Conservation of Oak Woodlands – Recognizing the Values

By Gregory A. Giusti

Oak woodlands have sustained European and pre-European cultures and civilizations for thousands of years. Even today, these biological systems provide basic needs for human survival: Food, water, and a place to live—a simple formula that has not changed over the millennia. Today, many of the basic properties needed for human survival are still derived from oak woodlands. Anyone familiar with California's landscape quickly recognizes the value that oak watersheds provide as a source of domestic, agricultural and industrial water. Though fewer people today gather their food than in the past, hunting and fishing still provide many people with food for their families. Most of today's food supply from oak woodlands is generated from introduced species of animals and plants—livestock and fruit and vegetable crops—sometimes propagated under intensive conditions necessary to meet an ever expanding human presence.

There is a good deal of scientific evidence that clearly demonstrates how modern human civilization has changed the structure and composition of oak woodlands in California in the last two centuries to meet the needs of today's modern culture. These changes have had dramatic impacts on the state's oak forests, affecting their ability to sustain some species. Although it is difficult to visualize today, valley oaks and sycamores once dominated the Central Valley, indicating to early European settlers the soil quality of these forest systems. These forests were converted to meet the needs of an agrarian society. Today, remnant valley oaks dot the Central Valley landscape, and valley oak/sycamore riparian forests are relegated to narrow, meandering stream corridors, a vestige of their once expansive acreage.

California leads the nation with more species protected under the Federal Endangered Species Act (ESA) than any other state (including Hawaii). With the recent listings of many salmonid species (fish belonging to the trout and salmon family), landowners, decision-makers and agency representatives are struggling with the need to understand the relationships between oak woodlands and the non-human species which inhabit them.

Oak Woodland Species Richness

Depending on your point of view, California is blessed (or cursed) with a wide variety of wildlife species. According to the California Wildlife Habitat Relationships Model (CWHR), a database maintained by the Department of Fish and Game, California's oak woodlands provide suitable habitat for approximately 335 species of vertebrate (animals with backbones) species. These include mammals (deer, black bear, ring-tailed cats), birds (woodpeckers, hummingbirds, sparrows), reptiles (snakes and lizards) and amphibians (frogs and salamanders). Diversity of native plant species in oak woodlands numbers in the thousands. Estimates of the richness of insect diversity in oak woodlands, though not conclusive, range between four and six thousand species.

The richness of species found in oak woodlands is due primarily to the diversity of available habitats. Just as there are different types of conifer forests in the California there are different types of oak forests. California has distinct forest types dominated by valley oak, blue oak, Englemann oak, coast live oak, interior live oak and mixed forests of conifers with canyon live

oak and black oak. This diversity of oak types is a major reason why so many wildlife species exists in what we collectively refer to as "oak woodlands".

Habitat Values

Habitat has historically been defined as the necessary food, water, cover and space requirements to sustain a particular species and its populations. For most people, the need for food and water are easily recognized.

Generally, the most significant aspect of habitat that a species has direct control over is *cover*. Cover provides protection from the elements and from predators, and has value for nesting, roosting and foraging. Land-use practices that impact the cover element of habitat may have long-lasting implications for maintaining species richness.

The aspect of *space* can be a complex issue, particularly when dealing with the requirements of a migratory species. For example, migratory neotropical birds (orioles, tanagers, and many hummingbirds) spend their summers in California's oak woodlands but winter in Mexico and Central America. In order to sustain these species it is important to recognize that habitat disturbances both north and south of the border can have significant impacts on them. The need to maintain strong migratory bird treaties between counties is vital to sustaining neotropical species.

With the recent listing of the steelhead trout under the ESA, people now realize that many oak woodland aquatic species are migratory and have different habitat requirements as part of their life histories. Steelhead, for example, is an *anadromous* species, meaning they are born and grow in fresh water, migrate to the ocean to grow to adult size, and then migrate back into freshwater to spawn. Though they may pass through the redwood and Douglas-fir forests on their treks to and from the ocean, most of their spawning and growth takes place in the smaller streams and tributaries found in oak woodlands. Subsequently, any activities or structures that influence the physical or biological components of these waters directly impact this species. In addition to steelhead, other anadromous species that spend time in river systems of oak woodlands include four species of salmon, two species of sturgeon, two species of smelt, and two species of lampreys. The major river systems that pass through California's oak woodlands include the Sacramento, San Joaquin, Petaluma, Napa, Navarro, Russian, Eel, and Klamath.

A recently emergent scientific discipline, *conservation biology*, is focused on helping people to view habitat in a more holistic sense rather than breaking it into simplified concepts of food, water, cover and space. Conservation biologists speak about the need to maintain the *functionality* of the habitat through the conservation of structure and composition. The discipline looks at the forest not as a collection of trees but rather as a community of organisms interacting with their biological and physical environments.

Maintaining Functional Habitats

In order to sustain oak woodlands it will be necessary to maintain functional habitat that meets the needs of plants, fungi and insects as well as wildlife. To insure the sustainability of oak forests, attention needs to be focused on the inter-dependencies of the various parts of the forest.

This can be achieved by recognizing the habitat values provided from forest composition and structure and the consequences of various land-use practices.

All too often, land-use practices are couched in terms of "good" or "bad" for wildlife. In reality, most land-use practices have different consequences for different species. For example, a mature stand of multi-aged blue oaks with a component of decadent snags may provide optimum habitat for cavity nesting birds, i.e. titmice, bluebirds, and violet-green swallows. That same stand of trees may not provide suitable habitat for meadowlarks, savanna sparrows, or horned larks. If that same stand of trees was removed and converted to grassland, the latter group of species would benefit. In this case, each group of birds is responding to the habitat based on the structure and composition of the site.

The same argument can be made for aquatic systems found within an oak woodland. Though obligate aquatic species like salamanders, frogs and fish need water; their habitat needs also include trees, logs and rocks. These elements are important in providing scouring action in streams that results in deep pools for summer habitat. They also provide appropriate insect habitat (food), predator and thermal refugia (cover), and organic material to the stream for proper nutrient cycling.

How Land-Use Can Affect Habitat Functions

Ecological functions are associated with all of the various "parts" of a forest. Soil and its inorganic and organic components support the multitude of organisms that inhabit the soil strata. Soil habitat functions are greatly influenced by the presence or absence of vegetation, the type of vegetation, soil temperature and soil moisture. Any actions that affect these relationships can have an effect on the soil structure and soil organisms. For example, it is widely recognized that the botanical composition of California's oak woodlands has changed dramatically in the last two centuries. Historically, the grass component of many of the oak woodlands was predominately a perennial grass system. Today's system, which is dominated by annual grasses, most likely has altered water regimes, soil structure, soil temperature and most probably soil organism diversity and abundance. In real terms, an acorn falling to the ground today, from a mother-tree that may be 300 years old, is falling to a very different environment than that which established the parent tree. The soil habitat can still regenerate oaks, but the soil environment is most likely hotter and drier than was historically the case, making oak regeneration more difficult.

Other impacts to soil structure can occur from a wide array of land-use activities such as road building, grading and construction. It is important to recognize those activities that can compact the soil and affect its ability to transport water and oxygen, thereby affecting its biological functions.

Most people readily recognize the visible components of habitat. The trees, bushes, water and other obvious properties of the landscape often get the most attention. It takes patience and practice to recognize the nuances of structure and composition that play a role in providing functional habitat. The complexities of bark conformation, snags, loose bark, perching sites, fallen logs, cavities, and hard and soft mast are all parts of the forest structure that play a role in

allowing so many species to co-exist. To dissect these elements is to begin to understand the complexity of a forest ecosystem.

Bark conformation – species of trees that have rough or deep fissured bark provide sites for many insects and plants to find refuge, feeding sites or growing sites. It also provides foraging sites for many insect-feeding organisms.

Snags are dead standing trees. Snags decay over time from the actions of various wood fungi. Snags often provide sites for cavity-nesting birds (woodpeckers) to excavate nest sites. Snags may have loose bark suitable for insects, nesting by tree swallows, and winter roost sites for lizards. They may also have branches suitable for perching for hawks, mourning doves, and phoebes. Older snags that have lost large branches may provide suitable nesting/roosting sites for many owls. Eventually snags fall over, providing another structural component to the habitat.

Fallen logs provide cover and nourishment for many arthropods, fungi and wildlife. In arid environments, logs can retain soil moisture and extend the activity periods for all of these organisms.

Mast

- Soft Mast – Berries. A number of botanical species found in association with oaks produce fruiting bodies. Examples include manzanita and madrone.

- Hard Mast – Acorns. An important food item for a number of invertebrate and vertebrate species. However, they are only produced during the autumn. Other forms of mast are necessary to sustain populations throughout the year.

Water

- Slow moving or static waters (ponds, lakes, and vernal pools) provide suitable habitat for selected species, i.e. many botanical species, aquatic invertebrates, pacific pond turtles, red-legged frog, tree frogs, rough-skinned newts, mink, and otters.

- Fast moving waters (rivers, streams), in combination with an appropriate component of terrestrial vegetation, provide suitable habitat for a number of invertebrates (both terrestrial and aquatic) such as deer, bats, yellow-legged frogs, beaver, salmon and trout.

Just as structure and composition play an important role in maintaining functionality in terrestrial habitats, these concepts are equally important for aquatic systems. Instream structure and composition are essential for maintaining sustainable populations of salmon and trout. Riverine habitat is a function of fallen logs, boulders, bank vegetation, decomposing vegetation (from deciduous trees) clean water and clean spawning gravels. In combination, these components insure deep pools for summer survival of instream organisms, suitable habitat for macro-invertebrates (fish food), and nutrient cycling and proper water chemistry for both plant and animal life.

Tying It All Together

When talking about conserving oak woodlands and their values we must recognize that these forest types have provided suitable habitats for humans and non-humans for thousands of years. This concept of suitable habitat is based on the premise that both the physical and biological components are working in concert to meet the temporal and spatial needs of the dependent organisms. These needs are provided from the compositional and structural diversity afforded through the assemblage of plants, soils, insects, fungi and people interacting on a daily basis. In order to maintain these dynamic ecological systems, it will be necessary for society to recognize the interactions and inter-dependencies that all of us have with oak woodlands. In other words, we have to look beyond the trees and start seeing the forest.

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