

URBAN FORESTRY
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VI



California Oaks in the Urbanizing Forest Ecosystem¹

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A mong a growing number of planners, managers, and researchers, it is now popular to view individual genera and species in terms of the way they function in changing ecosystems. Of all the tree genera in California, *Quercus* is the one most subjected to ecosystem change due to urbanization. Understanding the consequences for oaks begins with documentation of species composition change with urbanization (McBride and Jacobs 1986). From this description comes an understanding of functional changes such as shifts in water and chemical flux, fire, and disease processes. Our broader understanding of ecosystem change, in return, helps us to know whether, and how, we can sustain certain elements of that ecosystem such as native oaks. Thinking systemically about the future of California oaks at large spatial and temporal scales helps us to see the problem in cumulative terms.

The Landscape Scale: Projecting the Consequences of Future Settlement

The efforts of researchers and planners are helping us to see the changing future geography of oaks in California. The Sierra Nevada Ecosystem Project tells us that the foothill oak woodland is the most endangered forest type in the Sierra Nevada because of projected rapid urbanization in the Central Valley and Sierra Nevada foothills (Sierra Nevada Ecosystem Project 1996). Population in the Sierra Nevada will minimally triple (from approximately 700,000 today) in the next 40 years, and that growth will be focused on oak lands. Many Sierra counties will soon have the ability to produce maps that show where future development will threaten oaks. However, these maps are not a part of the normal county planning process and have been produced for only a few central westside Sierra Nevada counties by independent researchers (Duane 1996, Greenwood and Marose, 1993, Rowntree and others 1993). With the improved use of geographic information systems and better vegetation maps, groups and individuals involved in the planning process at several scales should soon be able to understand, and act upon, the large-scale and long-term projections for oak loss. To sustain an oak canopy within urbanized woodlands, we must protect existing pre-settlement oaks and provide conditions that will encourage new oaks to grow and survive in the evolving urban fabric.

The Community Scale: Preservation and Restoration of Oaks in the Expanding Urban Fabric

Pre-settlement oaks are still found in communities 125-140 years after the onset of urbanization. In Menlo Park, California, McBride and Jacobs (1975) found that, while oak density had dropped during urbanization from 142 to 3 trees/

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acre, oaks continued to reproduce in untended portions of gardens and undeveloped sites within the urban area. Compared with older cities such as Menlo Park, recently developed Sierra Nevada foothill communities tend to have greater densities of surviving pre-settlement oaks (McBride and others 1996). These oaks are a mixture of trees that survived the short-lived urbanization associated with the Gold Rush and second growth trees that date from the 1850's through the early 1900's. If modern techniques of tree protection are followed, many of the second-growth oaks in these communities could potentially live for another 150 years or more. If development occurs in the absence of adequate tree-protection measures, many existing oaks are likely to decline or die within 10 to 50 years (Swiecki 1996).

In Oakland, California, native oaks are the second-most important tree with 13 percent of the basal area (*Eucalyptus globulus* is the most important) (Nowak 1991). These oaks are not just in the relict wildlands lying within the city. Native oaks are the most important tree (as measured by basal area) in the institutional land use category (e.g., parks and educational institutions), and the second-most important tree (as measured by amount of crown cover) in the residential land use category. In Sacramento County, native oaks comprise 27 percent of the total tree basal area, but these trees lie mainly outside the urbanized area (McPherson 1996). In order to keep oaks as a visible component of the urban forest, the city and county of Sacramento passed resolutions a decade ago that require 20 percent of the plantings receiving city or county funds to be native oaks.

Thinking about Oaks in Urban-Influenced Ecosystems

One obvious tenet of ecosystem thinking requires that we expect, and plan for, change. We have learned this from the problems of pre-settlement oaks succumbing in urban irrigated landscapes.

Fire in the interface has raised the question about oaks as fuel and as elements of vegetated firebreaks. We have not yet learned enough about the part oaks played in the 1991 Oakland Hills fire and in the post-fire regeneration and restoration. There is speculation that oaks are less flammable under most fire conditions. Many homeowners now would like to know if a well-maintained mature oak next to their structure can be considered a reasonable landscape element in a fire-prone area.

In the wildland portion of the interface, how may we manage oak woodlands to reduce the possibility that (1) ignitions in the oak zone will not have the chance to develop into serious fires, and (2) active fires moving into an oak zone will diminish in flame length, rate of combustion, and rate of ember production? A useful approach for selecting the correct vegetation structure for both fire control and ecosystem biodiversity is to conduct computer modeling of fire behavior for different vegetation structures (Stephens 1996).

The ecosystem approach does not imply that oaks will be neglected or eliminated for some higher system purpose. The approach will encourage us to understand how the multiple forces that come with urbanization interact to govern both the ecological history and the future of this genus.

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