian Woodlands in the foothills and valley floor, blanketing the riparian corridor with a dense cover that excludes other plant species. Other noxious weeds seen in Riparian Woodland, especially near Rural/Residential areas, are periwinkle, edible fig, and giant reed. Scarlet wisteria, a highly invasive riparian tree, has been detected at Miner's Ravine in Roseville. Purple loosestrife, an herbaceous plant that is invasive in wetlands, is reported from the Lincoln area (California Department of Food and Agriculture 2000). Sesbania has been observed in the Dry Creek watershed (Placer County Planning Department, file data). Annual grasses, including medusa-head, are frequent on roadsides in agricultural areas. Other weeds reported from the Phase I Planning Area by CDFA (CalFlora 2003) include barbed goatgrass, whitetop (three species), skeleton weed, artichoke thistle, and perennial pepperweed.

Figure 3. Total Vertebrates in Large-Patch Ecosystems in the Phase I NCCP/HCP Planning Area of Placer County.



Animal Diversity

The Phase I Planning Area provides habitat for about 268 regularly occurring native vertebrates, 35 introduced species, and 40 extremely rare species (i.e., recorded five or fewer times in the county). Fourteen other species may occur in the county, based on their known ranges and habitat requirements, but no definite records for these species exist (Appendix V). In all, representatives of 104 vertebrate families are known to occur in the Phase I Planning Area.

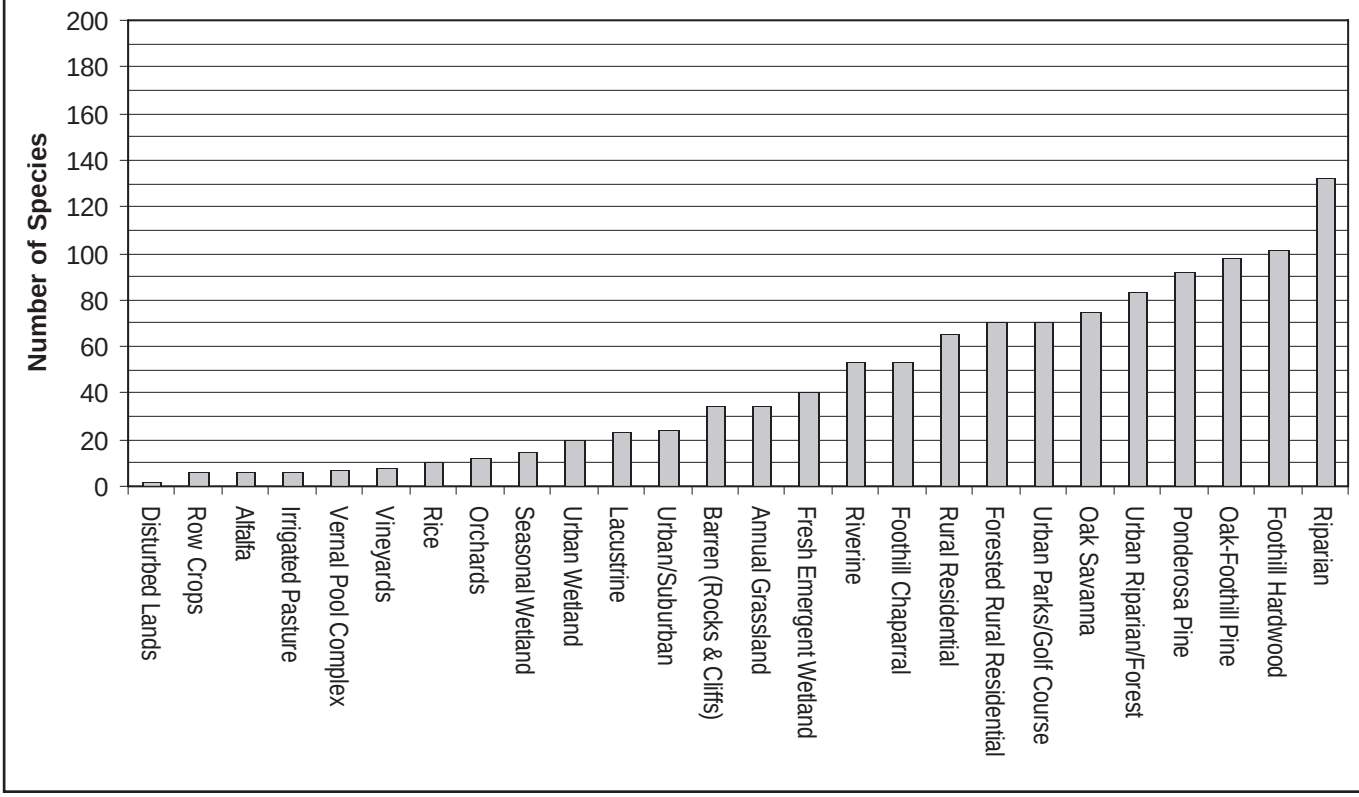
Fishes are represented by 12 families, with 12 native species and 26 nonnative introduced species (Appendix V). Amphibians are represented by seven families with six native species and one nonnative introduced species (bullfrog). Amphibians are most closely associated with aquatic ecosystems, but many species also use a variety of other terrestrial ecosystems for breeding, foraging, or escape cover (Appendices VI and VII).

Reptiles are represented by eight families, with 20 native species and no introduced species. Reptile species can be found in all the aquatic and terrestrial large-patch ecosystems in the Phase I Planning Area (Appendix VII).

Birds, the most diverse vertebrate group in the Phase I Planning Area, are represented by 54 families, with 190 native species that occur regularly (i.e., at least once per year) in the County and 39 other species that have extremely rare and/or irregular occurrences. The County bird list also includes five introduced species: ring-necked pheasant, wild turkey, rock dove (domestic pigeon), European starling, and house sparrow. A total of 235 regular, extremely rare, and introduced bird species have been documented in Placer County (Appendix V).

Mammals, the second most diverse vertebrate group in the Phase I Planning Area, are represented by 23 families, with 40 native species and six nonnative introduced species: Virginia opossum, muskrat (probably introduced), black rat, Norway rat, house mouse, and wild pig (Appendix IV).

Figure 4. Total Breeding Vertebrates in Large-Patch Ecosystems in the Phase I NCCP/HCP Planning Area of Placer County.



Special-Status Animals

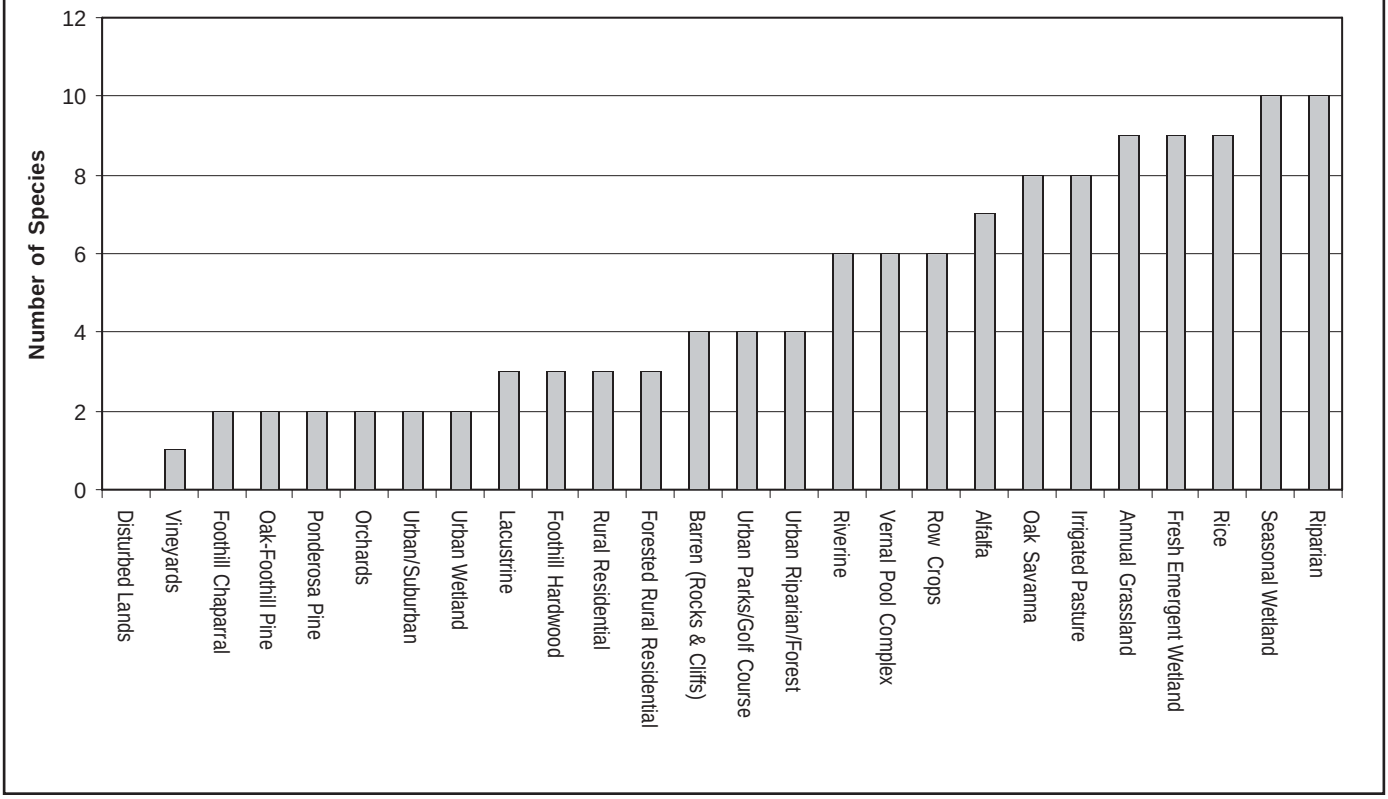
Twenty-seven animal species with known or potential occurrence in western Placer County were included on the list of target species that may be covered under the Phase I Planning Area NCCP/HCP (Table 4 and Appendices VI and VII). These species are: vernal pool fairy shrimp, vernal pool tadpole shrimp, California linderiella, valley elderberry longhorn beetle, Central Valley fall run chinook salmon, Central Valley steelhead, California tiger salamander, foothill yellow-legged frog, California red-legged frog, western spadefoot toad, northwestern pond turtle, giant garter snake, bald eagle, Swainson's hawk, northern harrier, ferruginous hawk, rough-legged hawk, American peregrine falcon, California black rail, California burrowing owl, western yellow-billed cuckoo, bank swallow, yellow warbler, yellow-breasted chat, Modesto song sparrow, grasshopper sparrow, and tricolored blackbird (Table 4).

Three species—California red-legged frog, giant garter snake, and western yellow-billed cuckoo—were included on the working list of covered species for the Phase I NCCP/HCP because they are known to occur in adjacent counties (California Natural Diversity Database 2003), and because potentially suitable habitat areas exist for them in western Placer County. However, none of these species has been documented recently in the Phase I Planning Area (California Natural Diversity Database 2003). Two species, the California black rail and grasshopper sparrow are extremely rare in the Phase I Planning Area (Appendix VI).

Wildlife and Habitat Relationships

A matrix of the occurrence and breeding status of each of the regularly occurring native and nonnative fishes, amphibians, reptiles, birds, and mammals in the 34 NCWHR large-patch ecosystems in the Phase I Planning Area is provided in Appendix VII. Two land-cover types, Valley Foothill Riparian Woodland and Foothill Hardwood Woodland, support more than 150

Figure 5. NCCP/HCP Special-Status Animals in Large-Patch Ecosystems in the Phase I NCCP/HCP Planning Area of Placer County.



visitors and breeding species (Figures 3 and 4). Large-patch ecosystems supporting the fewest total species (i.e., <60 visitors and breeding species) are Disturbed Lands, Row Crops, Alfalfa, Vineyards, Orchards, and Urban Wetlands.

Some large-patch ecosystems are more likely to support special-status animals than others. The highest numbers of special-status vertebrates can be found in Fresh Emergent Wetlands, Valley Foothill Riparian Woodland, Annual Grassland, and Riverine ecosystems (Figure 5). Vernal Pool Complexes provide the only suitable habitat for special-status invertebrates: vernal pool fairy shrimp, vernal pool tadpole shrimp, and California linderiella (Appendix VII, Figure 5).

Mapped Ecosystems of the Phase I Planning Area

Aquatic and Open Water Ecosystems

Lacustrine

Structural and Ecological Characteristics

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 this report, Lacustrine features as small as 0.4 hectare (0.1 acre) or as large as hundreds of hectares were mapped in the Phase I Planning Area. Aquatic features less than 0.4 hectare (0.1 acre), such as small stock ponds, are found throughout the Phase I Planning Area. However, most of these shallow features were not mapped as Lacustrine ecosystems due to limitations of scale in the aerial photography. Small and often intermittent wetland features are not deepwater or fish-bearing aquatic habitats, but some have a high probability of containing rare invertebrates and plants (Erman 1996).

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).

Many artificial reservoirs and agricultural or residential ponds exist in the Phase I Planning 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.

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 a meter or two can prevent plants from establishing at the shoreline or aquatic plant beds from developing. Reservoirs are usually built in steep-sided canyons with only small areas of shallow-water 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). The dam end is usually deep and stratifies in summer, with a warmer layer near the surface and a cool or cold layer at the bottom. Stratification also characterizes deep natural lakes.

Plant Diversity

Phytoplankton are the tiny suspended plants, such as diatoms, desmids, and filamentous green algae, that dominate deepwater (>1.8 meters [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). 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 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 ponds and reservoirs in the foothills of 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. Noxious aquatic weeds known from in or near western Placer County include water hyacinth, hydrilla, purple loosestrife, Eurasian milfoil, water hyacinth, and parrot's feather (Table 3).

Two special-status plants—slender-leaved pondweed and Sanford's arrowhead—may be associated with shallow-water habitats in Placer County (Appendix IV). 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 the foothill region of the county (Table 3).

Animal Diversity

Because of the importance of water to almost all wildlife, most vertebrate species use Lacustrine ecosystems to some degree. Ponds and reservoirs of the Phase I Planning Area support about 92 vertebrate species—24 breeding species and 68 visitors—(Appendix VII). 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 (Jones & Stokes 2003). Artificial water bodies also help to ameliorate the loss of natural wetlands by providing open water and mudflat habitats that may be used by these species.

Lacustrine ecosystems in western Placer County support at least 20 waterfowl species and many other waterbirds, and are used as wintering grounds or temporary stopover resting and foraging sites during migration. Typical waterfowl species include Canada goose, snow goose, white-fronted goose, mallard, northern pintail, American wigeon, gadwall, cinnamon teal, green-winged teal, canvasback, and ruddy duck. Other waterbirds that frequent Lacustrine ecosystems

include great blue heron, green heron, great egret, snowy egret, pied-billed grebe, western grebe, common loon, and American white pelican. Shorebirds (such as spotted sandpiper, western sandpiper, least sandpiper, killdeer, and Wilson's phalarope) and swallows (northern rough-winged swallow, tree swallow, violet-green swallow, and cliff swallow) are also common visitors to Lacustrine ecosystems in the Phase I Planning Area (Appendix VII).

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 Phase I Planning Area is near Granite Bay on the Placer County side of Folsom Lake (Webb pers. comm.). Bald eagle, American peregrine falcon, and bank swallow are special-status species hat are attracted to these large reservoirs (Appendices VI and VII).

Bats have a strong preference for foraging over open water; at least eight species are known to occur in the Phase I Planning Area. These include at least four special-status species: Yuma myotis, long-legged myotis, long-eared myotis, and pale Townsend's big-eared bat (Appendix VII).

Of the reptile and amphibian species associated with Lacustrine habitats, three are special-status species: western spadefoot, western pond turtle, and giant garter snake. The vast network of ponds, reservoirs, and associated canals throughout western Placer County are often the sites of exotic or nonnative species introductions and concentrations. Such species include many aquatic invertebrates (e.g., insects, snails, clams, crayfish); many nonnative fish species; and the widespread bullfrog. During times of high rainfall or stream flow, exotic species can be flushed from ponds and reservoirs into stream and river systems where they compete with or prey on native species. Bullfrogs and several species of bass are known to prey on the eggs or tadpoles of the declining foothill yellow-legged frog, as well as potentially exacting a significant toll on western pond turtle hatchlings or juveniles (Moyle 1973; Holland 1991). Hatchlings of wood ducks, mallards, and even Canada geese often fall prey to largemouth bass.

As a general rule, the more that a lake or stream is altered by human disturbance, the more likely it is to become dominated by nonnative fish species (Baltz and Moyle 1993). Environmental change resulting from reservoirs, dams, and diversions has been identified as the primary cause of the decline of seven fish species in the Sierra Nevada and as a contributing factor to the decline of 13 other species (Moyle et al. 1996). Reservoirs provide environmental conditions that generally favor nonnative species. Established nonnative species then invade stream reaches both upstream and downstream of the reservoir.

Dams alter flow and sediment transport regimes, adversely affecting area (e.g., spawning gravel) and quality (e.g., water temperature and fine sediment loading) of native species' habitat. They block upstream and downstream movement and migration to spawning and rearing habitat. Reservoirs 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 metapopulations and adversely affecting their genetic integrity. Reservoirs may also increase human use, affecting native species populations within reservoirs and in adjacent areas. Dams on major rivers have blocked access by spring-run Chinook salmon to more than 95% 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).

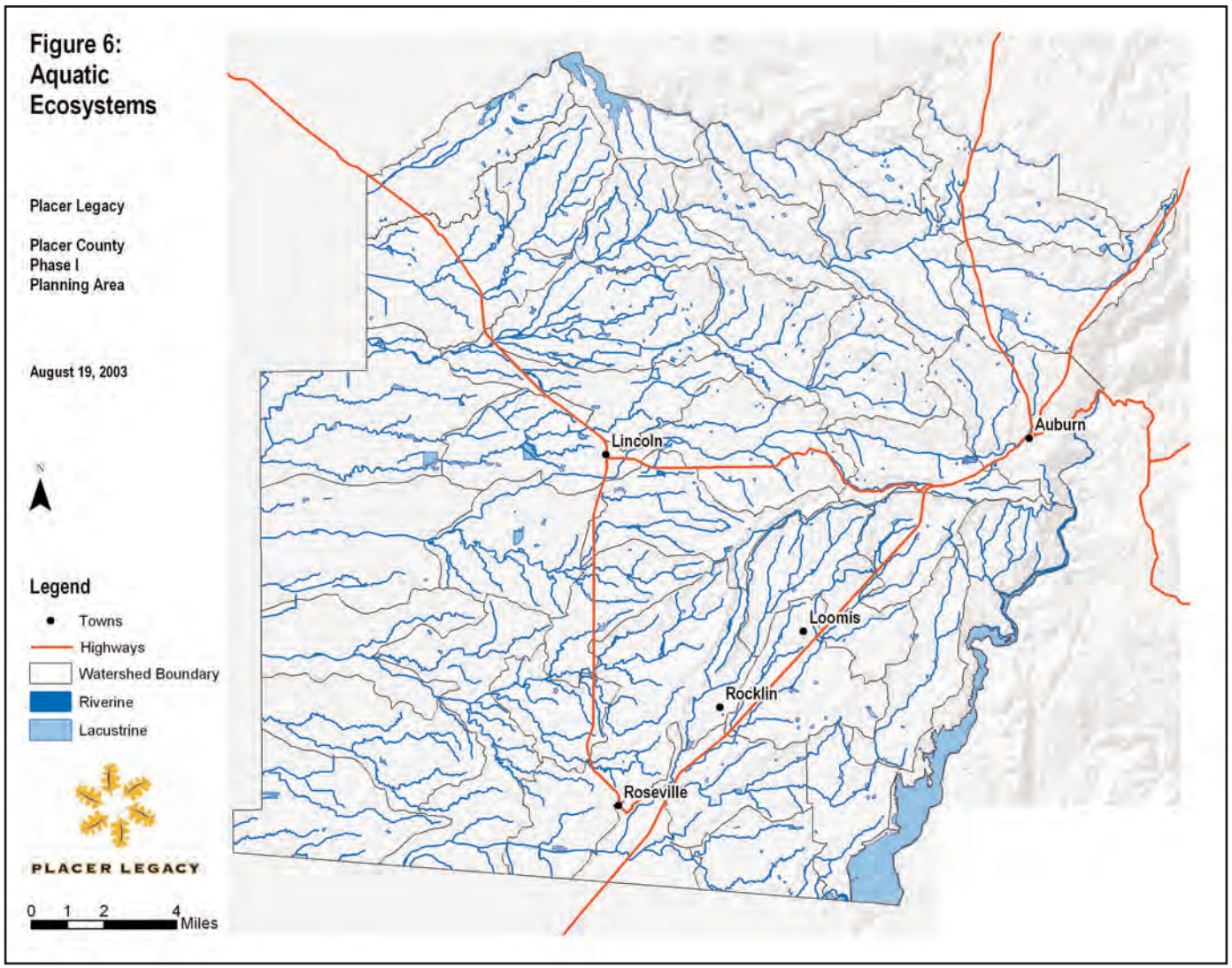
Distribution and Status

Lacustrine ecosystems, including reservoirs, are found throughout California at virtually all elevations, but they are less abundant in arid regions. Natural lakes did not occur in the foothill 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). Approximately 1,938 hectares (4,790 acres) of Lacustrine ecosystems were mapped in western Placer County (Table 5); these are widespread across the Phase I Planning Area (Figure 6).

Riverine

Structural and Ecological Characteristics

Moyle and Ellison (1991) developed a classification system for Sierra Nevada aquatic habitat types, including Riverine ecosystems. Riverine systems occurring in western Placer County comprise permanent, intermittent, and ephemeral streams (Figure 6). Intermittent streams receive some input from groundwater discharge in addition to precipitation runoff and flow seasonally; ephemeral streams receive no input from groundwater and flow only during and following storm events in response to precipitation runoff. The North



and Middle Forks of the American River, the Bear River, and all their tributaries are part of the Central Valley drainage of the Sacramento–San Joaquin River watershed.

Streams change greatly in character from their headwaters to their lower reaches. As low-order headwater streams unite to form larger streams and rivers (high-order streams), the water loses much of its clarity and the water temperatures rise. As streams leave the mountainous areas, the gradient becomes gentler, velocity decreases, and flow volume increases. Both low- and high-order streams in Placer County experience low-flow periods during summer and fall, except in streams (e.g., Coon Creek, Doty Ravine, and Auburn Ravine) where flow is augmented by conveyance of irrigation water.

In general, water temperatures in small, shallow streams tend to follow (but lag behind) air temperatures, warming and cooling with the seasons. Streams with large surficial areas exposed to direct sunlight warm more than those shaded by trees, shrubs, and high steep banks (Mayer and Laudenslayer 1988). Shallow and turbulent (e.g., those with riffles and cascades) streams generally have higher oxygen content than deep sluggish streams or streams with high levels of organic materials and contaminants. The surrounding watershed, nature of the substrate, water chemistry, climate, and gradient determine sediment input and transport rates and rates at which erosional and depositional processes modify the stream channel and adjacent floodplain. Higher-gradient streams have higher water velocities and increased capacities to transport sediment.

Descriptions of Riverine Ecosystems in Placer County

The Riverine ecosystems described below are characterized by fish assemblages in Central Valley streams in the Sacramento–San Joaquin Province as defined by Moyle (2002). Each assemblage of fish species is characteristic of stream systems that have distinct physical, chemical, and biological characteristics. The occurrence of endemic fishes and amphibians are key parts of the stream ecosystems. This method of stream classification assumes some overlap of species that may occur within the stream 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 21°C (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; riffle sculpin, Sacramento sucker, speckled dace, and California roach are often additional dominant species. In western Placer County, streams supporting the rainbow trout assemblage are represented by the upstream reaches and tributaries of the Bear River, North Fork American River, and Middle Fork American River, Auburn Ravine, and Coon Creek.
- *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 30°C (86°F). California roach is the main permanent native fish resident in these streams. Other native species may include Sacramento sucker and Sacramento pikeminnow. The nonnative green sunfish 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. However, surveys to accurately characterize these streams have not been conducted.
- *Pikeminnow-hardhead-sucker assemblage streams* are low- to mid-elevation 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 (19–22°C [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 are known to occur in Auburn Ravine.

  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. Nonnative species such as green sunfish, smallmouth and largemouth bass, carp, and black bullhead 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.
- *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. Nonnative species, including largemouth bass, white and black crappie, black bullhead, red shiner, threadfin shad, 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.

Plant Diversity

Aquatic mosses and heavily branched filamentous algae are held to rocks by strong holdfasts and align with the current (Mayer and Laudenslayer 1988). Other algae grow in spheric or cushion-like colonies with smooth, gelatinous surfaces. Algae growth in streams is influenced by depth and current, often exhibiting vertical zonation on rocks, and by nutrient, sediment, and contaminant load.

The terrestrial riparian vegetation that lines the banks of Riverine ecosystems is treated separately in the discussions of Foothill Riparian Woodland and Fresh Emergent Wetland. Common aquatic and emergent plants of foothill regions of Placer County include mosquito fern, gibbous duckweed, Canadian waterweed, common bulrush, broadleaf cattail, horsetail, and water plantain.

Animal Diversity

Riverine 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 Riverine ecosystems in western Placer County. Invertebrates that might be found in the county's rivers and creeks include mayflies, alderflies, stoneflies, dragonflies, damselflies, water striders, and caddisflies.

In Placer County, low-elevation Riverine ecosystems support about 95 vertebrate species—54 breeding species and 41 species that primarily visit during winter or in migration (Appendix VII). Riverine ecosystems in western Placer County support a diverse fish fauna comprising 12 native species and 18 nonnative species. Low-elevation rivers and large, perennial creeks (e.g., the Bear River, Coon Creek, Doty Ravine, Auburn Ravine, Antelope Creek, Secret Ravine, and Miners Ravine) support small runs of Central Valley fall/late fall–run Chinook salmon and Central Valley steelhead. Other native fish species include hitch, Sacramento roach, hardhead, Sacramento sucker, riffle sculpin, Sacramento pike-minnow, and Pacific lamprey (Appendices VI and VII).

Fish-eating birds such as ospreys and bald eagles forage for fish near the surface of pools and shallow waters along the Bear River. Belted kingfishers, double-crested cormorants, and common mergansers also forage for fish in streams and reservoirs. Many amphibians and reptiles depend on Riverine ecosystems; these include California newt, western toad, foothill yellow-legged frog, western terrestrial garter snake, western aquatic garter snake, and western pond turtle (Appendix VII).

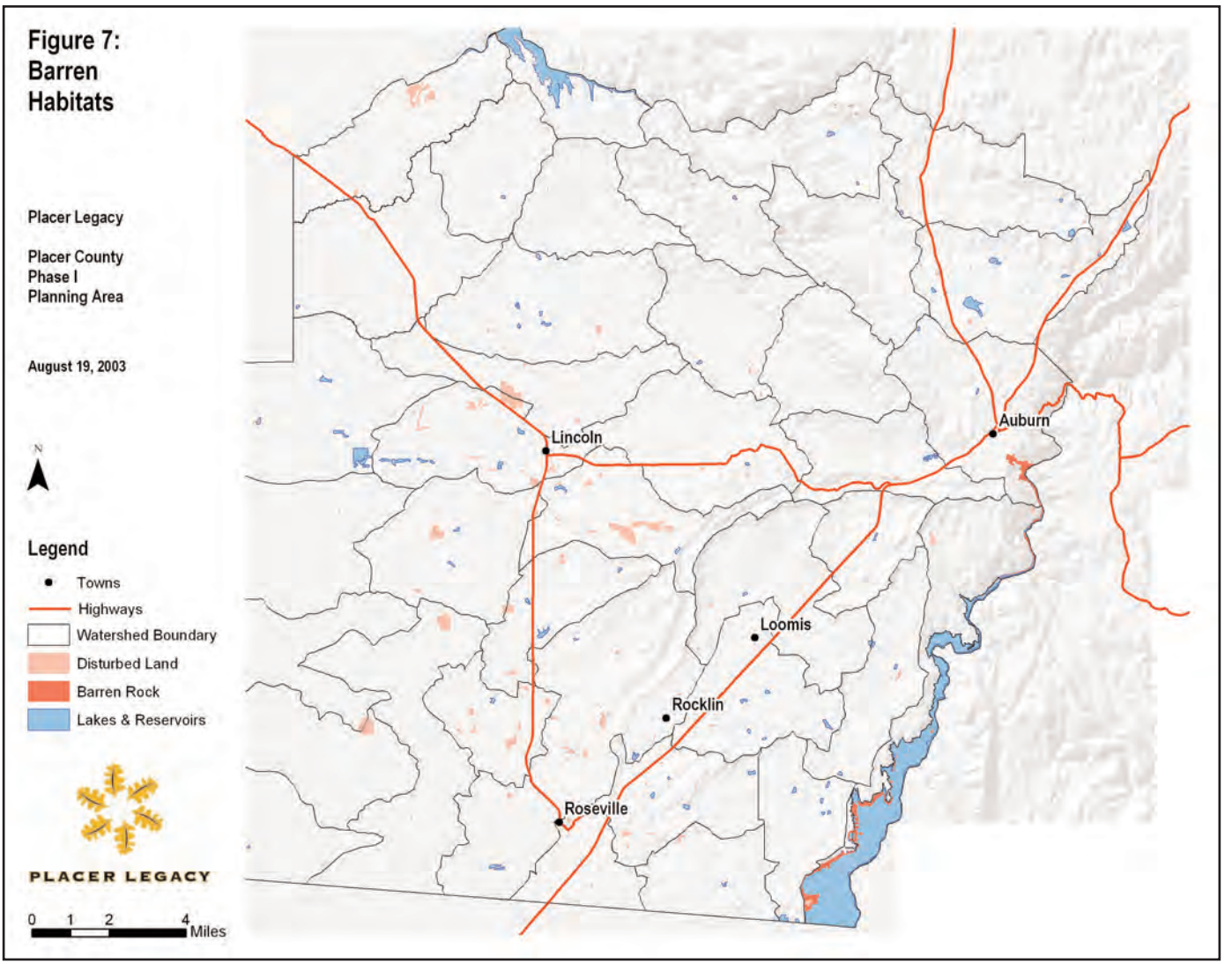
Characteristic mammals in Riverine ecosystems include northern river otter, American mink, muskrat, and American beaver. Emerging aquatic insects are a major food source for many bat species that forage over open waters.

Distribution and Status

In California, Riverine ecosystems occur statewide from sea level to about 2,438 meters (8,000 feet) (Mayer and Laudenslayer 1988). About 146 hectares (360 acres) of Riverine ecosystems were mapped in the Phase I Planning Area at elevations of about 15–458 meters (50–1,500 feet). Rivers and creeks represent much less than 1% of the total land area of the Phase I Planning Area; approximately 82% of this habitat is on private land (Table 5).

Rivers and creeks are among the most altered large-patch ecosystems in the Sierra Nevada. Two major impacts are the more than 400 dams (25 feet or more in height) and the significant amounts of hydraulic mining debris that passed through these systems historically (Kattelmann 1996).

The decline and loss of Riverine ecosystems are principal reasons why so many species of aquatic invertebrates, fish, and amphibians in the Sierra Nevada are in decline (Moyle 1996). Factors contributing to 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); 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 nonnative species (Meehan 1991).



Barren Ecosystems

Barren: Rocks, Cliffs, and Disturbed Areas

Structural and Ecological Characteristics

Barren areas (Figure 7) comprise natural features such as rock outcrops and cliffs, as well as historically and recently disturbed sites such as landfills and graded nonagricultural lands. In all cases, barren rock or soil dominates the ground layer, and tree and shrub cover is typically sparse or absent. In artificially disturbed areas, typically found in developing urban areas, vegetation is usually absent and wildlife values are low.

Plant Diversity

Pockets of Foothill Chaparral and Annual Grassland may be present within natural Barren areas. Shrubs range from 1 to 6 feet in height, and dominant species usually include chamise, whiteleaf manzanita, buck-brush, and shrubby interior live oaks. Small, scattered stands of conifer forest within Barren Areas are dominated by foothill pine and incense cedar.

Several special-status plants are known to occur or could potentially occur on Barren rock outcrops in river canyons of the Phase I Planning Area: Congdon's onion, Sanborn's onion, depauperate milk-vetch, and Red Hill soaproot (Appendices II and IV).

Animal Diversity

Despite their steep gradients and lack of vegetation, cliffs and rock outcrops are surprisingly rich in wildlife values. Approximately 50 vertebrate species—34 breeding species and 16 visitors—occur in these ecosystems (Figure 3, Appendix VII).

A variety of birds and mammals find safety and breeding sites within rocky crevices. Typical rock and cliff birds include white-throated swift, canyon wren, rock wren, common raven (nesting), and an assortment of nesting raptors. A variety of snakes and lizards, including western fence lizard, sagebrush lizard, and western rattlesnake, favor rocky cliffs and outcrops. Most amphibians in the county avoid dry, barren habitats.

It is likely that a number of bat species use crevices in rock faces for roosts or maternity sites in the Phase I Planning Area, but no local research has been conducted on these species. Bat species that are partial to rock faces include but are not limited to Yuma myotis, California myotis, pallid bat, hoary bat, and Brazilian free-tailed bat (Appendix VII).

Special-status bird species that might nest on canyon walls and rock faces of the Phase I Planning Area include golden eagle and prairie falcon. Northern harrier and American peregrine falcon may occur as visitors (Appendices VI and VII).

Artificially disturbed lands support far fewer species than cliffs and rock outcrops, and only about 14 vertebrate species—2 breeding species and 12 visitors—occur in these areas (Figure 3, Appendix VII). However, local landfills may attract large numbers of foraging and roosting gulls, especially in winter (Webb pers. comm.).

Distribution and Status

Approximately 202 hectares (500 acres) of rocks and cliffs exist in western Placer County, constituting much less than 1% of the Phase I Planning Area (Table 5). By virtue of their steep rocky slopes, cliff habitats in western Placer County and throughout the state are relatively protected from human disturbance. 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). In the Phase I Planning Area, rock outcrops and cliffs are most common in the American River canyon south of Auburn and along the shore of Folsom Lake (Figure 7). Artificially disturbed areas are widespread in developed and agricultural lands of western Placer County, occupying about 640 hectares (1,580 acres), or less than 1% of the Phase I Planning Area (Table 5, Figure 7).

Herbaceous Ecosystems

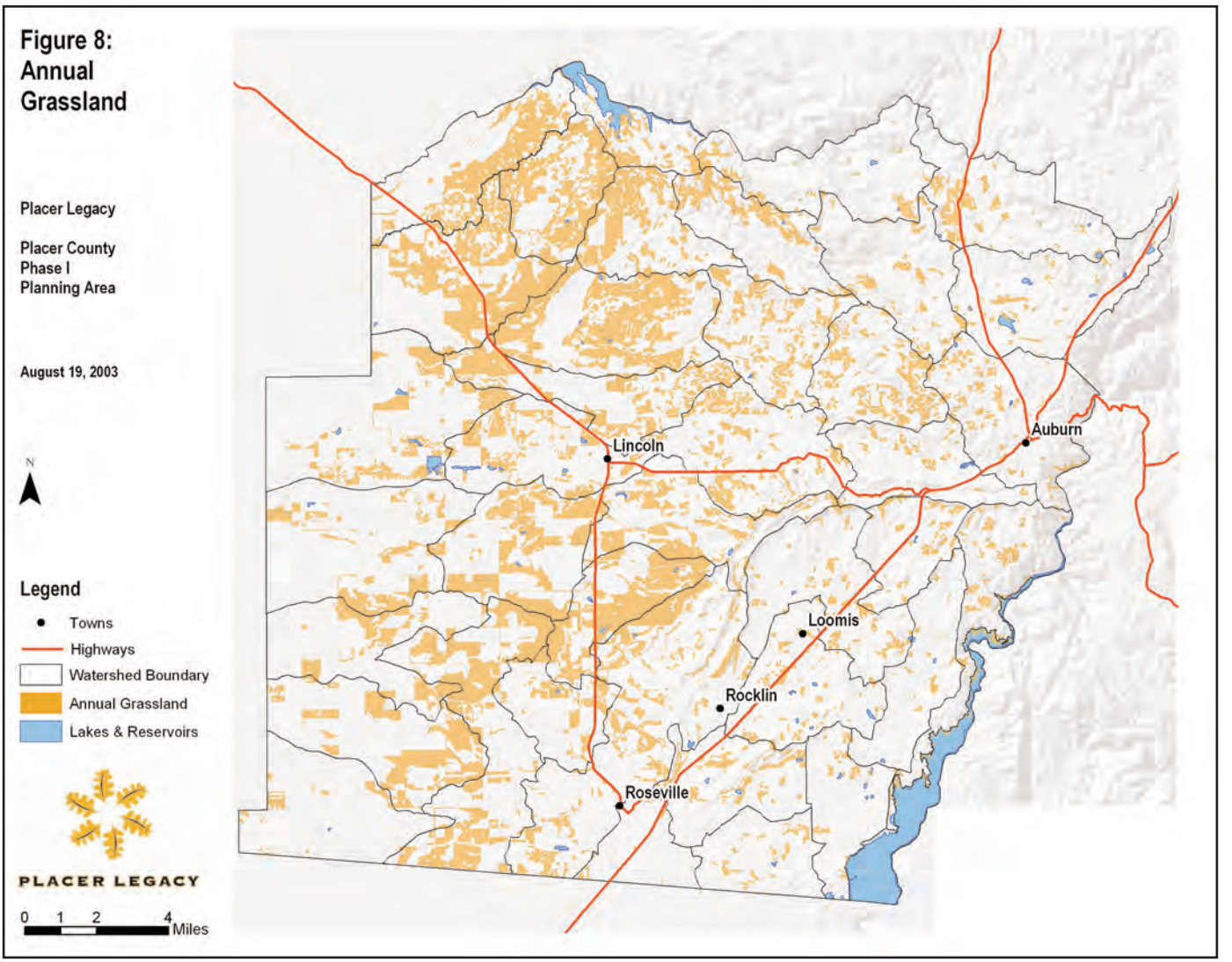
Annual Grassland

Structural and Ecological Characteristics

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). Annual Grasslands now dominate undeveloped areas at low elevations, and foothill areas are mostly comprised of open Annual Grassland–Oak Woodland/Savanna with widely scattered blue oaks, interior live oaks, and valley oaks. Elsewhere in Placer County, Annual Grasslands occur in the understory of open Foothill Hardwood Woodlands or in openings in Oak–Foothill Pine Woodland or Foothill Chaparral ecosystems. In many areas, woodland and chaparral have been cleared to create grazing land and are now annual grasslands. Consequently, the original boundaries of the grassland ecosystem have shifted from those of the original prairie in the low foothills of western Placer County (Ornduff 1974).

Open grassland/oak savannas in Placer County were once dominated by perennial bunchgrasses such as purple needlegrass, with other native annual and perennial forbs (Bartolome 1981). Today, these areas are now overwhelmingly dominated by introduced annual grasses, and native perennial bunchgrasses have become quite rare. Open Annual Grasslands are most common below 490 meters (1,600 feet) elevation on gentle slopes and in valleys of western Placer County (Table 5).

Domestic livestock grazing has shifted the species composition and extent of Annual Grasslands in the Sierra Nevada foothills; year-round heavy grazing favors introduced annual grasses at the expense of native perennial bunchgrasses (Heady 1977). It has been estimated that nonnative species constitute 70–80% of the biomass of California's pastures and Annual Grasslands (Ornduff 1974). 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). Little soil moisture remains available for native perennial species after seed set in Annual Grasslands (Heady 1977).

Plant Diversity

Nonnative Mediterranean annual grasses are particularly successful in Annual Grassland as they are throughout the milder regions of California, and they dominate the grasslands in western Placer County. Characteristic species include slender wild oat, ripgut brome, soft chess, medusa-head, and foxtail barley. Red-stemmed filaree is a dominant nonnative forb that was introduced to California by Spanish missionaries in the sixteenth century. Other dominant nonnative forbs include rose clover, bur clover, little hop clover, storksbill, and dovefoot geranium. Noxious weeds that occur in Annual Grasslands of western Placer County include yellow star-thistle, Italian thistle, and medusa-head. Other invasive plants that may occur include barbed goatgrass, tree-of-heaven, spotted knapweed, artichoke thistle, wild fennel, perennial pepperweed, Italian ryegrass, Russian thistle, and puncture vine (Table 3).

Despite the dominance of introduced species, dry Annual Grasslands are still home to many native species, particularly native bulbs and early- or late-season annual wildflowers, such as California poppy, popcornflower, rancher's fire, common brodiaea, Ithuriel's spear, winecup clarkia, johnny-tucks, common madia, cream cups, and gold nuggets. 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, squirreltail, one-sided bluegrass, and blue wildrye, as well as nonnatives such as soft chess, hedgehog dogtail, and ripgut brome.

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. Other special-status plants potentially occurring in Annual Grasslands are depauperate milk-vetch, big-scale balsamroot, hispid bird's-beak, stinkbells, sylvan microseris, and hoary navarretia.

Animal Diversity

Despite the dominance of introduced plants and their relative lack of vertical structure, Annual Grasslands support a higher diversity of animals than some other large-patch ecosystems in western Placer County. A total of 98 vertebrate species—34 breeding species and 64 visitors—occur in these ecosystems (Figure 3, Appendix VII).

Annual Grasslands provide abundant food and cover for high numbers of rodents and other small mammals. Consequently, several raptors, including red-tailed hawk, red-shouldered hawk, Swainson's hawk, and American kestrel, thrive in Annual Grasslands. Other characteristic wildlife species include yellow-bellied racer, California whipsnake, gopher snake, western kingbird, western bluebird, western meadowlark, black-tailed jackrabbit, California ground squirrel, Botta's pocket gopher, and American badger (Appendix VII).

Special-status animals that may use Annual Grasslands in the Phase I Planning Area for breeding or as visitors are California tiger salamander, western spadefoot, western pond turtle, giant garter snake, northern harrier, Swainson's hawk, ferruginous hawk, rough-legged hawk, American peregrine falcon, western burrowing owl, loggerhead shrike, bank swallow, grasshopper sparrow, and tricolored blackbird (Appendix VII). 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.

Distribution and Status

While the original native grassland prairies have been greatly reduced throughout their range, nonnative 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). In western Placer County, nonnative Annual Grasslands and grassland-savanna communities occur at elevations of approximately 12–563 meters (38–1,850 feet). Almost 23,000 hectares (57,000 acres) of Annual Grasslands exist in western Placer County, constituting about 17% of the Phase I Planning Area (Figure 8, Table 5).

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. Native grasslands continue to disappear in California with agricultural, residential, and industrial development. They should be managed with moderate grazing to prevent their conversion to Annual Grasslands. In the absence of grazing, or as a result of disking or very heavy grazing, weedy, nonnative annual grasses outcompete the desired native species. (Freckman et al. 1979.)

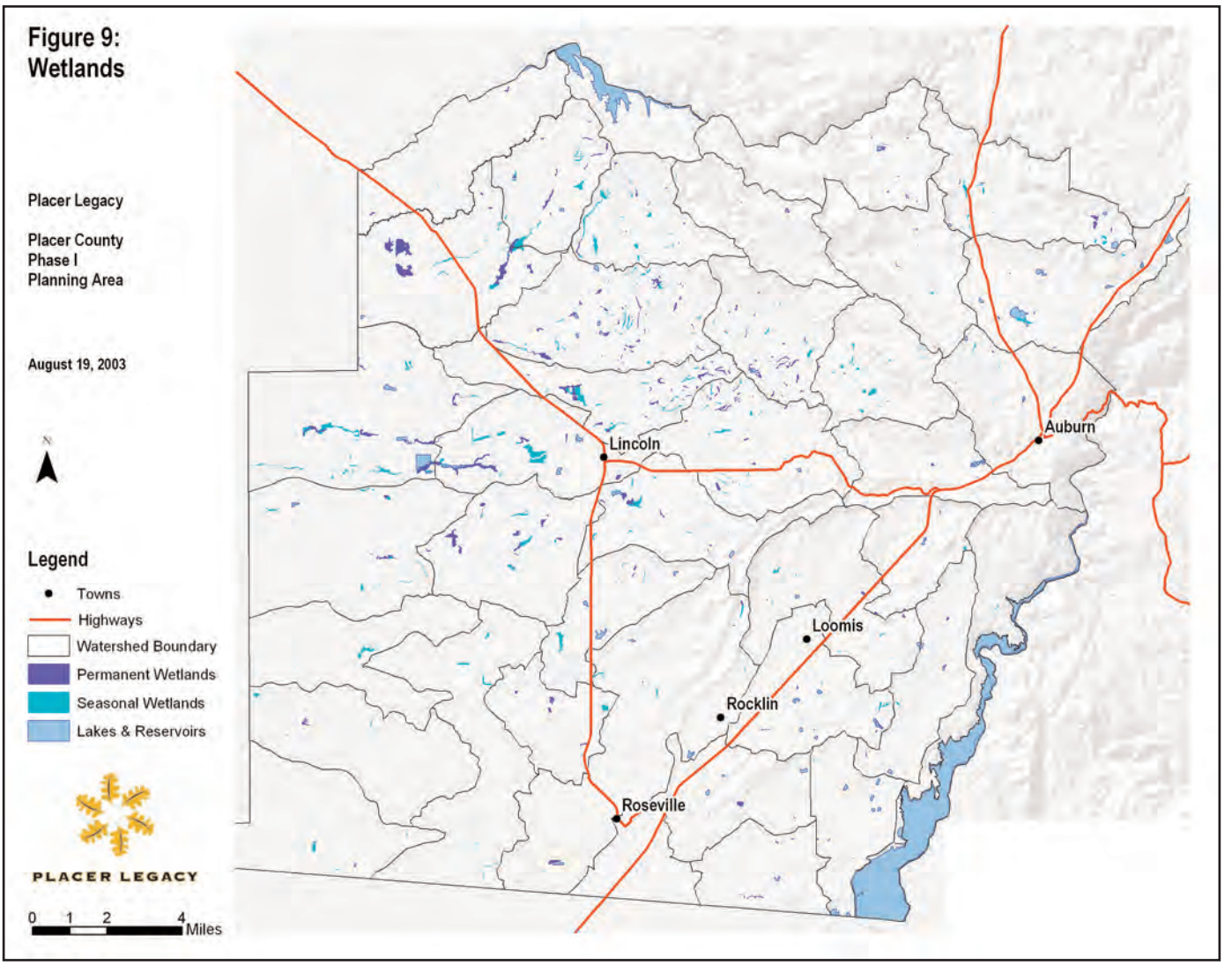
Fresh Emergent Wetland

Structural and Ecological Characteristics

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 2 meters (6.6 feet) (Cowardin et al. 1979). 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).

In western Placer County, Fresh Emergent Wetlands span a large elevational gradient, occurring at elevations of about 15–538 meters (50–1,765 feet) (Table 5). They are often associated with small humanmade 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.

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). Cattail and bulrush



marshes often exhibit this characteristic. These marshes 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 over geologic time; that is, marshes often appear relatively stable for many decades (Mayer and Laudenslayer 1988).

Plant Diversity

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). 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 0.3–0.9 meter (1–3 feet) tall and occasional tree or shrub species are more common.

In western Placer County, characteristic species include broadleaf cattail, common bulrush, creeping spikerush, Pacific rush, Baltic rush, mannagrass, floating water-primrose, water-plantain, and swamp smartweed. Goodding's willow and sandbar willow are woody plants that tolerate flooding and are occasionally found around the margins of Fresh Emergent Wetlands.

Two special-status plants—slender-leaved pondweed and Sanford's arrowhead—are known to occur in Fresh Emergent Wetlands in or near Placer County (Appendices III and IV).

Poison hemlock, Italian thistle, pampas grass, velvet grass, Italian ryegrass, and bulbous canarygrass are invasive nonnative plants that often occur in or adjacent to Fresh Emergent Wetland. Noxious weeds that can colonize Fresh Emergent Wetlands and that are known from within or near Placer County include Himalayan blackberry, Bermuda grass, perennial pepperweed, hydrilla, purple loosestrife, Eurasian milfoil, water hyacinth, giant reed, and parrot's feather. These species' aquatic setting and their ability to reproduce asexually by stolons or turions make many of these aquatic and emergent weeds particularly difficult to control or eradicate. Several species are common aquarium species or horticultural escapees (Table 3).

Animal Diversity

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). These ecosystems may support up to 97 vertebrate species—40 breeding species and 57 visitors—in the Phase I Planning Area (Appendix VII, Figure 4).

Characteristic waterbirds that nest in Fresh Emergent Wetland in western Placer County include Canada goose, mallard, cinnamon teal, gadwall, Virginia rail, sora, American coot, common moorhen, killdeer, and Wilson's snipe. These species are joined by a host of migratory waterfowl in fall, and many may remain in the county through the winter and spring. Typical migratory and wintering waterfowl in the county include American wigeon, northern shoveler, northern pintail, green-winged teal, ring-necked duck, bufflehead, common goldeneye, and ruddy duck (Appendix VII).

Amphibians in these habitats include long-toed salamander, California newt, western toad, and Pacific treefrog. Western pond turtle, giant garter snake, common garter snake, and western aquatic garter snake are the only reptiles that regularly occur in marshes of western Placer County. The most common mammals in these habitats are a variety of foraging bats, vagrant shrew, dusky shrew, ornate shrew, American beaver, and muskrat (Appendix VII).

Special-status animals that are known to visit Fresh Emergent Wetlands of the Phase I Planning Area are California tiger salamander, western pond turtle, giant garter snake, American white pelican, white-faced ibis, redhead, bald eagle, northern harrier, white-tailed kite, American peregrine falcon, black rail, bank swallow, Modesto song sparrow, and tricolored blackbird, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis) (Appendices VI and VII).

Bullfrogs are abundant, nonnative amphibians that are common in shallow ponds and other permanent wetlands of the county. This invasive species, along with introduced bass and signal crayfish, can displace or prey on many native aquatic species (Zeiner et al. 1990; Jennings and Hayes 1994).

Distribution and Status

Fresh Emergent Wetlands are found throughout California at all elevations, but they are most common below about 2,286 meters (7,500 feet). 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).

In the Phase I Planning Area of western Placer County, Fresh Emergent Wetland occurs at elevations of about 15–538 meters (50–1,765 feet). These ecosystems occupy about 518 hectares (1,280 acres), or less than 1% of the Phase I Planning Area. Approximately 98% of this habitat is on private land (Table 5). Most individual occurrences of marshland in the county are less than 0.4 hectare (1 acre) in extent; some larger, restored marshes exist in the northwestern part of the Phase I Planning Area near Sheridan (Figure 9).

Small pockets of Fresh Emergent Wetland are widely scattered in all elevations of western Placer County, but are nowhere common. Small marshes can be found along low-gradient reaches of rivers and streams in backwater areas or ponded overflow channels. In the Phase I Planning Area, some marsh habitats are induced or created by irrigation runoff and are potentially threatened by canal encasement. These ecosystems are also vulnerable to conversion for both agricultural and residential or urban uses.

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. They have decreased dramatically since the turn of the century due to drainage and conversion to other uses, primarily agriculture (Mayer and Laudenslayer 1988).

Whether naturally occurring or artificial, Fresh Emergent Wetlands usually offer valuable wildlife habitat except in areas with high levels of human disturbance. Residential and urban development near marshes in foothill areas may reduce the wetlands' integrity through the introduction of predators (including feral cats and dogs) and nonnative aquatic species.

Seasonal Wetland

Structural and Ecological Characteristics

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 in western Placer County are typically disturbed by human activities such as destruction and/or fragmentation by urban and suburban development, agriculture or road maintenance, or by natural flooding regimes. These ecosystems are usually dominated by nonnative ruderal plant species.

Plant Diversity

Seasonal Wetlands support a lower diversity of plant species than Vernal Pools, with a much higher proportion of nonnative species. Typical plant species characteristic of Seasonal Wetland ecosystems in western Placer County include Mediterranean barley, Italian ryegrass, curly dock, Baltic rush, and hyssop loosestrife. During the summer, Seasonal Wetlands may support late-season upland plants such as common spikeweed, tarweed, vinegar weed, doveweed, and the noxious weed yellow star-thistle. Himalayan blackberry is another noxious weed that often occurs in and around Seasonal Wetlands. Other noxious and invasive species that may occur in Seasonal Wetlands are whitetop species, bull thistle, pampas grass, velvet grass, perennial pepperweed, Bermuda grass, Harding grass, Johnson grass, and woolly mullein (Table 3).

Special-status plants that may occur in Seasonal Wetlands of western Placer County include: Bogg's Lake hedge-hyssop, legenere, dwarf downingia, Ahart's dwarf rush, Red Bluff dwarf rush, hispid bird's-beak, Sanford's arrowhead, pincushion navarretia, and Henderson's bent grass (Appendices III and IV).

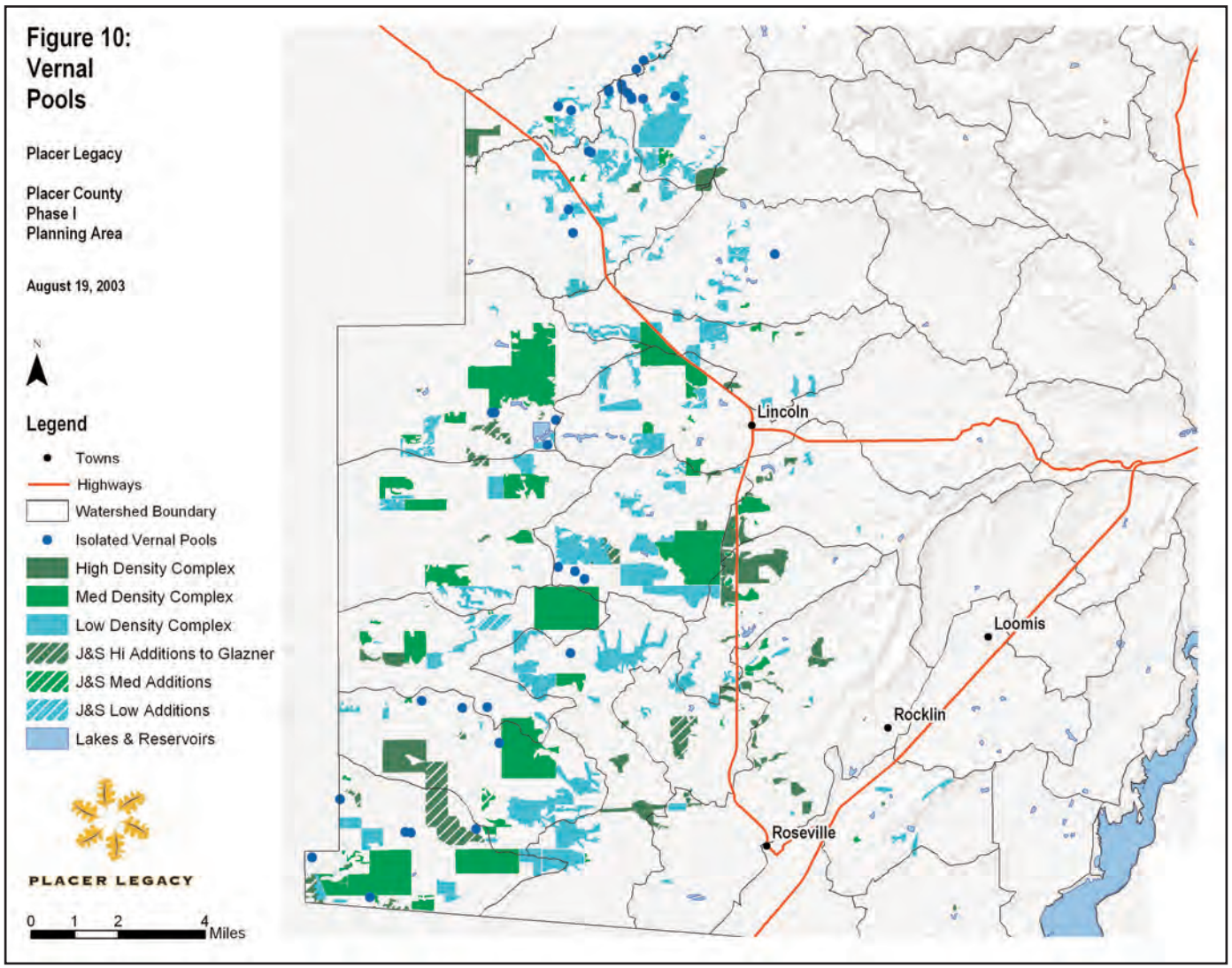
Animal Diversity

Like Fresh Emergent Wetlands, Seasonal Wetlands support a relatively low number of vertebrate species compared to many other large-patch ecosystems 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). In the Phase I Planning Area, these ecosystems may support up to 94 vertebrate species—15 breeding species and 79 visitors (Appendix VII, Figure 4). Characteristic waterbirds that visit Seasonal Wetlands in western Placer County include snowy egret, black-crowned night-heron, white-faced ibis, Canada goose, mallard, cinnamon teal, American wigeon, gadwall, killdeer, and Wilson's snipe (Appendix VII).

Seasonal Wetland ecosystems provide breeding habitat for seven special-status animals: vernal pool fairy shrimp, vernal pool tadpole shrimp, California linderiella, California tiger salamander, western spadefoot, giant garter snake, western pond turtle, northern harrier, Modesto song sparrow, and tricolored blackbird. Other special-status species that may visit these ecosystems are bald eagle, American peregrine falcon, and bank swallowdd and (Appendices VI and VII).

Distribution and Status

Seasonal Wetlands occur throughout the Phase I Planning 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 Phase I Planning Area.



In the Phase I Planning Area, Seasonal Wetlands are found at elevations of 15–580 meters (50 feet–1,906 feet) (Figure 9, Table 5). These ecosystems occupy approximately 541 hectares (1,338 acres), or approximately 0.5% of the Phase I Planning Area; about 90% of these lands are on private land (Figure 9, Table 5).

Vernal Pools and Vernal Pool Complexes

Structural and Ecological Characteristics

Vernal Pools are a unique type of wetland that 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).

The strongly seasonal rainfall of a Mediterranean climate, concentrated in the winter and spring months, fills the pools for a portion of winter and spring, remaining wet long enough to support a distinctive flora and fauna. 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.

Several types of restrictive soil layers have been described (Smith and Verrill 1998), two of which occur in western Placer County: hardpans, formed when silica minerals are leached, then redeposited and cemented lower down the soil profile; and volcanic flows.

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; while water from direct rainfall is the primary water source, overland runoff and groundwater may also contribute to Vernal Pool hydrology (Jokerst 1990). Size and depth of Vernal Pools vary. Vernal Pools are ecologically integrated with the surrounding uplands, typically Annual Grassland habitat, 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). Two general types of Vernal Pools occur in the Phase I Planning Area: Northern Hardpan Vernal Pools, which occur on alluvial terraces on the east side of the Central Valley; and Northern Volcanic Mudflow Vernal Pools (Holland 1986; Sawyer and Keeler-Wolf 1995), which 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).

Vernal Pools support a distinctive set of plants and animals that are adapted to periodic or continuous inundation during the wet season and desiccated soil during the dry season. They are well known for their high level of endemism of plants and animals (Jain 1976), supporting a relatively large number of rare, threatened, or endangered species (Holland and Jain 1988; California Native Plant Society 2001; California Natural Diversity Database 2003). They are also well known for the colorful displays of flowers that bloom in concentric circles around individual pools as they dry in spring (Zedler 1987).

Plant Diversity

Vernal Pools support a distinctive community of plants adapted to the annual cycle of flooding and desiccation; many plant species are unique to Vernal Pools in California. Pools are typically dominated by short-lived annual native plants (Holland 1976) that can complete their lifecycles during the inundation and drying phases that characterize the habitat. About 200 species are restricted to or closely associated with Vernal Pools in California (Holland 1976; California Department of Fish and Game 1998a). 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.

Pool size and the depth, duration, and seasonal timing of ponding are important factors influencing the plant and animal species composition and diversity in Vernal Pools (Keeley & Zedler 1998). Soil type and land management activities such as grazing and burning also influence species composition and diversity (Hobson and Dahlgern 1998).

Because of the extreme growing conditions in Vernal Pools, few nonnative plants are able to survive, and 75–95% of plant species in Vernal Pools are native (Holland and Jain 1978; Jokerst 1990). In the surrounding Annual Grasslands, in contrast, nonnative species dominate, comprising 90% of the biomass (U.S. Fish and Wildlife Service 2003). The proportion of nonnative plants may be higher in Vernal Pools subject to heavy livestock grazing (Jones & Stokes 2002).

Vernal Pools in western Placer County are dominated by native annual plants; typical species include several species of downingias, goldfields, popcornflowers, and clovers, as well as gratiola, coyote thistle, spike-rush, woolly marbles, buttercups, pogogyne, quillwort, purslane speedwell, and white navarretia. Nonnative species found in Vernal Pools in western Placer County include Italian ryegrass, small quaking grass, soft chess, lesser hawkbit, hyssop loosestrife, and cut-leaved geranium (Jones and Stokes 2002).

Five special-status plants—Boggs Lake hedge-hyssop, legenere, dwarf downingia, Ahart's dwarf rush, and Red Bluff dwarf rush— are known to occur in Vernal Pools in western Placer County (Table 4). Other special-status plants that may occur in Vernal Pools are depauperate milk-vetch, pincushion navarretia, and Henderson's bent grass (Appendices III and IV).

Animal Diversity

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; and other invertebrates such as water beetles, water boatmen, and aquatic larvae of fly and dragonfly species. Vernal Pool invertebrate communities have evolved in the absence of aquatic predators such as fish and nonnative bullfrogs, which cannot survive in Vernal Pools because of the long period of desiccation. The unique invertebrate communities in Vernal Pools include three special-status crustacean species—vernal pool fairy shrimp, vernal pool tadpole shrimp, and California linderiella—which have evolved accelerated reproductive maturity and high reproductive rates in response to the extreme environmental conditions. These crustaceans 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). Pacific tree frogs and western toads may be common in Vernal Pool Complexes.

Vernal Pools are important habitat for migratory birds, including sandpipers and herons, as well as waterfowl (Jokerst 1990; Silveira 1998), and Vernal Pool Complexes are important to the continuity of wetland habitats along the Pacific Flyway (U.S. Fish and Wildlife Service 2003). 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). 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. In the Phase I Planning Area, Vernal Pool Complex ecosystems may support up to 67 vertebrate species—7 breeding species and 60 visitors (Appendix VII, Figure 4).

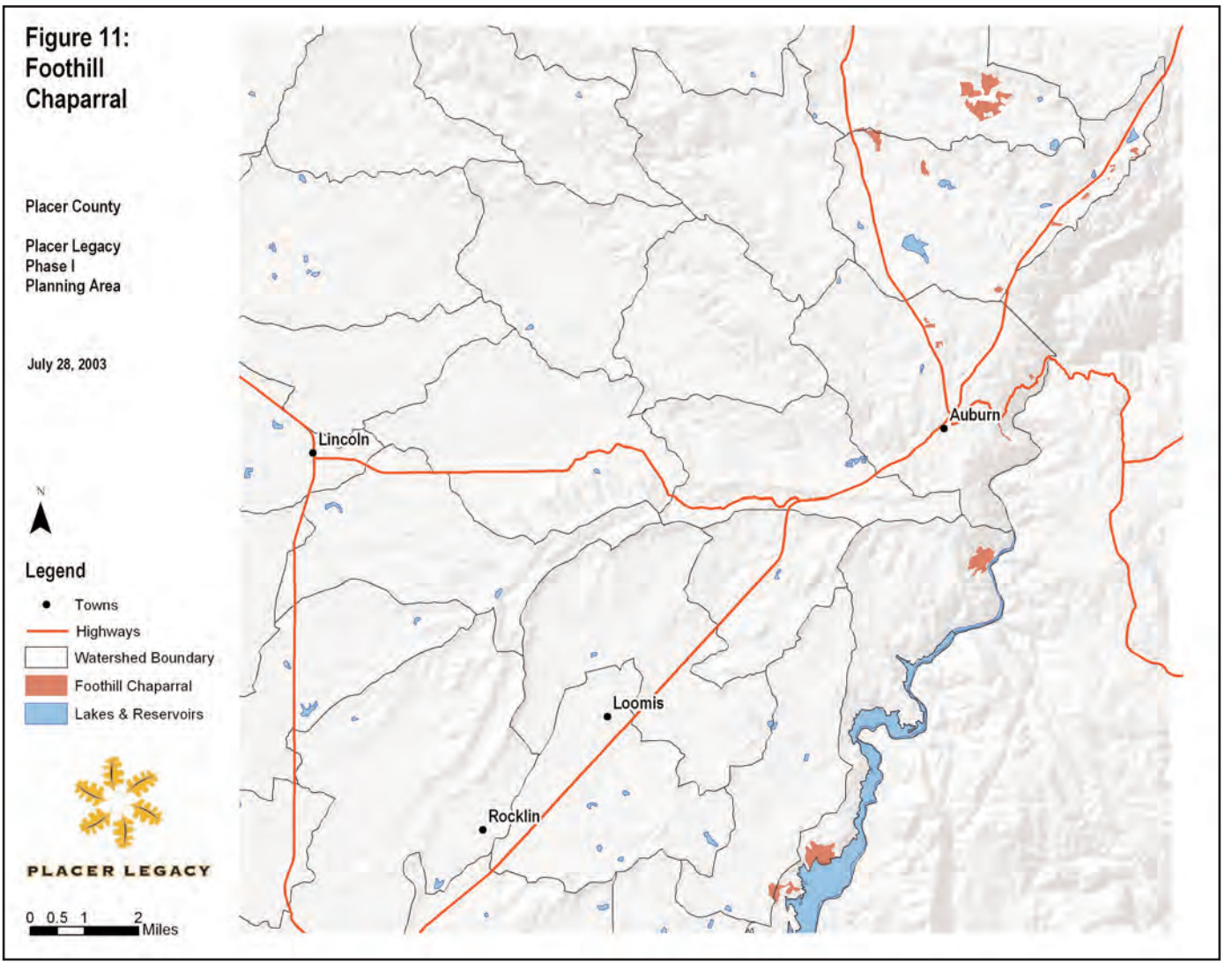
Vernal Pool ecosystems provide breeding habitat for a variety of special-status species including: vernal pool fairy shrimp, vernal pool tadpole shrimp, California linderiella, California tiger salamander, western spadefoot. Other special-status animals that may visit Vernal Pool Complexes of western Placer County are bald eagle, northern harrier, American peregrine falcon, and tricolored blackbird (Appendices VI and VII).

Distribution and Status

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. Vernal Pool Complexes are vulnerable to development because they occur on level or gently rolling terrain that is accessible and suitable for development (Cheatham 1976). It is estimated that more than 90% of California's Vernal Pools have been lost (Holland 1976) to agricultural development and urbanization. In western Placer County, grazing by livestock, especially cattle, is the most common land use for Vernal Pool Complexes. 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. Low to moderate grazing levels appear to benefit Vernal Pool Complex ecosystems by reducing the cover and competition of nonnative annual grasses, resulting in higher diversity of native plants (Robins and Vollmar 2002).

In August 2003, 13,043 hectares (32,230 acres) of the Phase I Planning Area were included in the Western Placer County Unit in the USFWS's Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants; Final Rule (68 FR 151 46684–46867). The unit contains numerous occurrences of vernal pool fairy shrimp in intact Vernal Pool Complexes of both Northern Hardpan and Volcanic Mudflow Vernal Pools and encompasses 70% of the remaining Vernal Pools in Placer County. Within the unit are numerous protected areas and conservation banks, including 20% of the mitigation areas established to protect vernal pool fairy shrimp. The unit is located west of Highway 65 and extends from the Sacramento County line to north of Roseville, northeast of Rocklin, and just north of Lincoln.

In the Phase I Planning Area, Vernal Pool Complexes occur at elevations of 9–160 meters (30–525 feet) (Figure 10, Table 5). These habitats occupy approximately 9,085 hectares (22,450) acres, or approximately 8% of the land area in the Phase I Planning Area; about 97% of these lands are in private ownership (Figure 10, Table 5).



Shrub Ecosystems

Foothill Chaparral

Structural and Ecological Characteristics

Foothill Chaparral ecosystems in western Placer County are characterized by high topographic and geologic diversity. For this study, Foothill Chaparral is defined as shrub-dominated habitat with less than 10% cover of trees. In the Phase I Planning Area, Foothill Chaparral ecosystems include successional habitats in Foothill Hardwood 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). 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% (Mayer and Laudenslayer 1988). On other soils it often forms dense, impenetrable thickets 1.8–7.3 meters (6–24 feet) high (Holland 1986). Early successional chaparrals and chaparrals on serpentine soils may be much lower, generally ranging from 1 to 2 meters (3 to 6 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).

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% of the overall cover as mapped in this study. 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).

Plant Diversity

Chamise, whiteleaf manzanita, buckbrush, and shrubby interior live oaks 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; in these sites, whiteleaf manzanita is usually dominant. On serpentine soils, buck brush is often the dominant shrub. However, under most other circumstances, particularly on shallow or rocky soils, Foothill Chaparral ecosystems in Placer County may exhibit a wide diversity of native shrubs, including hoary coffeeberry, western redbud, birchleaf mountain mahogany, Lemmon's ceanothus, Sierra plum, yerba santa, Fremont silk-tassel, western service berry, deerbrush, Brewer's white oak, shrubby interior live oak, chaparral honeysuckle, chaparral clematis, 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). In 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, climbing bedstraw, American vetch, Sierra milkwort, Watson's wild cucumber, common brodiaea, coyote mint, California helianthella, spiked rosinweed, bladder parsnip, and purple sanicle; several native bunchgrasses, such as California melic, squirreltail, and one-sided bluegrass, can also occur in these areas.

Foothill Chaparral ecosystems support many special-status plants (Appendix IV). One special-status species, Red Bluff dwarf rush, has limited potential to occur on seasonally moist sites within Foothill Chaparral (Table 4). Serpentine soils in Foothill Chaparral may support Congdon's onion, Sanborn's onion, dissected-leaved toothwort, and Red Hills soaproot; non-serpentine soils may support True's manzanita, depauperate milk-vetch, Brandegee's clarkia, tripod buckwheat, stinkbells, Butte County fritillary, Humboldt lily, sylvan microseris, and Sierra monardella.

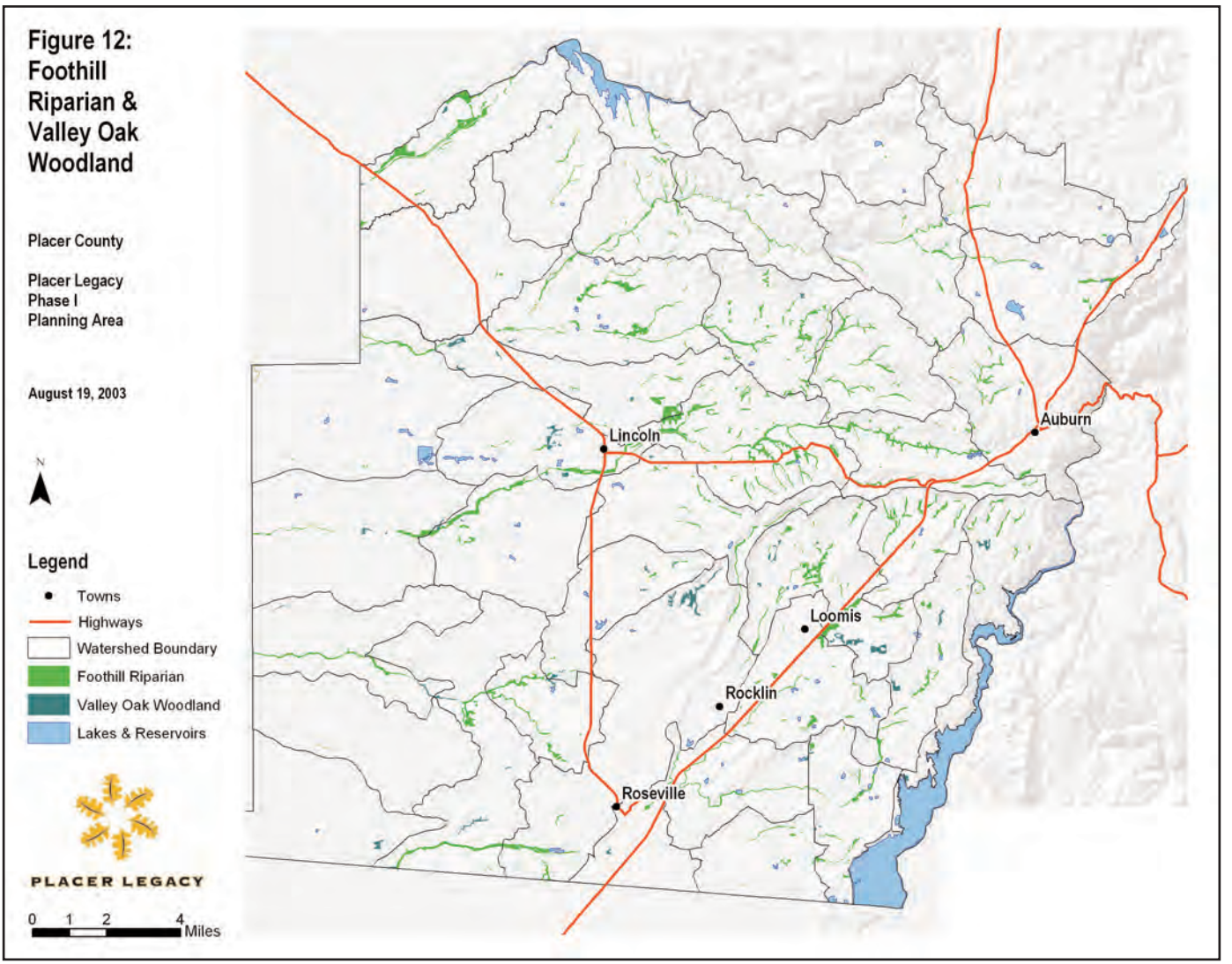
Relatively few nonnative, invasive plant species occur in Foothill Chaparral ecosystems, but abundant and widespread species, such as yellow star-thistle, cheat grass, Klamath weed, and medusa-head, may occur in disturbed areas (Table 3).

Animal Diversity

A large number of 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 Phase I Planning Area (Figure 3, Appendix VII).

Dusky-footed woodrats and deer mice, 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, black bear, coyote, gray fox, and ringtail are among the larger mammals that frequent these habitats. Other common mammals include western gray squirrel, California ground squirrel, and brush rabbit. Gopher snake, California whipsnake, western rattlesnake, and California kingsnake are commonly found in Foothill Chaparral ecosystems, along with smaller snakes such as western yellow-bellied racer, ringneck snake, and sharp-tailed snake. Western skink, 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 (Appendix VII).

Numerous bird species either nest in Foothill Chaparral ecosystems or use them seasonally. Common breeding species include Anna's hummingbird, western scrub-jay, blue-gray gnatcatcher, wrentit, spotted towhee, California towhee, and lazuli bunting. 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, produce fruits that attract species such as American robin, cedar waxwing, Townsend's solitaire, hermit thrush, and varied thrush (irregular). Ruby-crowned kinglet



and Hutton's vireo are typical wintering and resident insectivorous birds that primarily forage in evergreen foliage (Appendix VII).

Special-status animal species known to visit Foothill Chaparral ecosystems of the Phase I Planning Area are northern harrier, yellow warbler, three bat species (long-eared myotis, long-legged myotis, pale Townsend's big-eared bat) and ringtail (Appendices VI and VII).

Distribution and Status

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 by Holland (1986) and Sawyer and Keeler-Wolf (1995) (Table 2).

In the Phase I Planning Area of Placer County, Foothill Chaparral ecosystems occur at elevations of about 140–650 meters (460–2,130 feet), and they are most common between Foothill Hardwood Woodland and Ponderosa Pine Forest. They occupy about 247 hectares (610 acres), or much less than 1% of the Phase I Planning Area. Approximately 92% of this area is on private land (Table 5). The largest stands of Foothill Chaparral in Placer County are on the slopes of the American River canyon and north and east of Auburn (Figure 11).

Forested Ecosystems

Valley Foothill Riparian Woodland

Structural and Ecological Characteristics

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, willows, and Fremont cottonwood, as well as stands of Valley Oak Woodland.

In western Placer County, Valley Foothill Riparian Woodland is most common on perennial tributaries and the major rivers, particularly along reaches with shallow to moderate gradients. On the American and Bear River corridors and along Coon Creek and lower Auburn Ravine, significant stands are generally restricted to low-gradient, depositional reaches with some floodplain development. 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 a single tree canopy in width. Willow scrub is generally persistent, but is also an early successional stage that is eventually over-topped by valley oaks, cottonwoods, or alders in mature riparian woodland (Mayer and Laudenslayer 1988).

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 affected by livestock use of the channel, development adjacent to the stream, or noxious weed infestations. The herbaceous layer of Valley Foothill Riparian Woodlands 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 nonnative grasses, sedges, rushes, and forbs. 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.

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). 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 overhanging vegetation cover 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).

Plant Diversity

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, red willow, and California black walnut. Occasionally, lianas of wild grape up to 15 meters (50 feet) high contribute further to the habitat values (Mayer and Laudenslayer 1988). White alder is a common subcanopy component of mixed riparian forests of western Placer County, but at higher elevations it also frequently occurs in pure stands.

Species composition in a riparian corridor is largely determined by the depth of the summer water table and the local flooding frequency. On frequently flooded low terraces at or near the active channel, common riparian species in western Placer County include sandbar willow, mannagrass, water smartweed, ciliate willowherb, tall nutsedge, torrent sedge, horsetail, Pacific rush, occasional white alder and arroyo willow and, at the lowest elevations, mulefat.

Riparian forests are most diverse at mid-terrace levels, away from the scouring effects of the active channel. Characteristic species in the overstory and subcanopy layer are red willow, arroyo willow, shining willow, Oregon ash, California black walnut, Fremont cottonwood, wild grape, white alder, and valley oak. Box elder and western sycamore are uncommon in Placer County in comparison to their abundance in nearby counties. Two nonnative cottonwood species, silver poplar and Lombard poplar, can be abundant in riparian habitats in urbanized stream reaches and near old town or mining sites. Common shrubs associated with multilayered Valley Foothill Riparian Woodlands include the noxious weed Himalayan blackberry, as well as native species such as snowberry, wild rose, blue elderberry, poison-oak, spice bush, western ninebark, California blackberry, and shrubby willows. Characteristic forbs

and grasses include Douglas's mugwort, Santa Barbara sedge, clustered field sedge, blue wildrye, deer grass, common yarrow, bracken fern, and stinging nettle, as well as weedy nonnative species such as western vervain, velvet grass, Bermuda grass, and pennyroyal.

Interior live oaks can be important components of some Valley Foothill Riparian Woodland ecosystems, but they generally occur on high terraces or in the transition to upland, often in association with bigleaf maple, incense-cedar, black oak, or blue oak. In this zone, common understory species include poison-oak, California buckeye, hoary coffeeberry, blue elderberry, and coyote brush. Two special-status plants—hoary navarretia and yellow bur navarretia—could occur in Valley Foothill Riparian Woodland ecosystems of the Phase I Planning Area.

In addition to Himalayan blackberry, which is a dominant species in many riparian areas of the foothills, other noxious weeds and invasive plants in Valley Foothill Riparian Woodlands in Placer County include black locust, tree-of-heaven, periwinkle, English ivy, poison hemlock, bull thistle, scarlet wisteria, pampas grass, edible fig, giant reed, spotted knapweed, Canada thistle, wild fennel, velvet grass, and purple loosestrife (Table 3).

Animal Diversity

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 Phase I Planning Area (Appendix VII, Figure 4).

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, black phoebe, warbling vireo, western scrub-jay, bushtit, Bewick's wren, house wren, American robin, orange-crowned warbler, yellow-breasted chat, black-headed grosbeak, lazuli bunting, spotted towhee, song sparrow, house finch, and lesser goldfinch. Riparian areas are also attractive to migratory species including a variety of flycatchers, vireos, warblers, tanagers, and grosbeaks (Appendix VII).

Most amphibians, reptiles, and mammals use riparian corridors for cover, shade, and a source of water. Amphibians and reptiles in Valley Foothill Riparian Woodlands include ensatina, California slender salamander, Pacific treefrog, western toad, 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 (Appendix VI). 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).

A number of special-status animal species are known to visit Valley Foothill Riparian Woodlands in the Phase I Planning Area: valley elderberry longhorn beetle, foothill yellow-legged frog, western pond turtle, giant garter snake, bald eagle, Swainson's hawk, osprey, white-tailed kite, Cooper's hawk, yellow-billed cuckoo (one historical record), long-eared owl, willow flycatcher, purple martin, bank swallow, yellow warbler, yellow-breasted chat, Modesto song sparrow, and tricolored blackbird, ringtail, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis) (Appendices VI and VII).

Nonnative animals that may occur in these woodlands include European starling, wild turkey, Virginia opossum, and wild pig. Livestock operations attract brown-headed cowbirds, a native North American species that expanded its range into 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). 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 4 miles of breeding areas (Rothstein et al. 1984).

Distribution and Status

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). In western Placer County, Valley Foothill Riparian Woodlands occur as well-developed and continuous stands along depositional reaches of Coon Creek and portions of the Bear River and the American River.

Along most other creeks, however, 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 (Figure 12). In the Phase I Planning Area, Valley Foothill Riparian Woodland occurs at elevations of about 14–543 meters (45–1,780 feet). These ecosystems occupy about 2,456 hectares (6,070 acres), or about 2% of the Phase I Planning Area. Approximately 97% of this habitat is on private land (Table 5).

Throughout the Central Valley and Sierra Nevada foothills, including Placer County, riparian habitats have been reduced, fragmented, or degraded by a variety of human activities. The primary factors include historical gold mining; heavy livestock use of some riparian corridors; vegetation removal on the floodplain; introduction and spread of noxious weeds; road and home development; alterations in the hydrologic regime caused by hydroelectric and water storage reservoirs; gravel mining; and groundwater extraction (Kondolf et al. 1996).

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.

Foothill Hardwood Woodland

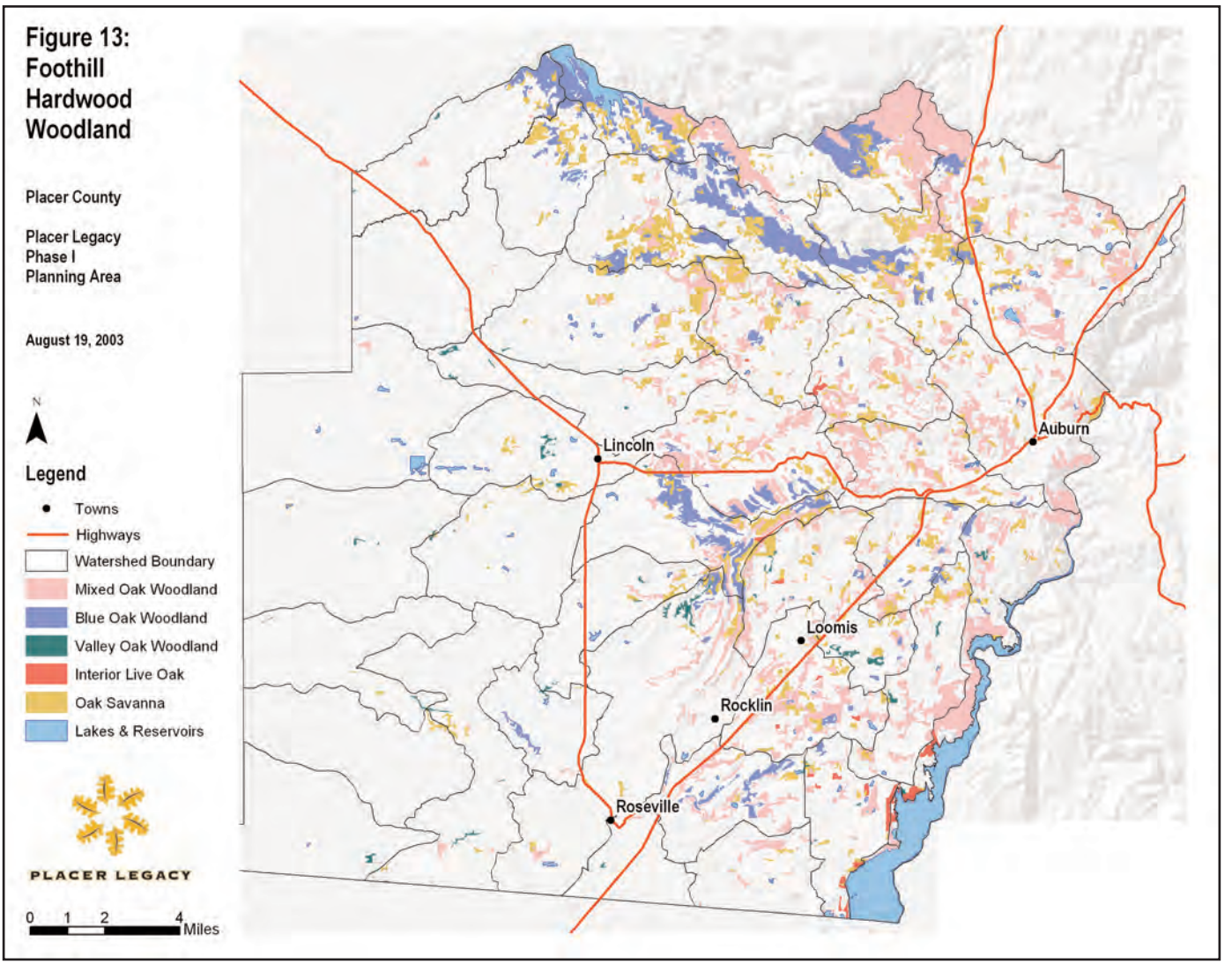
Structural and Ecological Characteristics

Foothill Hardwood Woodland comprises a zone of oak-dominated ecosystems growing between Annual Grassland at the edge of the Central Valley and Oak–Foothill Pine Woodland and Ponderosa Pine Forest at higher elevations (Figure 13). Two distinct subtypes of Foothill Hardwood Woodland types are recognized by the CWHR system (Mayer and Laudenslayer 1988): Blue Oak Woodland and Valley Oak Woodland (Table 2). In addition, Foothill Hardwood Woodland dominated by interior live oak was identified as a distinct habitat in the Phase I Planning area and was, accordingly, designated as Interior Live Oak Woodland. These three subtypes are discussed separately below, following an overview of oak woodland ecology and distribution. A fourth subtype, Mixed Oak Woodland, is characterized by the lack of a single dominant oak species. While this subtype is not further discussed below, it should be noted that subtypes that could not be identified on the basis of aerial photograph interpretation or field assessments were also mapped as Mixed Oak Woodland. Oak Woodland with low canopy cover was mapped as a separate large-patch ecosystem, Oak Woodland-Savanna.

Blue oaks, valley oaks, and interior live oaks are endemic to California (Hickman 1993). Blue Oak Woodland and Interior Live Oak Woodland often occur in mixed stands down to elevations of about 91 meters (300 feet). Valley Oak Woodland has a restricted distribution in western Placer County, and stands away from streams were mapped as Foothill Hardwood Woodland. Stringers of valley oaks occurring on stream corridors were mapped as Foothill Riparian Woodland, and are discussed in that section. The ubiquitous foothill pine and oak-dominated woodlands at elevations of approximately 61–640 meters (200–2,100 feet) were mapped separately as Oak–Foothill Pine Woodlands (Table 5).

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; currently, the major losses in the Phase I Planning Area result from intensive residential and industrial development. Reduced oak recruitment and regeneration is a serious problem in many areas. Oak woodlands have decreased in California by more than 1 million acres during the last 50 years because of agricultural, residential, and industrial development. Moreover, in many places, blue and valley oaks have reproduced poorly during this time period, and even when germination occurs, seedlings often fail (Holland 1976).

Some ecologists think that the lack of regeneration in oak woodland has been caused by the consumption of acorns and seedlings by cattle. However, the removal of livestock grazing can result in a build-up of thatch or thicker, taller cover of weedy annual grasses that may inhibit seedling germination and growth. In addition, wildlife and insects also cause heavy damage to acorns and seedlings. Populations of mule deer and other species of urban-adapted wildlife that eat acorns and young oaks may be more abundant now than in the past because of increasing urbanization of Foothill Hardwood Woodland areas and associated predator control activities. However, some of these species have positive effects on oak regeneration; acorns buried by western scrub-jays, yellow-billed magpies, western gray squirrels, and California ground squirrels are often likely to germinate because they root better and are less likely to be eaten than those that remain on the surface (Griffin 1971).



Frequent fires historically occurred in oak woodlands, and fire suppression has affected regeneration negatively in both Valley and Blue Oak Woodlands. Young trees of both species will sprout when fire damaged, but older trees will not. Thus, while frequent fires tend to maintain oak stands of younger age classes, a century of fire control has resulted in the predominance of older trees. When these stands eventually burn, the old trees do not resprout and are often killed. Furthermore, the absence of frequent, non-catastrophic ground fires encourages the invasion of evergreen oaks (e.g., interior live oaks), the seedlings of which seem to be more browse resistant than those of deciduous oaks (Griffin 1977).

Blue Oak Woodland

Blue oaks are relatively slow-growing, long-lived trees that can reach heights of 25 meters (80 feet). Large blue oaks range in age from about 150 to 390 years (White 1966); however, the diameter to age relationship of individual trees varies tremendously depending on site quality. On shallower, well-drained upland soils, blue oaks form savanna-like stands on dry ridges and gentle slopes. They are well adapted to dry, hilly terrain where the water table is usually unavailable, and they have an unusual tolerance of severe drought, shedding their leaves under extreme moisture stress. The density of blue oaks on slopes is directly related to water stress, and both blue oaks and interior live oaks can be present where the soils are deep or moist (Griffin 1973).

The shrub layer in Blue Oak Woodland is usually sparse, often occurring only on rock outcrops or poor soils where trees are often very small. The understory is generally dominated by nonnative Annual Grassland. 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. Blue Oak Woodland is generally grazed more than Interior Live Oak Woodland, due in part to higher clearance and a more sunlit and

grassy understory. Unlike the leathery, evergreen leaves of live oaks, the leaves of blue oaks are deciduous and the leaf litter is faster to decompose, resulting in a more developed herbaceous layer. The higher levels of sunlight also promote development of nonnative annual grasses.

Above elevations of approximately 457 meters (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, 20-centimeter- (8-inch-) diameter blue oaks may be as much as 100 years old (McCreary pers comm.). On shallow soils and south-facing slopes, Blue Oak Woodland is replaced by Foothill Chaparral; on steep north-facing slopes or in areas burned by high-intensity fires, it is replaced by Interior Live Oak Woodland.

Poor regeneration of blue oaks is well documented (White 1966; Holland 1976; Griffin 1977; Baker et al. 1981) and is evident in 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). The absence of regenerating blue oaks 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 oaks are somewhat intolerant of shade, and disturbances producing openings in the canopy may be necessary for seedling growth and survival in denser stands.

Valley Oak Woodland

Valley Oak Woodland in California is best represented in the Central Valley on deep, well-drained alluvial soils, often along river bottoms, where it forms nearly pure, park-like woodlands of large trees. Valley oaks are tolerant of flooding; consequently, Valley Oak Woodland is well developed in areas that receive regular flooding (Griffin 1977). In western Placer County, as in other Central Valley and Sierra foothill counties, Valley Oak Woodland has a very limited distribution (Figure 12), occurring where soils are deep and contain some subsurface soil moisture. Here, large and broad-crowned trees occur in savanna-like stands, at least historically, and blend into riparian woodlands of valley oak or mixed tree species along streamcourses and on active floodplains. These dense stands of smaller-diameter valley oaks were mapped as Foothill Riparian Woodland because they are distinguished from Valley Oak Woodlands that are farther from streamcourses and provide somewhat different wildlife habitat values. They are, accordingly, addressed in the discussion of Foothill Riparian Woodland. Valley Oak Woodland mixes with Blue Oak Woodland or Oak–Foothill Pine Woodland on shallower or drier sites (Griffin 1977; Mayer and Laudenslayer 1988).

Few young trees grow in open, dry sites, although reproduction of valley oaks 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). In the Central Valley, flood control projects may also play an important role in the reduced regeneration of valley oak.

Interior Live Oak Woodland

Interspersed with Blue Oak Woodland ecosystems of western Placer County, Interior Live Oak Woodland typically occurs on north-facing slopes and in drainages and stream canyons. In the Granite Bay and Folsom Lake area, interior live oaks are common on flat terrain. However, at elevations above approximately 457 meters (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. At middle elevations, Interior Live Oak Woodland is generally characterized by dense stands of small-diameter trees less than approximately 6 meters (20 feet) high. 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.

Usually situated on steep canyon slopes, Interior Live Oak Woodland is often ungrazed or only lightly grazed, and the stands are usually not thinned. The average tree diameters are often small due in part to high stand densities. The presence of multi-trunked trees suggests that these individuals have stump-sprouted following a fire or stand clearing. Live oaks often replace blue oaks after catastrophic fire, because they are more successful crown-sprouters (Griffin 1977).

Plant Diversity

The three subtypes of Foothill Hardwood Woodland differ somewhat in the shrub and forb species that are characteristic of the understory; these are described separately below.

One special-status species, Red Bluff dwarf rush, has limited potential to occur in seasonally moist sites in Foothill Hardwood Woodland (Appendix IV). Other special-status plants that could occur in Foothill Hardwood Woodland in Placer County are Sanborn's onion, depauperate milk-vetch, big-scale balsamroot, Red Hills soaproot, Brandegee's clarkia, tripod buckwheat, stinkbells, Butte County fritillary, dubious pea, Humboldt lily, sylvan microseris, Sierra monardella, and hoary navarretia (Appendix IV).

Blue Oak Woodland

Blue oaks generally dominate the tree layer, often with widely scattered, emergent foothill pines. However, blue oak and interior live oak are often co-dominant in many Placer County woodlands. The shrub layer is generally sparse in this more heavily grazed habitat, except for scattered poison-oak, coffeeberry, buckbrush, California buckeye, and whiteleaf manzanita. Dominant species in the grassy understory include nonnative grasses such as wild oat, soft chess, ripgut brome, foxtail barley, hedgehog dogtail, and rattail fescue, and forbs such as rose clover, hedge parsley, and winter vetch. Common noxious weeds include yellow star-thistle, Italian thistle, and medusa-head, as well as many invasive nonnative annual grasses. The understory of Blue Oak Woodlands in western Placer County can also support a wide variety of colorful native bulbs and annual wildflowers. Characteristic native species include California poppy, common brodiaea, fiddleneck, popcornflower, winecup clarkia, soap plant, Ithuriel's spear, and gold nuggets.

Valley Oak Woodland

In the small alluvial valleys of western Placer County, valley oaks frequently co-occur with blue oaks away from the watercourses. The understory is often grazed and consists of a thick carpet of nonnative annual grasses and forbs; the shrub layer, if present, contains bird-dispersed native species such as poison-oak, coffeeberry, and toyon. Himalayan blackberry, a noxious weed species, may be common. Typical nonnative species in the understory include Italian ryegrass, wild oat, Italian thistle, foxtail barley, yellow star-thistle, soft chess, and winter vetch. Other invasive nonnative species that may occur include tree-of-heaven, black locust, ripgut brome, poison hemlock, and French broom. Occasional native forbs and grasses found in the understory of Valley Oak Woodlands in Placer County include blue wildrye, western buttercup, and popcornflower.

Interior Live Oak Woodland

Where light permits development of an herbaceous layer, dominant species in the understory of Interior Live Oak Woodlands include nonnative species that are somewhat shade tolerant, such as hedgehog dogtail, hedge parsley, chickweed, and the noxious weed Italian thistle. Common native species include blue wildrye, miner's lettuce, foothill sanicle, hairy wood rush, 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. In these canopy openings, common nonnative herb associates include slender wild oat, 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, twining brodiaea, common brodiaea, round-tooth ookow, soap plant, California melic, one-sided bluegrass, purple needlegrass, common madia, and goldback fern.

Animal Diversity

Foothill Hardwood Woodland (all three subtypes) is one of the richest wildlife habitats in California (Mayer and Laudenslayer 1988). This statewide characterization seems to hold true for western Placer County: Foothill Hardwood Woodland provides habitat for about 152 vertebrate species—101 breeding species and 51 visitors—in the Phase I Planning Area (Appendix VII).

Amphibians and reptiles in Blue Oak Woodland and Valley Oak Woodland are mostly those of open Annual Grassland ecosystems: California slender salamander, western toad, western yellow-bellied racer, common garter snake, California whipsnake, gopher snake, western and Gilbert's skinks, southern alligator lizard, and western fence lizard. The grassland component attracts bird species such as American kestrel, lark sparrow, western meadowlark, and Bullock's oriole, while oaks provide food for various songbirds and nesting sites for cavity nesters such as woodpeckers, oak titmouse, ash-throated flycatcher, house wren, Bewick's wren, and

violet-green swallow. Typical mammals in these ecosystems include mule deer, California ground squirrel, and western gray squirrel (Appendix VI).

Interior Live Oak Woodland often supports many of the wildlife species associated with Foothill Chaparral; the two 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 structural framework and cavities for nesting of larger birds such as red-tailed hawk and great horned owl.

Special-status wildlife species that are known to occur in Foothill Hardwood Woodlands of the Phase I Planning Area are valley elderberry longhorn beetle (especially in Valley Oak Woodland), western pond turtle (if suitable aquatic habitats are present), California horned lizard, Swainson's hawk (Valley Oak Woodland only), white-tailed kite, Cooper's hawk, golden eagle, purple martin, yellow warbler, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis) (Appendices VI and VII).

Nonnative animals that may occur in Foothill Hardwood of western Placer County are European starling, wild turkey, Virginia opossum, and wild pig.

Distribution and Status

Foothill Hardwood Woodland is widespread in western Placer County (Figures 12 and 13). In the Phase I Planning Area, Foothill Hardwood Woodlands occur at elevations of 21–677 meters (73–2,221 feet). These ecosystems occupy about 8,508 hectares (31,253 acres), or about 11% of the Phase I Planning Area. Approximately 95% of this community is on private land (Table 5).

Blue Oak Woodland

Blue Oak Woodland is the dominant interior foothill woodland, forming an almost continuous belt around the Central Valley (Holland 1986; Mayer and Laudenslayer 1988). Blue Oak Woodland dominates the lower elevations of western Placer County (Figure 13). In the Phase I Planning Area, Blue Oak Woodland occurs at elevations of 27–518 meters (87–1,699 feet). This ecosystem occupies about 3,628 hectares (8,964 acres), or about 3% of the Phase I Planning Area. Approximately 99% of this community is on private land (Table 5).

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 80s. 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).

Valley Oak Woodland

Valley Oak Woodland is typically a Central Valley riparian forest type. This ecosystem was formerly extensive in the Sacramento and San Joaquin Valleys (Holland 1986), but most of the historical stands have been cleared for agriculture, flood control, and urban expansion. The rarest Foothill Hardwood Woodland type, Valley Oak Woodland is restricted to about 271 hectares (670 acres) in Placer County. These stands occur at elevations of about 15–266 meters (50–873 feet), and about 98% of the Valley Oak Woodlands in the Phase I Planning Area are on private land (Table 5). Large stands (>40 acres) of valley oak are nearly absent from the valley-foothill bioregion (Greenwood et al. 1993).

Interior Live Oak Woodland

Interior Live Oak Woodland is widespread throughout the foothill region surrounding the Central Valley, from Shasta County south through the North Coast Ranges to Sonoma County and south through the Sierra foothills to the Kern River (Holland 1986). However, Interior Live Oak Woodland has a restricted distribution in the Phase I Planning Area, occurring at elevations of about 94–203 meters (312–663 feet). This ecosystem occupies only about 241 hectares (595 acres), or <1% of the Phase I Planning Area. Approximately 71% of this community is on private land (Table 5).

Mixed Oak Woodland

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 22–677 meters (73–2,221 feet). This ecosystem occupies about 8,510 hectares (21,025 acres), or 7.7% of the Phase I Planning Area. Approximately 94% of this community is on private land (Table 5).

Oak–Foothill Pine Woodland

Structural and Ecological Characteristics

Oak–Foothill Pine Woodlands comprise a wide range of ecosystems. On gentle, grassy slopes of the lower elevations of the county, they occur as park-like blue oak and foothill pine woodlands. At higher elevations and in river canyons, foothill pines become more abundant on steeper or rockier slopes where oak trees may be sparse or absent. Blue oaks are intolerant of shade and generally do not occur in dense foothill pine stands. Oak–Foothill Pine Woodland is distinguished from Foothill Hardwood Woodland by having a component of foothill pine that exceeds 10% of the total canopy cover (Mayer and Laudenslayer 1988).

Low-elevation Oak–Foothill Pine Woodland is usually dominated by scattered blue oaks, with foothill pines occurring sparsely in the more shallow and rocky soils (Mayer and Laudenslayer 1988). Most existing stands in the Sierra Nevada are in mature stages, with canopy cover ranging from 10% to about 60% (Mayer and Laudenslayer 1988). At higher elevations, interior live oaks replace blue oaks, especially on steep, rocky soils on north-facing slopes.

Oak–Foothill Pine Woodland usually has an understory of shrubs and an herbaceous layer dominated by nonnative annual grasses characteristic of Annual Grassland. Native forbs are usually sparse and best represented on rock outcrops. At middle elevations, this ecosystem may be an indicator of serpentine-derived soils; it also occurs as chaparral-woodlands on extremely dry, shallow, non-serpentine soils. At higher elevations, Oak–Foothill Pine Woodlands merge with Foothill Chaparral or Ponderosa Pine Forest.

Foothill pines grow more rapidly than either blue or interior live oaks following fires, clearing, or other disturbances, and the pines may mature into relatively large trees within 30–40 years. Blue oaks tend to grow slowly at all stages, and acorn-producing trees may take decades to develop. In a study of blue oaks in Nevada, Shasta, and Placer Counties, this species showed little or no height growth after reaching 26 inches in diameter (Mayer and Laudenslayer 1988).

Researchers have expressed concern about the future of this ecosystem 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).

Plant Diversity

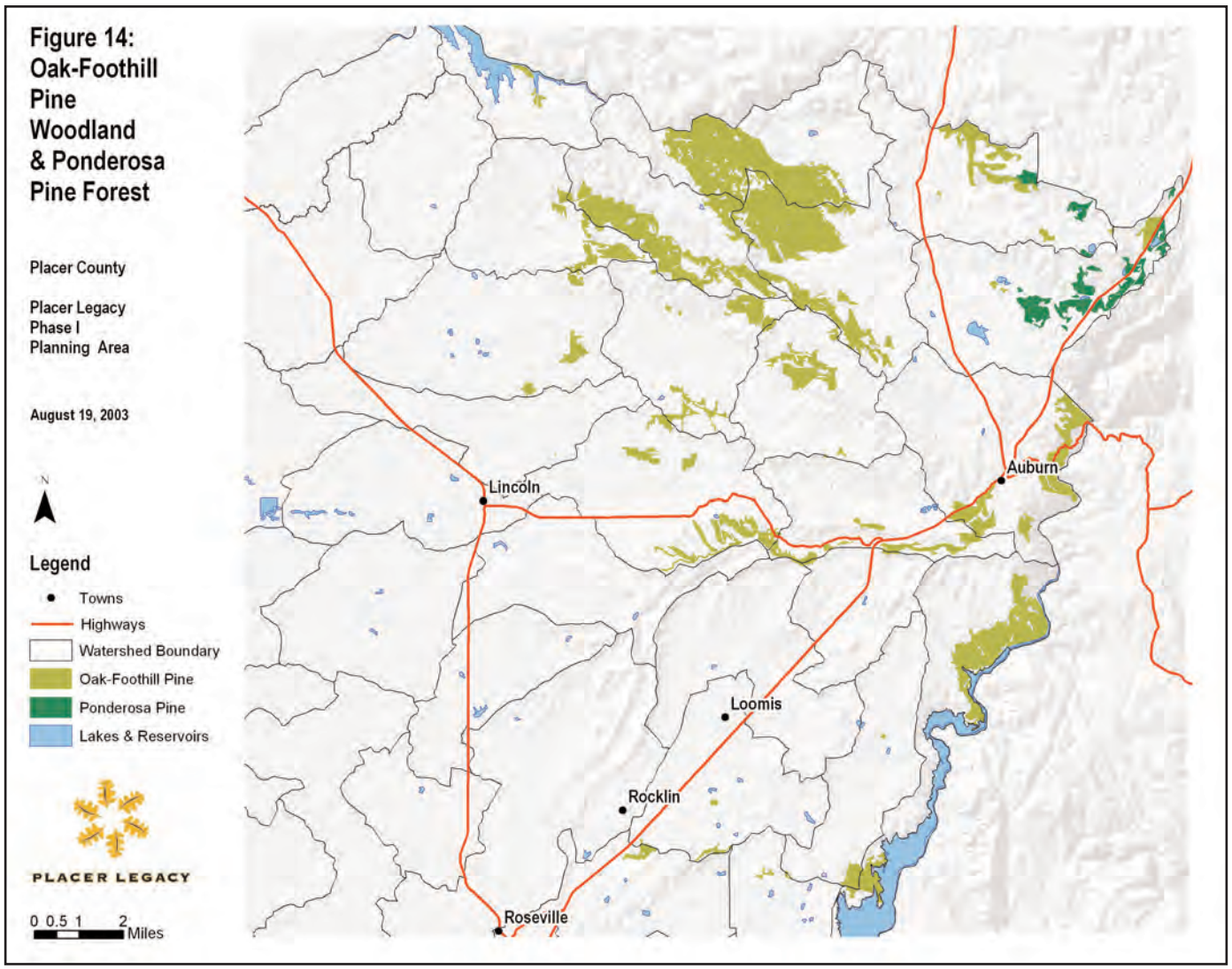
The shrub and herbaceous layers of open Oak–Foothill Pine Woodland at low elevations in western Placer County are characterized by Foothill Chaparral species, including shrubby California buckeye, whiteleaf manzanita, buckbrush, toyon, hoary coffeeberry, and poison-oak. Dominant species in the herbaceous layer include nonnatives 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 nonnative species include yellow star-thistle, Italian thistle, medusa-head, woolly vetch, black mustard, and Klamath weed (Table 3).

Where the woodland is a dense mix of foothill pine, interior live oak, blue oak, and black oak, 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, poison-oak, hoary coffeeberry, bush penstemon, silver bush lupine, hoary honeysuckle, chaparral honeysuckle, California buckeye, and western redbud. Native perennial bunchgrasses such as California melic, one-sided bluegrass, blue wildrye, and purple needlegrass are usually present in canopy openings. Shade-tolerant forbs and grasses are often sparse in the shade of the oaks; these include miner's lettuce, western buttercup, foothill sanicle, goldback fern, and nonnatives hedgehog dogtail and hedge parsley.

One special-status species—Red Bluff dwarf rush—has limited potential to occur in seasonally moist sites. Other special-status plants known to occur in these ecosystems in or near Placer County are Sanborn's onion, depauperate milk-vetch, big-scale balsamroot, Red Hills soaproot, Brandegee's clarkia, tripod buckwheat, stinkbells, Butte County fritillary, dubious pea, Humboldt lily, sylvan microseris, Sierra monardella, and yellow bur navarretia; several of these species occur on specific microhabitat sites within the woodland, such as seasonally moist sites, serpentine soils, or small canopy openings (Appendices III and IV).

Animal Diversity

Oak–Foothill Pine Woodland provides habitat for a large number of animals, although no species are totally dependent on this type (Mayer and Laudenslayer 1988). In the Phase I Planning Area, these ecosystems may support up to 143 vertebrate species—98 breeding species and 45 visitors (Appendix VII, Figure 4).



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. Western scrub-jays, acorn woodpeckers, western gray squirrels, and other acorn specialists may be common in these mixed woodlands. Similarly, 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, California towhee, white-crowned sparrow, golden-crowned sparrow (winter only), wrentit, and blue-gray gnatcatcher 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, western and Gilbert's skinks, southern alligator lizard, and western fence lizard (Appendix VII).

Special-status animal species known to visit Oak–Foothill Pine Woodland of the Phase I Planning Area are western pond turtle (near permanent water), yellow warbler (nonbreeding), Yuma myotis, long-legged myotis, pale Townsend's big-eared bat, and ringtail (Appendix VII).

Nonnative animals that may occur in Oak–Foothill Pine Woodlands of Placer County include European starling, wild turkey, and wild pig.

Distribution and Status

In California, Oak–Foothill Pine Woodlands form a nearly continuous ring around the Central Valley. They can also be 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). In the Phase I Planning Area of western Placer County, Oak–Foothill Pine Woodland

occurs at elevations of about 58–645 meters (190–2,115 feet) (Figure 14). These ecosystems occupy about 5,220 hectares (12,900 acres), or about 5% of the Phase I Planning Area. Approximately 94% of this habitat is on private land (Table 5).

Oak Woodland-Savanna

Structural and Ecological Characteristics

Areas mapped as Oak Woodland-Savanna were characterized by a low canopy cover of oak trees (<30%) with fewer than 12 trees per hectare (five trees per acre). The understory is typically Annual Grassland. Oak Woodland-Savanna often occurs in a mosaic with Foothill Hardwood Woodland and Annual Grasslands. Blue oak savanna is the most frequently occurring subtype in western Placer County. It is found on hillsides and broad ridges in the foothills on dry, shallow, loamy, or gravelly soils (Allen et al. 1989), and can cover extensive areas (Figure 13). Small areas of valley oak savanna occur on valley floors on rich loam soils. Rangelands with scattered live oak trees were also mapped as Oak Woodland-Savanna.

Plant Diversity

Oak-Woodland Savanna is characterized by an open canopy of large oak trees with an understory of introduced Mediterranean grasses and forbs. Shrub cover is generally sparse, consisting of scattered California buckeye, toyon, and poison-oak. Typical plant species in this ecosystem are those of Annual Grassland and Foothill Hardwood Woodland ecosystems. The noxious weeds that occur in Oak-Woodland Savanna are also a mix of those occurring in Annual Grassland and Foothill Hardwood Woodland.

One special-status species, Red Bluff dwarf rush, has limited potential to occur in seasonally moist sites in Oak Woodland-Savanna (Appendix IV). Because they often grow in canopy openings in woodland, the special-status plants that could occur in Foothill Hardwood Woodland could also occur in Oak Woodland-Savanna in Placer County: Sanborn's onion, depauperate milk-vetch, big-scale balsamroot, Red Hills soaproot, Brandegee's clarkia, tripod buckwheat, stinkbells, Butte County fritillary, dubious pea, Humboldt lily, sylvan microseris, Sierra monardella, and yellow bur navarretia (Appendix IV).

Animal Diversity

Oak Woodland-Savanna provides habitat for a large number of animals, although no species are totally dependent on this ecosystem, which supports many of the wildlife species associated with Foothill Hardwood Woodland and Annual Grassland ecosystems. In the Phase I Planning Area, Oak Woodland-Savanna provides habitat for about 136 vertebrate species—76 breeding species and 60 visitors (Appendix VII). Several special-status animal species are known to occur in Oak Woodland-Savanna of the Phase I Planning Area: valley elderberry longhorn beetle, California tiger salamander, northern harrier, white-tailed kite, Swainson's hawk, ferruginous hawk, rough-legged hawk, Cooper's hawk, burrowing owl, long-eared owl, purple martin, bank swallow, grasshopper sparrow, and tricolored blackbird, ringtail, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis) (Appendices VI and VII).

Nonnative animals that may occur in Oak Woodland-Savanna of Placer County include European starling, wild turkey, and wild pig.

Distribution and Status

Oak Woodland-Savanna ecosystems occur in the Coast Ranges and in a ring around the Central Valley in the foothills of the Sierra Nevada and Coast Ranges (Allen et al. 1989). Much Oak Woodland-Savanna has been cleared for range improvement; the major land use is livestock grazing. There is evidence that scattered trees increase the production of forage (Allen-Diaz et al. 1999), but long-term livestock grazing reduces survival of oak seedlings and saplings, resulting in a lack of recruitment of oaks (Adams et al. 1991).

In the Phase I Planning Area, Oak Woodland-Savanna occurs at elevations of about 22–593 meters (71–1,946 feet). This ecosystem occupies about 4,303 hectares (10,632 acres), or 3.9% of the Phase I Planning Area; 98% of this ecosystem is on private land (Table 5).

Ponderosa Pine Forest

Structural and Ecological Characteristics

Ponderosa Pine Forests are characterized by a dominance of ponderosa pine trees in the forest canopy. Prior to European settlement, these forests experienced frequent, low- to mid-intensity wildfires (primarily surface fires) that were a primary factor influencing stand density, structure, and species composition (Skinner and Chang 1996). A policy of fire exclusion or

suppression during the twentieth century, along with the selective harvest of many large pines, has significantly changed fire behavior and led to an increase in fire severity and the number of infrequent but high-intensity, stand-destroying fires.

Ponderosa Pine Forest generally occupies a broad band above the Oak–Foothill Pine Woodland and below the higher elevation Mixed-Conifer Forest. Within this range, chaparral and hardwood species (both foothill and montane) intermingle with pines and other conifers. At its lower elevational limits, Ponderosa Pine Forest is primarily restricted to cool, moist sites on north-facing slopes. It also occurs at low elevations in canyon bottoms, while Foothill Hardwood Woodlands and Foothill Chaparral usually occupy adjacent ridgetops and south-facing slopes (Whitney 1979). At higher elevations, Ponderosa Pine Forest occupies south-facing slopes until it is replaced by Mixed-Conifer Forest at about 1,675 meters (5,500 feet). At intermediate elevations, this habitat occupies non-rocky soils on a wide variety of slopes and aspects. Ideal site conditions for Ponderosa Pine Forest are coarse, well-drained soils of a granitic or basaltic base (Holland 1986).

Historically, Ponderosa Pine Forest featured open, park-like stands with scattered understory trees and shrubs growing beneath pines as tall as 46–61 meters (150–200 feet) (Holland 1986). Frequent fires cleaned out the massive needle accumulations that collect under ponderosa pines and eliminated invading seedlings and competing young trees. It has been estimated that, prior to the turn of the twentieth century, the median fire return interval for this forest type was eleven years; currently, the estimated return interval is 192 years (Skinner and Chang 1996).

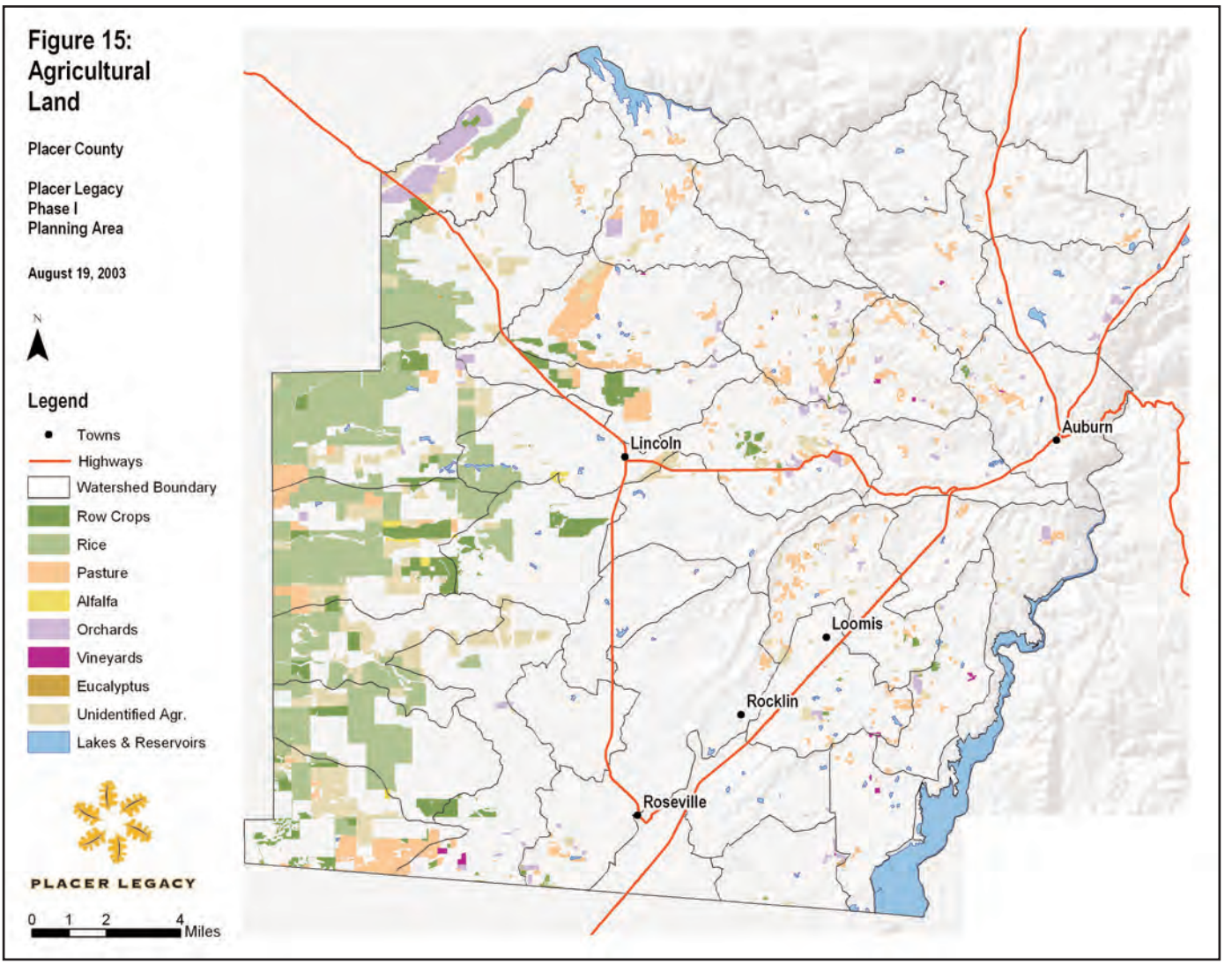
Many decades of fire suppression and overstory removal have dramatically altered the Ponderosa Pine Forest. Formerly open stands have been replaced by much denser thickets of early- to mid-successional ponderosa pines mixed with large numbers of oaks, firs, incense-cedars, and manzanita species that have become established in the absence of periodic fires (Whitney 1979). Historically, the shrub understory of open forest stands comprised a diverse mix of species with variable density depending on light and soil conditions. Decades of fire suppression and shading by young conifers have reduced the diversity and abundance of the shrub understory in these forests.

Plant Diversity

By convention, mixed-species stands are categorized as Ponderosa Pine Forest when more than 50% of the canopy is ponderosa pine (Mayer and Laudenslayer 1988). One of the more common associates of the Ponderosa Pine Forest is black oak, which also occurs in pure stands as a seral stage to ponderosa pine in areas disturbed by fire or logging (Holland 1986) or on drier, rockier sites. Other canopy associates include white fir, incense-cedar, sugar pine, Douglas-fir, canyon live oak, and Pacific madrone.

Species composition of the understory of Ponderosa Pine Forest varies widely with elevation, aspect, and fire history of individual stands. However, in most areas, the shrub and herb layers occur primarily at forest edges or in canopy openings, such as rock outcrops and other natural or artificial clearings. At lower elevations, below approximately 914 meters (3,000 feet), characteristic native shrubs include whiteleaf manzanita, deer brush, hoary coffeeberry, poison-oak, toyon, buckbrush, Sierra plum, and western redbud. Common herbaceous species in these settings include Hartweg's iris, mariposa lily, Sierra milkwort, American vetch, mountain violet, blue wild rye, rhomboid clarkia, and the nonnative grass hedgehog dogtail. Poison-oak, mountain misery, and bracken fern are native species of this habitat that are often indicators of earlier disturbance, such as fire and logging.

Fire suppression and high levels of disturbance from human settlement have greatly increased the number of weedy exotic species in Ponderosa Pine Forest. These invasive nonnative species displace native vegetation and may increase ignition sources and alter the frequency or intensity of wildfires. This is particularly true in the Auburn area and other wildlands that are near urban or residential development. Along roadsides and in areas disturbed by fire, logging, historic mining, and brushing, Scotch broom and French broom may be a serious pests. On moister aspects near towns, common noxious weeds in the understory of Ponderosa Pine Forest include Himalayan blackberry, cut-leaf boysenberry, periwinkle, sweet cherry, English ivy, and Klamath weed. These invasive species often dominate the understory of disturbed Ponderosa Pine Forest.



Several special-status plants are known to occur in the lower elevations of Ponderosa Pine forests in the Phase I Planning Area: Sanborn's onion, True's manzanita, Brandegee's clarkia, dissected-leaved toothwort, Red Hills soaproot, Butte County fritillary, dubious pea, Humboldt lily, and Sierra monardella (Appendices III and IV). These species are more likely to occur at forest edges or in small canopy openings.

Animal Diversity

Ponderosa Pine Forests of western Placer County have potential to support one of the highest vertebrate diversities of any of the county's large-patch ecosystems (Figure 3). Approximately 134 vertebrate species—92 breeding species and 42 visitors—occur in these ecosystems in the Phase I Planning Area (Appendix VII, Figure 4).

Wildlife management in Ponderosa Pine Forest often focuses on the value of this habitat to migratory mule deer herds that find critical feeding and wintering habitat there (Mayer and Laudenslayer 1988). The mix of nutritious shrubs, as well as the fact that the Ponderosa Pine belt occurs mostly below the level of deep winter snows, contributes to its value as critical mule deer habitat (Zeiner et al.1990).

Other large mammals that frequent this habitat include coyote, black bear, mountain lion, and bobcat. A variety of smaller rodents, squirrels, and shrews favor the mix of shrub thickets and open patches. Amphibians and reptiles that occupy Ponderosa Pine Forest include ensatina, California newt, long-toed salamander, Pacific treefrog , western toad, western fence lizard, northern alligator lizard, gopher snake, common kingsnake, mountain kingsnake, common garter snake, western terrestrial garter snake, and western rattlesnake (Appendix VII).

A variety of flycatchers, vireos, warblers, and many other species occur in Ponderosa Pine Forests. Canopy-dwelling species include olive-sided flycatcher, golden-crowned kinglet (winter only), and western tanager.

Large snags (i.e., >24 inches diameter at breast height [dbh]) and the decaying portions of living trees offer nesting cavities for pileated woodpecker, western screech owl, and northern flicker. Nutritious sap exudes from maturing cones and wounds in the bark caused by tree falls, fire, insects, and some woodpeckers and sapsucker species; the sap and the insects it attracts provide feeding opportunities for sapsuckers, woodpeckers, and many other bird species. The high-protein pine seeds are eaten by a long list of birds, including some woodpeckers (primarily white-headed woodpecker), mourning dove, white-breasted nuthatch, red-breasted nuthatch, chestnut-backed chickadee, mountain chickadee, dark-eyed junco, spotted towhee, black-headed grosbeak, and evening grosbeak (Appendix VI).

Special-status species that are known to visit this habitat include Western pond turtle (if suitable aquatic habitats are present), northern goshawk, California spotted owl, yellow warbler, American marten, Pacific fisher, ringtail, and an unknown number of bat species (e.g., long-eared myotis, long-legged myotis, and Yuma myotis) (Appendices VI and VII). Some of these declining species depend, at least to some degree, on large conifer trees and/or blocks of undisturbed forest (Verner and Boss 1980; Zeiner et al. 1990).

Nonnative bullfrogs occur in artificial ponds and other wetlands within Ponderosa Pine Forest, where they can outcompete and prey upon native amphibians (Zeiner et al. 1990; Jennings and Hayes 1994). European starlings are uncommon nesters in low-elevation Ponderosa Pine Forest of the Sierra Nevada, where they can displace native cavity-nesting birds (Beedy and Granholm 1985; Gaines 1992). Black rats and house mice are potentially invasive species around human habitations; however, they have been little studied.

Livestock operations attract brown-headed cowbirds, a native North American species that expanded its range into 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). In Ponderosa Pine Forests of the Sierra Nevada, brown-headed cowbirds are most common in disturbed areas and in early-successional stands, especially where livestock are present within about 4 miles of breeding areas (Rothstein et al. 1984).

Distribution and Status

Like many other montane forest types in the Sierra Nevada, Ponderosa Pine Forest occurs along the Sierra-Cascade axis with an extension in the northwestern corner of the state. Unlike the many other Sierra forest types, however, Ponderosa Pine Forest also extends southward along the Coast Ranges as far as Santa Barbara County (Griffin and Critchfield 1976; Mayer and Laudenslayer 1988).

In the Phase I Planning Area of Placer County, Ponderosa Pine Forest occurs at elevations of about 416–650 meters (1,365–2,130 feet). These ecosystems occupy about 400 hectares (990 acres), or less than 1% of the Phase I Planning Area. Approximately 93% of this habitat is on private land (Table 5). The largest stands of Ponderosa Pine Forest in the Phase I Planning Area are north and east of Auburn (Figure 14). This forest type is a primary timber-producing ecosystem, and many stands been converted to an early- or mid-successional stages by logging activities or have been modified by their proximity to human development (Sierra Nevada Ecosystem Project 1996).

Agricultural Ecosystems

Rice is the single largest crop in Placer County. Most of the remaining agricultural lands are irrigated and dryland pasture, but large areas of hay, grain, and vegetable crops are also grown (U.S. Department of Agriculture 1997; 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 Foothill Hardwood Woodland (Rogers 1980).

Seven major Agricultural Ecosystems were mapped in this study: Rice, Row Crops, Unidentified Croplands, Alfalfa, Irrigated Pasture, Vineyard, and Orchard (Figure 15). In the Phase I Planning Area, Agricultural Ecosystems occur at elevations of 11–562 meters elevation (35–1,844 feet). These ecosystems occupy about 18,270 hectares (45,150 acres),or about 16.5% of the Phase I Planning Area; 99% of these habitats are on private land (Table 5). The extent and relative habitat values of these artificial ecosystems are discussed below.

Rice

Rice fields mapped in this study included both 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. 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 nonnative. Typical plants found in uncleared ditches and canals include bulrush, cattail, nutsedge, rushes, Harding grass, western vervain, and Bermuda grass. No special-status plants occur in Rice lands of western Placer County (Appendices III, IV), nor is suitable habitat present for any of these species.

Flooded Rice fields in the Phase I Planning Area attract wintering and migrating waterfowl, waders, shorebirds, and gulls (Jones & Stokes 2003). The relative attractiveness of flooded rice fields to migratory and wintering birds depends on rainfall and on site-specific flooding cycles and management practices. Most waterfowl use open water areas after the hunting season is over, and large concentrations (more than 10,000 individuals) of northern pintails congregate in flooded Rice fields prior to spring migration (Miller pers. comm.). In spring, these fields often support foraging resident species such as black-crowned night-heron, Canada goose, cinnamon teal, mallard, gadwall, and killdeer.

During fall migration (which begins in late June), flooded Rice fields 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. In winter, flooded Rice fields support large numbers of overwintering killdeer, greater yellowlegs, long-billed curlew, dunlin, least sandpiper, long-billed dowitcher, Wilson's snipe, and American pipit. During these winter months, especially after the waterfowl-hunting season, large flocks of waterfowl forage in flooded rice fields. These shorebird and waterbird concentrations attract raptors, especially northern harrier, American peregrine falcon, and bald eagle. When not flooded, rodent populations in the fields may also attract raptors, including white-tailed kite, red-tailed hawk, American kestrel, and short-eared owl (Jones & Stokes 2003).

In the Phase I Planning Area, Rice fields support about 99 vertebrate species—10 breeding species and 89 visitors (Appendix VII, Figure 4). Eleven special-status animal species may visit Rice fields in the Phase I Planning Area: giant garter snake, bald eagle, northern harrier, white-tailed kite, Swainson's hawk, ferruginous hawk, rough-legged hawk, American peregrine falcon, burrowing owl, Modesto song sparrow, and tricolored blackbird (Appendices VI and VII).

Rice is grown on suitable soils throughout the Sacramento Valley and is the major crop in Placer County. In the Phase I Planning Area of western Placer County, Rice fields lie at elevations of about 13–43 meters (45–140 feet) (Table 5, Figure 15). These ecosystems occupy about 8,183 hectares (20,220 acres), or about 7% of the Phase I Planning Area; 100% of these ecosystems are on private land (Table 5).

Row Crops

Row Crops are generally monotypic Agricultural fields of herbaceous species varying in height from 0.3 to 1.8 meters (1 to 6 feet). Most Row Crops are annual species, although a few (e.g., strawberries) are perennials. Major Row Crops in Placer County are grain, vegetable crops, and miscellaneous crops (e.g., clover seed, corn, oats) (U.S. Department of Agriculture 1997). 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).

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).

The dominant species on the margins of Row Crops include a variety of introduced grasses and legumes; noxious weeds and other nonnative invasive plants may also be present. The major noxious weeds subject to biological control measures in Placer County are yellow star-thistle, Italian thistle, Klamath weed, skeleton weed, and puncture vine (Placer County 2001); many other noxious and invasive plants have the potential to occur in and around Row Crops (Table 3). In moist areas near irrigation ditches and farm ponds, noxious weeds such as Johnson grass and Bermuda grass are often present. No special-status plants occur in Row Crop habitats of western Placer County (Appendix III, IV), nor is suitable habitat present for any of these species.

In comparison with native large-patch ecosystems in western Placer County, Row Crops support relatively few native wildlife species. In the Phase I Planning Area, these ecosystems support about 47 vertebrate species—six breeding species and 41 visitors (Appendix VII, Figure 4). Most of these species do not breed in active Row Crops, 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 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, western kingbird, American crow, western meadowlark, Brewer's blackbird, and red-winged blackbird.

Special-status species that may visit Row Crops of the Phase I Planning Area include giant garter snake, northern harrier, Swainson's hawk, white-tailed kite, golden eagle, merlin, prairie falcon, rough-legged hawk, ferruginous hawk, American peregrine falcon, burrowing owl, loggerhead shrike, and tricolored blackbird (Appendix VI). Exotic animals that may be destructive of Row Crops include European starling, house sparrow, Virginia opossum, and wild pig.

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 Phase I Planning Area, Row Crops are found at elevations of about 11–390 meters (35–1,280 feet), but most are below about 61 meters (200 feet) (Table 5, Figure 15). These ecosystems occupy about 1,997 hectares (4,935 acres), or about 2% of the Phase I Planning Area; 100% of this habitat is on private land (Table 5).

Unidentified Croplands

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 nonnative invasive plants, as listed in the description of Row Crops.

In the Phase I Planning Area of western Placer County, Unidentified Croplands are found at elevations of about 14–417 meters (47–1,368 feet) (Table 5, Figure 15). These ecosystems occupy about 3,505 hectares (8,660 acres), or about 3% of the Phase I Planning Area; 100% of this habitat is on private land (Table 5).

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 nonnative invasive plants may also be present. No special-status plants are known to occur in Alfalfa in western Placer County, nor is suitable habitat present (Appendix IV).

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. The larger Alfalfa fields in the Phase Planning I Area, when bordered by suitable nesting trees, may support nesting Swainson's hawks. 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 duck species.

In the Phase I Planning Area, Alfalfa fields support about 58 vertebrate species—six breeding species and 52 visitors (Table 5, Figure 4). Special-status wildlife species that may visit Alfalfa fields in the Phase I Planning Area are giant garter snake, northern harrier, Swainson's hawk, ferruginous hawk, rough-legged hawk, burrowing owl, Modesto song sparrow, and tricolored blackbird (Appendices VI and VII).

In the Phase I Planning Area, Alfalfa fields are found at elevations of about 21–41 meters (70–135 feet) (Table 5, Figure 15). These ecosystems occupy about 100 hectares (250 acres), or less than 1% of the Phase I Planning Area; 100% of this habitat is on private land (Table 5).

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 nonnative wetland species such as ryegrass, fescues, Dallis grass, orchard grass, velvet grass, Bermuda grass, curly dock, lady's-thumb, barnyard grass, and white clover. 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, and Johnsongrass. Native species in Irrigated Pastures are generally found only in wetland settings. No special-status plants are known to occur in Irrigated Pastures in western Placer County, nor is suitable habitat present (Appendix IV).

In the Phase I Planning Area, Irrigated Pastures support about 63 vertebrate species—six breeding species and 57 visitors (Appendix VII, Figure 4). Special-status wildlife species that may visit Irrigated Pastures in the Phase I Planning Area are giant garter snake, bald eagle, northern harrier, Swainson's hawk, ferruginous hawk, rough-legged hawk, American peregrine falcon, burrowing owl, loggerhead shrike, and tricolored blackbird (Appendix VII). Some birds that typically forage in the county's Irrigated Pastures include great blue heron, great egret, Canada goose, American kestrel, California quail, western kingbird, American crow, western meadowlark, Brewer's blackbird, and red-winged blackbird.

Irrigated Pastures occur throughout western Placer county, and vary from small irrigated fields in Rural-Residential areas in the foothills used for small-scale livestock rearing to extensive pastures on floodplains in the lower foothills and valley area used for intensive cattle rearing.

In the Phase I Planning Area, Irrigated Pastures are found at elevations of about 14–562 meters (45–1,845 feet) (Table 5, Figure 15). These ecosystems occupy about 3,180 hectares (7,860 acres), or about 3% of the Phase I Planning Area; 99% of this habitat is on private land (Table 5).

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).

Vineyards have a more limited distribution in western Placer County than in many California counties that have experienced a dramatic increase in Vineyard conversions. 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).

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).

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, wild oat, orchard grass, red-stemmed filaree, dove-foot geranium, little hop clover, and rose clover. Noxious weeds such as Bermuda grass and Johnson grass may also be present, particularly in moist areas. No special-status plants are known to occur in Vineyards of western Placer County, nor is suitable habitat present (Appendix IV).

Vineyards support relatively few vertebrate species compared to other large-patch ecosystems in western Placer County. In the Phase I Planning Area, these ecosystems support about 52 vertebrate species—seven breeding species and 45 visitors (Appendix VII, Figure 4). Native birds that typically forage in Placer County Vineyards include mourning dove, western scrub-jay, American crow, western bluebird, white-crowned sparrow, golden-crowned sparrow, dark-eyed junco, 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). No special-status animals are known to breed in Vineyards of western Placer County (Figure 3, Appendix VII), nor is suitable habitat present.

Vineyards are found in nearly every California county except Alpine, Lassen, Modoc, Mono, Plumas, San Francisco, and Trinity (Mayer and Laudenslayer 1988). In the Phase I Planning Area, Vineyards are found at elevations of about 26–393 meters (85–1,290 feet) (Figure 15). These ecosystems occupy about 53 hectares (155 acres), or less than 1% of the Phase I Planning Area; 100% of this habitat is on private land (Table 5).

Orchard

Orchards in western Placer County are often found within Annual Grassland, Foothill Hardwood Woodland, or Ponderosa Pine Forest 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 Placer County. Loamy soils are the most common or preferred substrate for orchards (Rogers 1980).

Orchards are generally monotypic, tree-dominated habitats, although pruning to facilitate harvest results in trees that range in height from 4.5 to 9 meters (15 to 30 feet) (Mayer and Laudenslayer 1988). The crowns do not overlap, and trees are uniformly spaced in straight rows. Most Orchards are sprinkler irrigated 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 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.

Walnuts, plums, peaches, oranges, apples, and pears are the most commonly planted crops in western Placer County Orchards (Placer County 2001). Below the fruit trees, the understory is either bare soil or a periodically mowed herbaceous layer of nonnative 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. No special-status plants are known to occur in Orchards (Appendix IV), nor is suitable habitat present.

In comparison with native large-patch ecosystems in western Placer County, Orchards support relatively few native wildlife species. In the Phase I Planning Area, Orchards support about 55 vertebrate species—12 breeding species and 43 visitors (Appendix VII, Figure 4). 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 Placer County Orchards include white-tailed kite, red-tailed hawk, American kestrel, California quail, mourning dove, red-breasted sapsucker, western kingbird, yellow-billed magpie, and American crow. No special-status species breed in Orchards of the Phase I Planning Area, however, white-tailed kites may use Orchards for communal roosting sites. Exotic animals that may be destructive of Orchards in the county include European starling, house sparrow, Virginia opossum, and wild pig.

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 Phase I Planning Area of western Placer County, Orchards are found at elevations of about 18–515 meters (60–1,680 feet) (Figure 15). These ecosystems occupy about 1,100 hectares (2,740 acres), or about 1% of the Phase I Planning Area; 100% of this habitat is on private land (Table 5).

Urban Ecosystems

Areas mapped as Urban 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). 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 seven types of Urban Ecosystems recognized in this report are based on zoning categories used by the Placer County Planning Department: Urban/Suburban, Rural-Residential, Rural-Residential Forested, Urban Parks, Golf Courses, Urban Riparian, Urban Woodland, and Urban Wetland (Table 1, Figure 16).

No special-status plants are known to occur in Urban or Residential areas of the Phase I Planning Area. However, two special-status vertebrate species—white-tailed kite and purple martin—are known to use these areas on occasion (Appendices VI and VII). The relatively low number of special-status animals in Urban/Residential areas may be related to lack of suitable habitat, human disturbance, and the high numbers of native and introduced predators that thrive there (often with increased population densities) (Erlich et al. 1988). In the Phase I Planning Area, typical Urban/Suburban predators include feral and free-ranging cats and dogs, raccoons, striped skunks, opossums, coyotes, western scrub-jays, Steller's jays, and American crows.

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 Foothill Hardwood Woodland or Annual Grassland, as well as areas that may have been previously modified for agricultural uses (Mayer and Laudenslayer 1988).

In the Phase I Planning Area of western Placer County, Urban/Suburban Ecosystems occur at elevations of 10–660 meters elevation (33–2,165 feet), but most occur below 305 meters (1,000 feet). These ecosystems

occupy about 31,180 hectares (77,047 acres), or 28% of the Phase I Planning Area; 96% of this habitat is on private land (Table 5). The extent and relative habitat values of the seven defined types of artificial ecosystems are discussed below.

Urban/Suburban

Urban/Suburban areas were defined as areas developed with more than 2.5 units per hectare (1 unit per acre). These areas occupy about 13, 830 hectares (34,180 acres), or about 12.5% of the Phase I Planning Area (Table 5). Ornamental plantings in the older neighborhoods of Auburn, Lincoln, and Roseville are often mature, introduced evergreen and deciduous trees that may be as much as 100 years old. These ornamental species range from approximately 6 to 15 meters (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/Suburban areas include many introduced fruiting species that may be attractive to birds and other wildlife.

Urban/Suburban areas support about 67 vertebrate species—25 breeding species and 42 visitors (Appendix VII). Special-status animal species that are known to visit Urban/Suburban habitats of the Phase I Planning Area are yellow warbler and Modesto song sparrow (Appendices IV and VII).

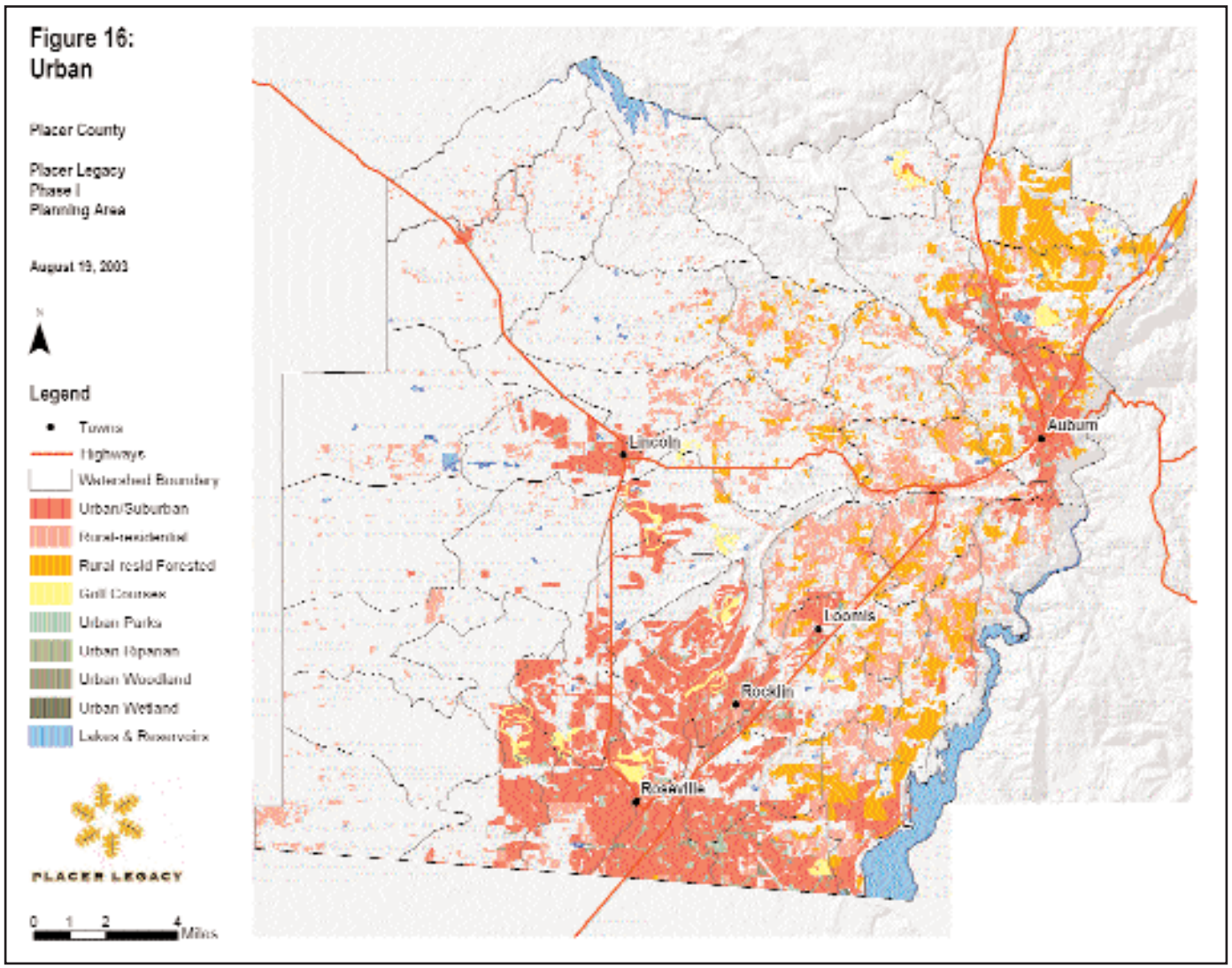
Rural-Residential

Rural-Residential areas were defined as areas developed with 0.25–2.5 units per hectare (0.1–1 unit per acre) and less than 70% tree canopy cover. These areas occupy about 9,460 hectares (23,380 acres), or about 8.5% of the Phase I Planning Area (Table 5). Areas mapped as Rural/Residential include small pockets of remnant Foothill Hardwood Woodland, 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 property-damaging fire.

Large ungrazed lots in Rural-Residential areas often become infested with weedy, nonnative species, especially yellow star-thistle. Many of these invasive nonnative 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, tree-of-heaven, black locust, English ivy, periwinkle, pampas grass, giant reed, scarlet wisteria, pennyroyal, wild oat, tall fescue, and aquarium species such as parrot's feather and water hyacinth (Table 3). 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; Klamath weed; field bindweed; bull thistle; medusa-head; and other invasive species such as fennel, black mustard, and woolly mullein (Table 3). Other abundant nonnative plants in these ecosystems include hedgehog dogtail, hedge parsley, dove-foot geranium, ripgut brome, red brome, velvet grass, dallis grass, and many more.

Rural-Residential areas may support about 122 vertebrate species—65 breeding species and 57 visitors. Special-status animals that are known to visit Rural-Residential habitats of the Phase I Planning Area are yellow warbler, Modesto song sparrow, and tricolored blackbird. Native species that may occur in Rural-Residential areas include yellow-billed magpie, American crow, western scrub-jay, house wren, and brown-headed cowbird (Appendix VII). The high densities of exotic fruits and flowers, bird baths, and hummingbird and seed feeders attract Anna's hummingbird, rufous hummingbird, California towhee, spotted towhee, golden-crowned sparrow, white-crowned sparrow, and American goldfinch. Likewise, vegetable garden produce and pet food put out overnight are irresistible attractants for resident mammals such as Virginia opossum, Norway rat, black rat, house mouse, raccoon, and striped skunk.



Rural-Residential Forested

Rural-Residential Forested areas were defined as areas developed with 0.25–2.5 units per hectare (0.1–1 unit per acre) with more than 70% cover of large, mature trees. These areas occupy about 5,970 hectares (14,745 acres), or about 5% of the Phase I Planning Area (Table 5). Undeveloped lots in Rural-Residential Forested areas may support remnant patches of mature Foothill Hardwood Woodland 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).

Rural-Residential Forested areas support about 122 vertebrate species—70 breeding species and 52 visitors (Appendix VII). Special-status animals that are known to visit Rural-Residential Forested habitats of the Phase I Planning Area NCCP/HCP are Swainson's hawk, yellow warbler, and Modesto song sparrow. 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. Nonnative animals that frequent Rural-Residential Forested areas of Placer County include house sparrow, European starling, wild turkey, bullfrog, black rat, Norway rat, and house mouse (Appendix VII).

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 2 hectares [5 acres]), and their combined acreage is only about 24 hectares (60 acres) in the Phase I Planning Area (Table 5, Figure 15). Eucalyptus trees flower in winter, producing large

quantities high-quality nectar, and are, consequently, highly attractive to a variety of nectar- and insect-foraging birds. Anna's hummingbird, rufous hummingbird, ruby-crowned kinglet, bushtit, yellow-rumped warbler, American goldfinch, and house finch are among the species that are especially abundant in Eucalyptus groves of the Phase I Planning 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.).

Urban Parks and Golf Courses

Urban Parks were defined as isolated city parks, playgrounds, and grass fields. These areas occupy about 685 hectares (1,610 acres), or less than 1% of the Phase I Planning Area (Table 5). Parks in western Placer County are found at elevations of about 27–573 meters (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 Phase I Planning Area are dominated by lawn grass and a few mature trees. Golf courses occupy about 880 hectares (2,180 acres), or less than 1% of the Phase I Planning Area (Table 5), and are found at elevations of about 28–600 meters (90–1,970 feet).

Urban Parks and Golf Courses support about 131 vertebrate species—70 breeding species and 61 visitors (Appendix VII). Special-status animals that are known to visit Urban Parks and Golf Courses of the Phase I Planning Area are western pond turtle, yellow warbler, Modesto song sparrow, and tricolored blackbird. Wildlife species typically found in these areas are Canada goose, American coot, red-shouldered hawk, northern flicker, black phoebe, white-breasted nuthatch, northern mockingbird, western tanager, bobcat, and mule deer (Appendix VII).

Urban Riparian

Urban Riparian areas are creeks and riparian woodlands (often occurring as greenbelts) that are surrounded by Urban/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/Suburban Areas that appeared to be undisturbed and unused for recreation were mapped as Valley Foothill Riparian Woodland. Urban Riparian areas occupy about 170 hectares (420 acres), or less than 1% of the Phase I Planning Area (Table 5).

Urban areas often have disproportionate effects on stream environments. Some development projects in the Placer County have been permitted to encroach into floodplain environments within 3–6 meters (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 nonnative 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).

Despite their small size, Urban Riparian areas support about 137 vertebrate species—83 breeding species and 54 visitors (Appendix VII). Urban Riparian habitats usually support more species than other Urban habitat types (Erlich et al. 1988). Strips of habitat (greenbelts) along streams can make urban areas much more attractive to birds and other wildlife as well as to people. Special-status animals known to visit Urban Riparian areas of the Phase I Planning Area are western pond turtle, yellow warbler, and Modesto song sparrow. Some typical native species that might be found in Urban greenbelt areas of 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 (Appendix VII).

Urban Woodland

Urban Woodland includes city parks with predominantly tree-dominated vegetation;windbreaks with mostly nonnative trees; and remnant patches of the former tree cover, usually Foothill Hardwood Woodland, that are disturbed and surrounded by urban development. Urban Woodland areas occupy about 195 hectares (480 acres), or much less than 1% of the Phase I Planning Area (Table 5). 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, red maple, deodar cedar, linden tree, Modesto ash, Washington hawthorn, and English holly. In newer developments, frequently planted trees include liquidambar, European birch, weeping willow, coast redwood, purple-leaf plum, and eastern dogwood. Locally native oak and conifer species are rarely planted and are not widely available in local nurseries.

Despite their small size, 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. Special-status species that may visit Urban Woodland areas of the Phase I Planning Area are western pond turtle, yellow warbler, and Modesto song sparrow. Some of the native species that might be found in urban greenbelt areas of 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 (Appendix VII).

Urban Wetland

Urban Wetland includes Vernal Pools, Seasonal Wetlands, and Fresh Emergent Wetlands that are surrounded by Urban/Residential development. These areas occupy about 22 hectares (55 acres), or much less than 1% of the Phase I Planning Area (Table 5). Urban Wetlands support about 34 vertebrate species—20 breeding species and 14 visitors. Modesto song sparrow and tricolored blackbird are special-status species that breed in Urban Wetlands. Other native species that might be found in Urban Wetlands are California newt, Pacific tree frog, mallard, American coot, red-winged blackbird, and muskrat (Appendix VII).

One special-status plant species, Sanford's arrowhead, is known to occur in Urban Wetlands in Sacramento County very close to the Placer County line (Appendix III, IV).

Small-Patch Ecosystems

Small-Patch Ecosystems were defined in this report as isolated or unique communities that are small (usually less than 4 hectares [10 acres]) and that have unusual qualities or species associated with them. Five Small-Patch Ecosystem types were identified and mapped in this report: Landscape and Golf Course Ponds, Stock Ponds, Seeps and Springs, Mehrten Formation Soils, and Serpentine Soils (Table 6). Some of these ecosystems may support special-status plants and animals, or they may be locally or regionally scarce and therefore vulnerable to disturbance. For these reasons, several of the following Small-Patch Ecosystems are recognized by state and/or federal resource agencies as sensitive habitats in California (California Natural Diversity Database 1997).

Landscape and Golf Course Ponds

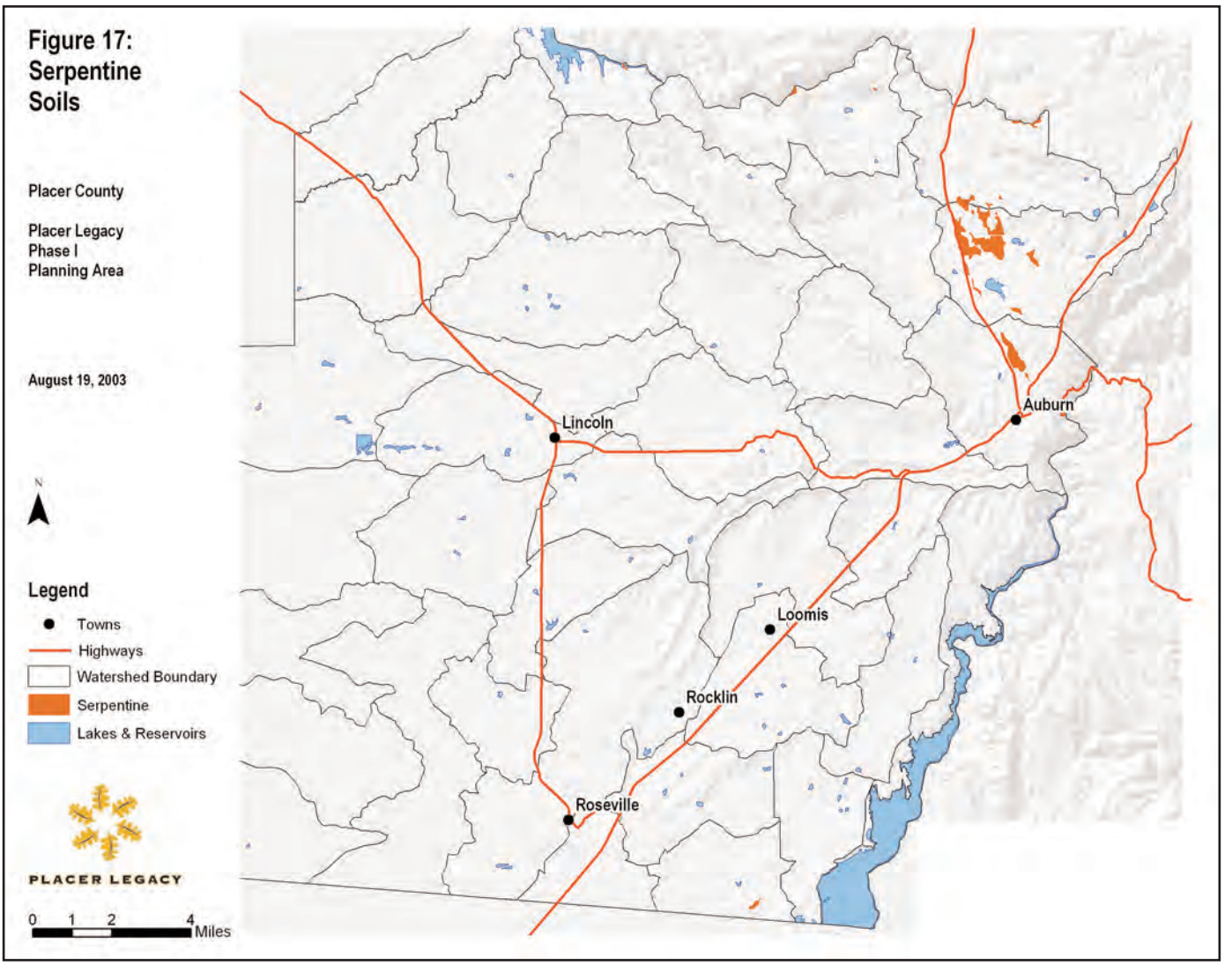
Ponds mapped as Landscape and Golf Course Ponds were less than 0.4 hectare (1 acre) in extent; larger ponds were mapped as Lacustrine ecosystems. Many of these ponds were created by excavation and damming of seasonal creeks. These ponds are typically constructed for aesthetic purposes or to enhance golf 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). Despite their small size, managed vegetation, and human disturbance, Landscape and Golf Course Ponds provide a year-round water source for wildlife. Landscape and Golf Course Ponds occur at elevations of about 29–574 meters (95–1,883 feet). About 51 hectares (125 acres) of Landscape and Golf Course Ponds were mapped in the Phase I Planning Area (Figure 6); 96% of these habitats are on private land (Table 6).

Stock Ponds

Ponds were mapped as Stock Ponds if they were less than 0.4 hectare (1 acre) and provided a water source for livestock. Like Landscape and Golf Course Ponds, Stock Ponds are frequently constructed on seasonal creeks. Surrounding vegetation is usually grazed heavily, and Stock Ponds are often heavily trampled by concentrated livestock use. Stock Ponds may retain water year-round, or they may dry out in the summer. Stock Ponds occur at elevations of about 13–446 meters (43–1,463 feet), and about 56 hectares (139 acres) were mapped in the Phase I Planning Area (Figure 6); 97% of these habitats are on private land (Table 6).

Seeps and Springs

This category includes permanent, intermittent, and ephemeral Seeps and Springs. 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 and Springs are rare in western Placer County and are encountered on the north-facing

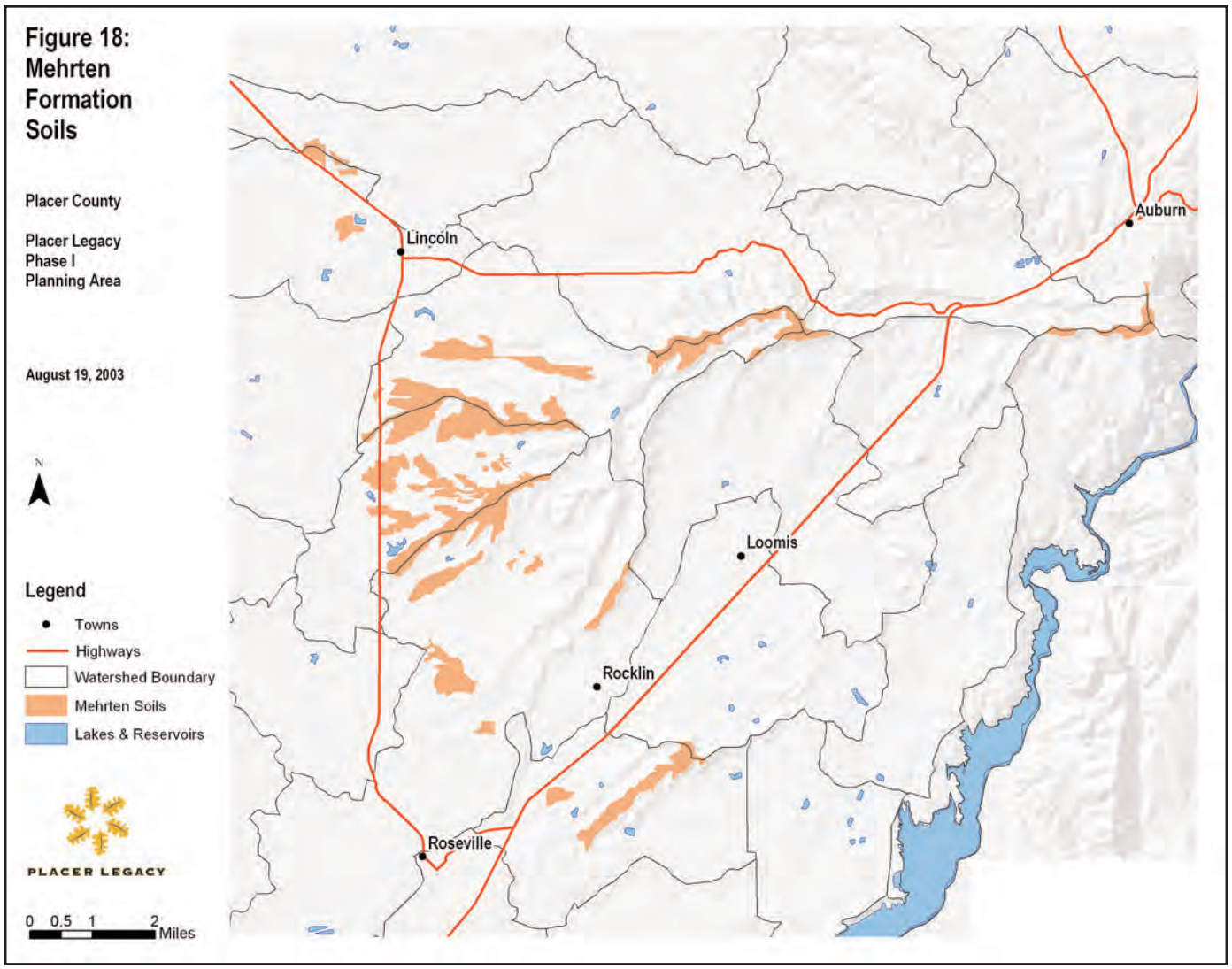


cliffs of metamorphic rocks in the major river drainages and on hillsides in the lower foothills. These ecosystems occur at elevations of about 52–400 meters (170–1,315 feet). Only about 0.8 hectare (2 acres) of Seeps and Springs were mapped in the Phase I Planning Area (Figure 19); 100% of these ecosystems are on private land (Table 6).

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 Seeps and Springs include seep-spring monkeyflower, fragile fern, ciliate willow herb, water chickweed, California maidenhair fern, western bittercress, liverworts, and a wide variety of mosses. Seeps and Springs enhance the wildlife value of the surrounding area by providing water and lush vegetative growth that attract deer and other browsers. They can also support an abundant supply of insects for bats, as well as for violet-green swallows, tree swallows, and other insectivorous birds. No special-status plants or animals are known to be associated with Seeps or Springs in the Phase I Planning Area.

Mehrten Formation Soils

The Mehrten Formation is comprised of volcanic andesitic mudflows of the Pliocene and Miocene, 4–10 million years old (Helley and Harwood 1985), 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). In the Phase I Planning Area, Northern Volcanic Mudflow Vernal Pools are restricted to the Mehrten Formation. Large areas of Vernal Pools (complexes) are concentrated in western Placer county, for example between Lincoln and Roseville (Keeler-Wolf et al. 1998). The Mehrten Formation was mapped from NRCS soil maps (Rogers 1980).

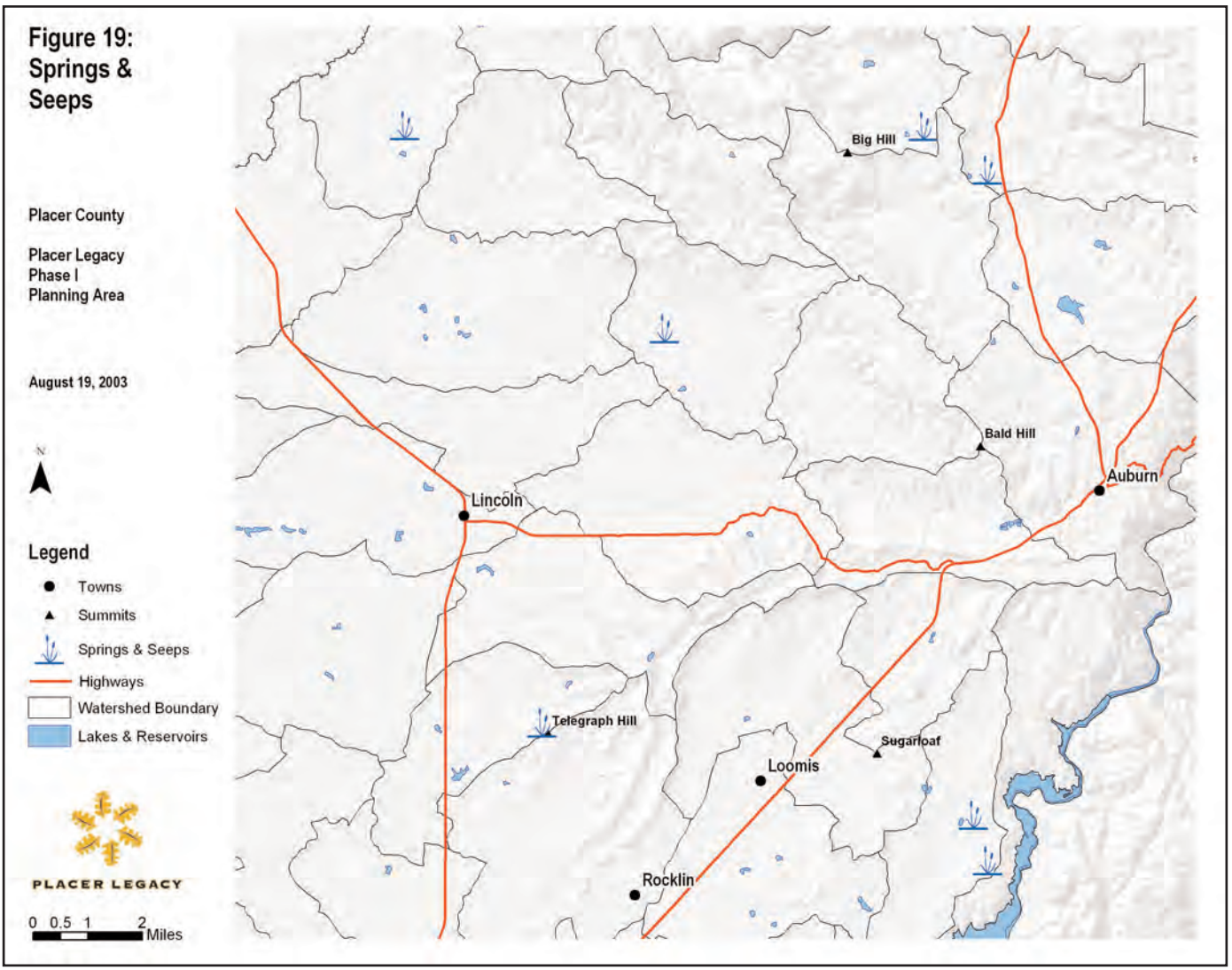


In the Phase I Planning Area, Mehrten Formation Soils occur at elevations of 27–443 meters (89–1,453 feet). They occupy approximately 1,700 hectares (4,200) acres, or approximately 1.5% of the land area in the Phase I Planning Area; almost 100% of these lands are in private ownership and have been converted by urban and suburban development (Figure 18, Table 6).

Serpentine Soils

Many of Placer County's and California's rarest plants and 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 soil conditions (Kruckeberg 1984). This severe and challenging environment supports a plant community characterized by a high degree of endemism and sparse plant cover. Serpentine Soils, with their high rate of endemism, function as ecological islands, and even species not restricted to Serpentine may evolve serpentine-tolerant races (Kruckeberg 1984).

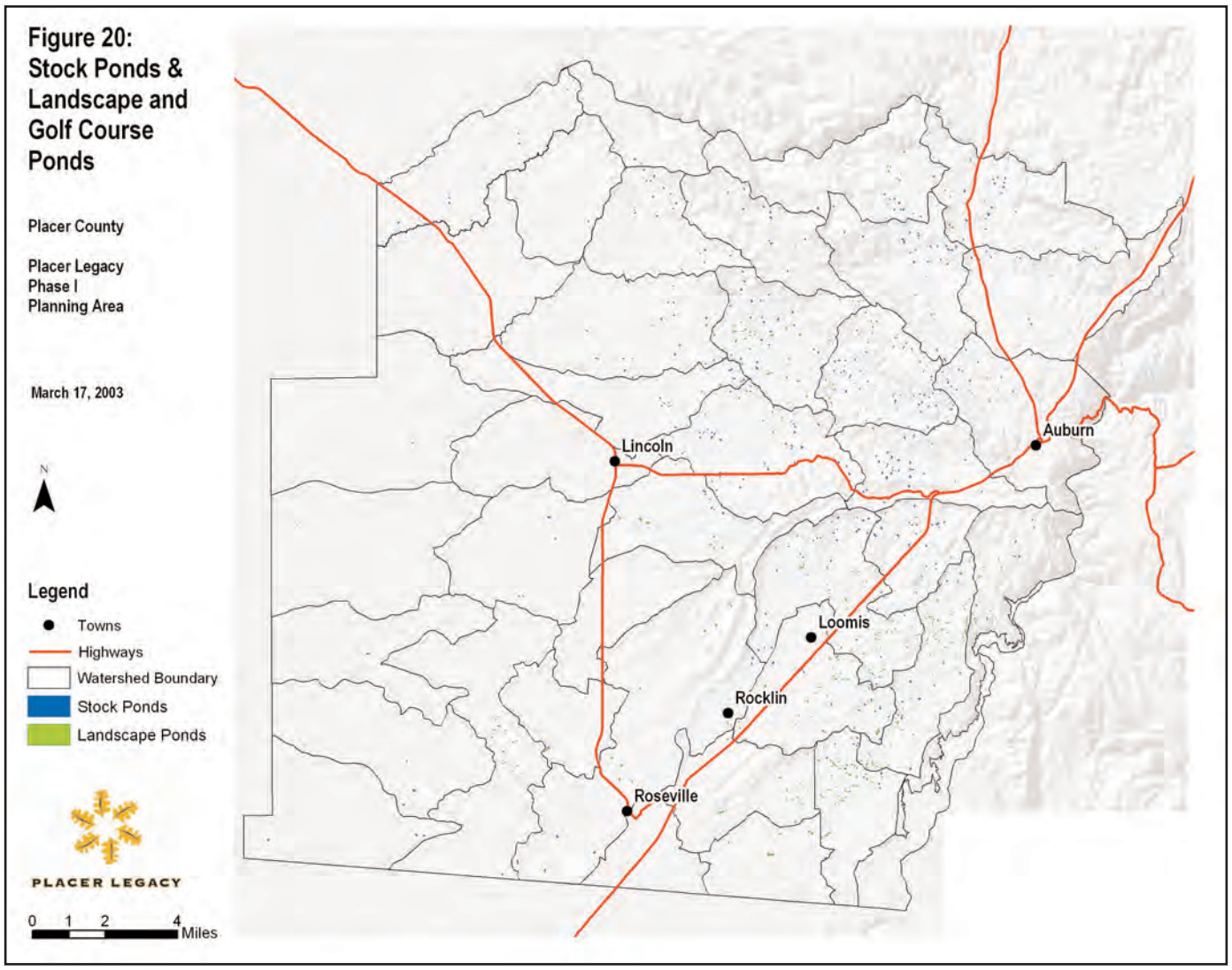
In western Placer County, the typically shallow, rocky Serpentine Soils range from sparse Oak–Foothill Pine Woodlands with a shrub or herb-dominated understory, to sparse to dense thickets of Foothill Chaparral with scattered emergent foothill pine. Plant diversity is often low, and there is a clear demarcation between Serpentine and non-Serpentine ecosystems.



Serpentine ecosystems occur in a variety of physiographic settings, from steep slopes to level flats, and plant species composition may be driven as much by soil chemistry as by elevation or aspect. The majority of the county's serpentine soils are found at elevations of about 82–523 meters (270–1,715 feet) in western Placer County. Serpentine soils comprise about 340 hectares (840 acres), or less than 1% of the Phase I Planning Area; about 95% of this habitat is on private land (Figure 17, Table 6). Serpentine Soils were mapped as Small-Patch Ecosystems, but they overlap with Foothill Chaparral, Woodland, and Barren areas.

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 nonnative plant species in Placer County are excluded from serpentine soils by the harsh soil chemistry. Chaparral pea and leather oak are strong local indicators of Serpentine Soils. However, dominant and characteristic species also include many indifferent species that are tolerant of Serpentine Soils but that also flourish away from Serpentine. Examples of indifferent species include foothill pine, buckbrush, toyon, and hoary coffeeberry.

The sparse cover and lack of competition from nonadapted, nonnative species results in a rich display of native wildflowers on serpentine soils. Characteristic species in the foothill region include frosty paintbrush, cutleaf owl's clover, Sierra fawn lily, rosin weed, white hyacinth brodiaea, common brodiaea, Hartweg's sidalcea, bladder parsnip, naked buckwheat, Bear Valley buckwheat, deer grass, California melic, and squirreltail. Dwarf foothill pine mistletoe is common on the often small and stunted foothill pines.



In California, approximately 300 rare plant taxa are associated with serpentine soils, representing more than 14% of all rare plants in California (California Native Plant Society 2001). Western Placer County Serpentine Soils may support several special-status plants: Congdon's onion, Sanborn's onion, dissected-leaved toothwort, Red Hills soapwort, tripod buckwheat, stinkbells, Butte County fritillary, sylvan microseris and, occasionally, bigscale balsamroot (Appendix IV).

While there is no evidence of bird or mammal species being closely associated with these habitats in Placer County, serpentine ecosystems are home to one of the most unusual—and threatened—butterfly faunas in the Sierra Nevada (Shapiro and Gervais 1999). Additionally, many of the local California horned lizard observations have been reported in Serpentine ecosystems (California Natural Diversity Database 2003). Both butterflies and reptiles are heliotherms (warmed by the sun), and are attracted to the open, sunny, and rocky areas.