# Appendix H

## Natural Resource Values of Oak Woodlands

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Oak woodlands provide many natural resource values. Oak woodlands provide habitat for native wildlife, plants, and insects some of which have special-status. Oak woodlands contribute to nutrient cycling, soil quality and erosion control, water quality, and watershed health. Humans benefit from these ecosystem functions of oak woodlands and from the aesthetic and open space values of oak woodlands, which provide many recreational opportunities in El Dorado County. With the rapid development in the County, the effects from loss of oak woodland habitat on these values are of increasing concern.

## A. Wildlife

In California, over 300 species of birds, mammals, reptiles, and amphibians, 5,000 insect species, and 2,000 plant species occur in oak woodlands (Giusti et al., 1996). Siegel and DeSante (1999) identified 24 bird species that are critically dependant on oaks or oak woodland habitats in the Sierra Nevada and an additional six species that substantially utilize oaks or oak woodlands, but may not be critically dependent on them. Of these 30 species of birds, all occur within the planning area.

Oak woodlands provide many values to wildlife including food, cover, and breeding sites. Acorns are an important food source for mule deer, western gray squirrels, acorn woodpeckers, band-tailed pigeons, scrub jays, and many other vertebrate species as well as invertebrate species (Giusti et al., 1996; USDA Forest Service, 2001; Tietje et al., 2005). Mule deer migrations are influenced by acorn production (Garrison, 1992). Acorn woodpeckers are dependent not only on acorns as a food source but also on trees where they can store acorns in holes (i.e., granaries). Other animals depend on leaves and roots. Oak trees also are sources of fungi, mistletoe, and insects for rodent and bird species.

Cavity trees provide shelter and breeding sites for birds. Deciduous oaks, such as blue oak, black oak, and valley oak, are particularly important as cavity trees (Tietje et al., 2005). Evergreen trees are important for secondary cavity nesters. Snags provide perching and basking sites as well as roosts. Downed woody material from limbs to logs provides resting and reproductive cover for reptiles, amphibians, and birds. Oak woodlands with a shrub understory provide habitat for more species including ground-nesting birds.

Oaks and other trees influence stream conditions, such as water temperature and flow, which in turn influence the presence and health of fish populations (Tietje et al., 2005). Oaks provide structure through deposition of coarse woody debris in streams and help reduce sedimentation. Some streams that flow through oak woodlands in the Sierra Nevada foothills are identified as special habitat in the California Natural Diversity Database (CNDDB); refer to Table H-1.

El Dorado County supports resident and migratory populations of mule deer (EDAW, 2003). The preservation of deer migration corridors has been a concern of the California Department of Fish and Game (CDFG) as urbanized areas expand in the foothills. As a result, CDFG has mapped critical habitat and deer migration patterns for three deer herds (EDAW, 2003). Critical winter range occurs primarily below 4,000 feet. Critical summer range, holding areas, and fawning areas occur primarily above 4,000 feet (i.e., outside the OWMP planning area). Connectivity between the critical winter range and other areas is essential for the long-term health of deer populations.

**Connectivity** touches on larger values of oak woodlands. In addition to needing sufficient space to provide for food, shelter, and social structures, wildlife need connectivity of habitats. Corridors are essential for dispersal of young animals, migration routes, and gene flow. Corridors allow dispersers (inlcuding plants, fungi, insects, and other organisms) from one area to recolonize another area that may have experienced local extirpations (e.g., from a catastrophic wildfire).

Length, width, and vegetative structure are important features of corridors that affect the number and composition of species that use a corridor. All organisms within a community cannot use the same corridors equally. Species with limited mobility will not be able to utilize long corridors. For species sensitive to edge effects, corridors must be wide enough to retain core habitat. Relative intact native vegetation is an important component of corridors. (Hilty et al. 2006).

Other considerations for corridors involve multiple uses and adjacent land uses. If recreation trails are part of a corridor, corridors must be much wider so species sensitive to high-intensity human use can use the corridor. Invasive species are more likely to be present with human use. Focal plant species might be damaged or extirpated. Presence of domestic animals whether from recreation or adjacent land uses affects wildlife use of corridors. Corridors adjacent to other natural vegetation will provide greater wildlife value than corridors passing through heavily modified landscapes.

For corridors approximately one-half mile wide, mountain lions require a corridor width over 300 feet. As the length of the corridor increases, the width of the corridor needs to increase. Fewer native carnivore and bird species were detected in narrower corridors in oak woodlands in northern California (Hilty 2001 and Hilty and Merenlender 2004). Hilty and Merenlender (2002) reported on the use of three types of riparian corridors adjacent to vineyards and connecting oak woodlands in Sonoma County. Significantly more species of native mammal predators were detected in corridors a minimum of 200 feet wide compared with corridors less than 200 feet wide or corridors with little natural vegetation (length of corridor not reported but presumed to be length of vineyard). Domestic carnivores such as house cats were more prevalent in the narrow corridors.

In El Dorado County, Highway 50 presents a major barrier to north-south wildlife dispersal (EDAW, 2003; Saving and Greenwood, 2002). The Oak Woodland Technical Advisory Committee that was formed in El Dorado County in 1996 "concluded that connectivity of woodlands from north to south was an important value to preserve and that it was at risk from future development" (Georgetown Divide Resource Conservation District, 2004). The Weber Creek drainage is the only north-south corridor allowing passage of wildlife across the Highway 50 corridor and needs to be maintained as an important existing corridor. Opportunities to establish additional north-south corridors across Highway 50 may exist at other sites (e.g., Slate Creek to Indian Creek drainages).

Other opportunities to provide connectivity among oak woodlands include linking lands designated as open space (e.g., recreation) with lands designated for agricultural uses (e.g., grazing lands). These opportunities may be implemented through acquisition of open space land, conservation easements, or other means that maintain oak woodland habitats. Opportunities may be enhanced by cooperative efforts with other organizations such as the Bureau of Land Management (BLM). One objective of the BLM's Sierra Draft Resource Management Plan and Environmental Impact Statement is to "conserve and restore oak woodland" (USDI Bureau of Land Management, 2006).

## B. Special-Status Species

A query of the CNDDB identified 38 special-status species and three unique natural communities in the planning area (Table H-1). Eight of the 10 vertebrate species in Table H-1 are associated with oak woodland habitats (Garrison, 1996). Fifteen of the 17 plant species occur in oak woodland habitats (Shaffer, 1996; CNPS, 2006).

**Table H-1. Special-status species and habitats in the OWMP planning area.**

| In Oak Types | Scientific Name | Common Name |
|---|---|---|
| | **Birds** | |
| x | Accipiter gentilis | northern goshawk |
| | Agelaius tricolor | tricolored blackbird |
| x | Haliaeetus leucocephalus | bald eagle |
| | **Amphibians** | |
| x | Rana aurora draytonii | California red-legged frog |
| x | Rana boylii | foothill yellow-legged frog |
| | | |
| | **Reptiles** | |
| x | Emys (=Clemmys) marmorata marmorata | northwestern pond turtle |
| x | Phrynosoma coronatum (frontale population) | Coast (California) horned lizard |
| | **Mammals** | |
| x | Lasionycteris noctivagans | silver-haired bat |
| x | Myotis yumanensis | Yuma myotis |
| | **Invertebrates** | |
| | Ammonitella yatesi | tight coin (=Yates' snail) |
| | Andrena blennospermatis | |
| | Andrena subapasta | |
| | Banksula californica | |
| | Branchinecta lynchi | vernal pool fairy shrimp |
| x | Cosumnoperla hypocrena | A Spring Stonefly |
| x | Desmocerus californicus dimorphus | valley elderberry longhorn beetle |
| | Monadenia mormonum buttoni | Button's Sierra sideband (snail) |
| | Nebria darlingtoni | South Forks ground beetle |
| x | Orobittacus obscurus | gold rush hanging scorpionfly |
| | Rhyacophila spinata | spiny rhyacophilan caddisfly |
| | **Plants** | |
| x | Allium jepsonii | Jepson's onion |
| x | Arctostaphylos nissenana | Nissenan manzanita |
| x | Balsamorhiza macrolepis var. macrolepis | big-scale balsamroot |
| | Calochortus clavatus var. avius | Pleasant Valley mariposa lily |
| x | Calystegia stebbinsii | Stebbins's morning-glory |
| x | Ceanothus roderickii | Pine Hill ceanothus |
| x | Chlorogalum grandiflorum | Red Hills soaproot |
| x | Clarkia biloba ssp. brandegeeae | Brandegee's clarkia |
| x | Fremontodendron decumbens | Pine Hill flannelbush |
| x | Fritillaria eastwoodiae | Butte County fritillary |
| x | Galium californicum ssp. sierrae | El Dorado bedstraw |
| | Helianthemum suffrutescens | Bisbee Peak rush-rose |
| x | Horkelia parryi | Parry's horkelia |
| x | Packera layneae | Layne's ragwort |
| x | Phacelia stebbinsii | Stebbins's phacelia |
| x | Viburnum ellipticum | oval-leaved viburnum |
| x | Wyethia reticulata | El Dorado County mule ears |
| | **Habitat** | |
| x | Central Valley Drainage Hardhead/Squawfish Stream | Central Valley Drainage Hardhead/Squawfish Stream |
| x | Central Valley Drainage Resident Rainbow Trout Stream | Central Valley Drainage Resident Rainbow Trout Stream |
| x | Sacramento-San Joaquin Foothill/Valley Ephemeral Stream | Sacramento-San Joaquin Foothill/Valley Ephemeral Stream |

The California red-legged frog (CRLF) is federally listed as a threatened species. In 2006 the U.S. Fish and Wildlife Service issued new critical habitat designations for the CRLF. One critical habitat unit for CRLF occurs in El Dorado County. This unit surrounds Spivey Pond, one of five known breeding populations of CRLF in the Sierra Nevada. The 8,388-acre critical habitat unit supports montane hardwood and montane hardwood-conifer as well as smaller areas of other oak woodlands.

### C. Recreation and Open Space

A major incentive for people to move into the Sierra Nevada foothills is the open space. As the population has grown, so has the desire to maintain areas of open space for recreational purposes or aesthetic values. El Dorado County supports an expanding network of trails for hikers, bicyclists, and equestrians. These lands designated for recreation (e.g., Cronan Ranch Regional Trails Park) help to maintain large expanses of oak woodland. The benefits of supporting oak woodland habitat and providing wildlife habitat are enhanced when recreational areas connect with other open space, such as under agricultural and natural resources land use designations.

A partial list of areas in the OWMP study area that provide recreational and/or open space values are described below. This list is not exhaustive, but helps to identify potential opportunities to maintain large expanses of oak woodland and to provide connectivity among the woodlands.

The Cronan Ranch Regional Trails Park, east of Coloma, is managed by the Bureau of Land Management. Plans exist to connect this area with the South Fork American River corridor trail that will run from Greenwood Creek to Salmon Falls. This park contains oak woodlands.

The Folsom Lake State Recreation Area provides trails, camping, and open space around Folsom Lake.

The Auburn State Recreation Area provides trails through oak woodland habitats near the confluence of the north and middle forks of the American River and in Cool. Corridors are maintained along the north and middle forks of the American River.

Marshall Gold Discovery State Historic Park in Coloma has the Monroe Ridge and Monument trails and other open space in oak woodland habitats near the South Fork of the American River.

The Sacramento-Placerville Transportation Corridor (SPTC), as discussed in Section XIII, includes 28 miles of the corridor within El Dorado County, much of which passes through oak woodland.

The El Dorado Trail is jointly owned by the City of Placerville and El Dorado County. It winds through oak woodland habitats from Placerville to Camino. The El Dorado Trail eventually will connect the SPTC and the National Pony Express Trail Route.

Potential may exist to expand the sections through oak woodlands to enhance oak woodland conservation and to meet the need for trails

Lands along Weber Creek that are part of the El Dorado Irrigation District's (District) Texas Hill properties contain large expanses of oaks. Potential partnering between the District and the County could meet water storage needs and oak conservation goals.

The Dave Moore Nature Area provides a small recreation area with oak woodland habitat along the South Fork of the American River.

The Red Shack Trail passes through a 131-acre property supporting oak woodland habitat to reach the South Fork of the American River.

The Bureau of Land Management (BLM) manages over 3,100 acres in the Pine Hill Preserve network that serves to protect rare plants that occur on gabbroic soils (http://www.pinehillpreserve.org/index.htm). The Pine Hill Preserve consists of five separate units in northern gabbroic mixed chaparral and oak woodland.

The Upper Cosumnes River Project Area encompasses 1,200 acres in conservation easements and 280 acres in fee to protect riparian habitat throughout the Upper Cosumnes River Basin (American River Conservancy, 2006). This project protects oak woodlands in open space and provides connectivity with adjacent public lands.

Peavine Point Research Natural Area on the Eldorado National Forest encompasses 1,098 acres about two miles northeast of Pollock Pines at an elevation range of 2,080 to 3,854 feet (USDA Forest Service, undated). Although the primary target element for designating this site as a research natural area is old-growth ponderosa pine, the secondary target element is black oak, which dominates the middle canopy.

Maintaining and expanding open space is not a panacea for encroaching development and the effects from loss of oak woodland habitat and fragmentation. Human activities within open space affect biological values. The introduction of nonnative species, wildlife harassment by pets, and trampling of vegetation are examples of factors that impair biodiversity values (Hilty et al., 2006). Open space that provides for human activities should be used as one component of a comprehensive approach to preserving oak woodland habitats in the County.

### D. Health and Function of Local Watersheds

Oak woodlands contribute to the health of watersheds in several ways. Organic debris from oaks is important for soil building and maintenance of water quality (USDA Forest Service, 2001). Oak woodlands contribute organic matter to the soil and thereby provide soil cover and nutrients as well as reducing bulk density. Improved soil structure increases infiltration rates, reduces soil erosion and sedimentation, and contributes to better water quality.

In a study of blue oak stands, soil quality and fertility were enhanced beneath oak canopies as compared to adjacent grassland (Dahlgren et al., 2003). Oak woodlands remove more water from the soil profile than do grasslands and this water is released through evapotranspiration. Because the loss of water through evapotranspiration reduces the leaching intensity beneath oak woodland canopy, more nutrients are retained within the soil and fewer nutrients are leached into streams and creeks.

A Watershed Assessment was completed for the South Fork of the American River (Georgetown Divide Resource Conservation District, 2004). A water quality risk was assigned to each sub-basin in the watershed. Eleven sub-basins in the OWMP planning area received the two highest ratings for risk; sub-basins outside the planning area had lower risk. High risk was associated with high density of roads, structures, and impervious cover in the lower reaches of the watershed, which are in the OWMP planning area and where most urban development has occurred. This risk assessment highlights the importance of maintaining the functions of oak woodlands to protect watersheds.

### E. Soil and Water Retention

Leaves and other organic matter on the ground in oak woodlands absorb water from precipitation and reduce evaporation from the soil (USDA Forest Service, 2001). Organic matter from oak woodlands reduces bulk density and improves soil structure (Dahlgren et al., 2003). The improved soil structure increases infiltration rates and reduces soil erosion and sedimentation. When litter and organic matter are burned in wildfires, infiltration can be reduced and runoff increased (McCreary, 2004). Giusti et al. (2004) stated that soil erosion "is often the most glaring impact" from removal of oak woodland vegetation.

### F. Reduction of Fuel Loads

Fire in oak woodland habitats was used by Native Americans and then by ranchers until the 1950's (Standiford and Adams, 1996). In a fire history study near Diamond Springs in El Dorado County, Stephens (1997) determined that the mean fire interval in blue oak woodland from 1850 to 1952 was approximately 8 years. Fires have largely been suppressed since the early part of the 1900's (McCreary, 2004).

Oak woodlands are not only adapted to fire, but fire is critical to their ecology (Standiford and Adams, 1996). Mature oaks are resistant to low-intensity ground fires; seedlings and saplings resprout after being top-killed by fire. Germination of some plant species within oak woodland is stimulated by fire. Oak recruitment events in Sierra Nevada have been associated with fire.

Because fires have been suppressed, fuels have accumulated in some oak woodlands. The increase in fuel loadings increases the risk of high-intensity fires. Consequences of

higher intensity fires include increased run-off and erosion, increased sedimentation into streams, reduction in water quality, loss of wildlife habitat and loss of oak woodlands that had been resilient under an earlier low-intensity fire regime (Standiford and Adams, 1996; McCreary, 2004).

The California Department of Forestry and Fire Protection administers a Vegetation Management Program to assist with fuels management. The use of prescribed fire is complicated by development in oak woodlands, air quality considerations, increased hazard from greater fuel accumulations, and liability for escaped fires.

## G. Effects from Loss of Oak Woodlands

Loss of oak woodlands affects many natural resource values. The loss of oak woodlands affects wildlife habitat, plant species diversity, soils, and the function of watersheds. Not only is habitat lost when oak woodlands are removed, but fragmentation of the remaining oak woodlands diminishes the quality of the remaining habitat (Saving and Greenwood, 2002; Scott, 1996).

### 1. Wildlife Habitat

Loss of oak woodlands affects wildlife habitat both directly and indirectly. When oak woodlands are removed, food (e.g., acorns, insects, and fungi), cover, cavities, and nesting sites are removed, reducing the overall amount of available habitat. Downed woody debris and snags that provide shelter also are removed.

Indirect effects from loss of woodlands may be more subtle. Remaining habitat may be small and lack some of the components that wildlife requires. Barriers may be established that prevent wildlife from safely accessing and utilizing all habitat that they need (e.g., water sources or breeding areas). Isolated, small patches may not support the metapopulations or metacommunities necessary for long-term viability.

### 2. Fragmentation

- Fragmentation is the breaking up of contiguous land into smaller pieces that are separated by varying distances. Degradation of habitat and ecosystem values increases with increasing fragmentation.

Oak woodlands function most effectively and provide the greatest habitat value in large contiguous expanses. Both size and configuration are important. Larger fragments (especially with greater connectivity) tend to support more species. The rate of local extinction increases with smaller patch size; however, species also are lost from larger (250 acres) fragments (Hilty et al., 2006). The species composition within California oak woodland changes from large to small areas and with decreasing distance from urban settings. Merenlender and Heise (1999) reported that the percent of neotropical birds was

significantly higher in undeveloped oak woodlands in California than at ranchettes (10-40 acres) and suburban lots (0.5-2.5 acres).

Natural resource values are maximized when the interior or core area is greater in relation to the edge. Round shapes have more greater core to edge area; more irregularly shaped areas or linear areas have greater edge to core area. Edge effects are least significant when the edge transitions to other natural vegetation and is most intense when the edge transitions to an altered landscape such as development. As edge habitat increases, oak woodland is more subject to invasion by exotic species such as invasive weeds and domestic animals.

Giusti et al. (2004) identified two main processes influencing oak woodlands in California: 1) land clearing for subdivisions and intensive agriculture and 2) the parcelization of large continuous woodland ownerships for exurban development. Impacts vary from complete removal of oak woodland to degradation of the quality of remaining oak woodland.

Rural residential development, which erodes habitat quality, has been a particular concern in several studies such as Saving and Greenwood (2002) and Merenlender and Heise (1999). The majority of oak woodland habitats in El Dorado County are privately owned rural lands (Marose, 1997). Marose (1997) projected fragmentation of oak woodland during full build-out of the 1996 general plan, predicting that remaining oak woodland would consist of smaller fragments with greater distance among them. Large contiguous habitat and connectivity would be lost.

Saving and Greenwood (2002) modeled projected development of El Dorado County under the proposed 1996 General Plan. They concluded that 4 percent of oak woodland land cover would be physically lost to development but 40 percent of "rural" oak woodland would be converted to marginal or urban habitat. "…areas that once functioned under a more natural state and presumably provided functional habitat for species are degraded, either due to proximity to urban land uses or by isolation from larger patches of contiguous natural vegetation." They determined that rural residential development would impact habitat quality through fragmentation more than it would impact the extent of habitat.

High-intensity land uses (up to and including low-density residential) result in fragmentation and loss of the majority of the existing habitat; medium-intensity land uses (including rural residential) result in removal and fragmentation but to a lesser extent (EDAW, 2003). With medium-intensity land uses, some habitats would continue to be viable but the quality of the habitat would be diminished and biological diversity would be reduced. With increasing fragmentation, fragments may become too small to support viable populations of species.

When oak woodlands are converted to urban landscapes, some woodlands remain because of oak protection ordinances or because they occur on steep slopes or drainages (Scott, 1996). When oak woodlands are imbedded within other land uses, their biological values decline as adjoining habitats are lost. Barriers such as housing alter wildlife movement between stands and then populations decline.

In El Dorado County, Highway 50 presents a major barrier to north-south wildlife dispersal (EDAW, 2003; Saving and Greenwood, 2002). The Oak Woodland Technical Advisory Committee that was formed in the County in 1996 "concluded that connectivity of woodlands from north to south was an important value to preserve and that it was at risk from future development" (Georgetown Divide Resource Conservation District, 2004). The Weber Creek drainage is the only north-south corridor allowing passage of wildlife across the Highway 50 corridor and needs to be maintained as an important existing corridor. Opportunities to establish additional north-south corridors across Highway 50 may exist at other sites (e.g., drainages from Slate Creek to Indian Creek).

The Saving and Greenwood study identified the need to maintain large contiguous areas of oak woodland that function under a more natural state. The study also emphasized the need for a program that focuses on critical areas of connectivity such as habitat corridors. The General Plan EIR (EDAW, 2003) discussed the importance of preserving connectivity in the form of riparian corridors, canyon bottoms, and ridgelines and also by maintaining a landscape that contains a network of multiple pathways for wildlife movement.

3. Retention of Soil and Water

A study in the northern Sierra Nevada foothills examined changes to soil quality following blue oak removal (Camping et al., 2002). Significant reduction in carbon, nitrogen, and other nutrients occurred within 5 to 15 years. Nutrient concentrations in streams increase for 3 to 4 years following vegetation conversion (Larsen et al., 2005).

Sediment concentrations also increase in streams following vegetation conversion (Larsen et al., 2005). In the Sierra Nevada foothills, conversion of 90% of an oak-dominated watershed to grassland led to an almost two-fold increase in sedimentation. Loss of vegetation from development also reduces the retention of soils and water. Increased surface runoff leads to increased water velocity and erosion (Larsen et al., 2005). Rates of sedimentation and non-point source pollution increase with increased run-off.