Measuring the Health of the Mountain: A Report on Mount Tamalpais' Natural Resources (2016)
(Chapter 5 excerpts)

ONE TAM

OPEN-CANOPY OAK WOODLANDS

Condition: Caution

Trend: Declining

Confidence: Moderate

WHY IS THIS RESOURCE INCLUDED?

Open-canopy oak woodlands on Mt. Tam are characterized by the presence of long-lived acorn-producing trees from the genus *Quercus*. This discussion focuses on stands with dominant species include coast live oak (*Q. agrifolia*), valley oak (*Q. lobata*), Oregon white oak (*Q. garryana var. garryana*), and/or black oak (*Q. kelloggii*). The most common co-occurring tree species include bay laurel (*Umbellularia californica*), madrone (*Arbutus menziesii*), and tanoak (*Notholithocarpus densiflora*). Most stands dominated by interior live oak (*Q. wislizeni*), canyon live oak (*Q. chrysolepis*), Shreve's oak (*Q. parvula var. shrevei*), or leather oak (*Q. durata*) dominated stands are excluded because their overall structure is presently more similar to shrublands or to closed canopy mixed hardwood forest.

In California, oak woodlands are typically defined as stands with oak cover ranging between 10 and 60%. Although open-canopy oak woodlands have many tree species in common with mixed hardwood forests, the lower density and patchier distribution of trees create a distinct habitat structure for both herbaceous plants and wildlife. Understory species also include a distinct and more varied array of grasses, sedges, and forbs than closed canopy forests. Oak woodlands in California support 1,400 species of flowering plants and over 300 species of vertebrates, which is more species than any other habitat type in the state.

On Mt. Tam, open-canopy oak woodlands can be used as an indicator of forest disease, fire regimes, and habitat quality for a number of oak-dependent birds. Lace lichen (*Ramalina menziesii*), which is California's state lichen, primarily grows in open-canopy oak woodlands and is a good indicator of air quality. Between 80 and 90% of California's oak woodlands are under private ownership, making conservation of these community types on public lands a high priority.

OVERALL CONDITION

Mt. Tam supports approximately 2,154 acres of open-canopy oak woodlands that meet this definition, covering approximately 6% of the open space in the One Tam area of focus. The mountain is home to valley oak woodlands, which are restricted to California, and are considered a plant community that is threatened and of high priority for inventories. Mt. Tam also has the southernmost patch of Oregon white oak-California fescue (*Festuca californica*) association.

DESIRED CONDITIONS

The desired conditions for open-canopy oak woodlands in the One Tam area of focus are maintenance of the full spatial extent of this vegetation type (2,154 acres), the persistence of a discontinuous canopy dominated by trees from the genus *Quercus*, and a discontinuous shrub layer and an herbaceous layer dominated by native species. Good examples of this type can be found in the Bon Tempe/Lake Lagunitas area and in the Cascade Canyon Preserve.

STRESSORS

Sudden Oak Death (SOD): A 2014 Marin Municipal Water District (MMWD) survey found that more than 90% of open-canopy oak woodlands were impacted by SOD. The loss of so many trees creates canopy gaps, reduces wildlife food sources, may reduce gene flow and genetic diversity within impacted species, and can at least temporarily increase the hazard for higher severity fires around impacted trees.

Altered Fire Regime: Historically, wildfires in north coast oak woodlands were typified by their high frequency and limited intensity. Crown fires were relatively rare, and mature oaks typically survived. Wildfires maintained an open-canopy structure, limited the development of a shrub layer, and prevented the establishment of Douglas-fir (*Pseudotsuga menziesii*). Over 100 years of fire suppression on Mt. Tam has changed oak woodland stand structure, and increased fuel loads. This in turn increases the associated risks of high-intensity wildfires with the potential to kill mature oaks.

Lack of Top Predators and Cascading Effects: In the past, Native Americans, mountain lions, and wolves all preyed on deer. The loss of these predators from the ecosystem means that deer densities are likely elevated compared to historic levels. There is ample evidence supporting the hypothesis that high densities of ungulate grazers results in elevated browsing pressure on broadleaf tree seedlings and young saplings, leading to a depressed rate of new tree recruitment.

Douglas-fir Recruitment into Oak Woodlands: Due to thousands of years of deliberate human fire use and burning, less fire tolerant species such as Douglas-fir were kept out of large areas of woodlands now dominated by oaks. On Mt. Tam, the recent fire regime of very infrequent fires has allowed Douglas-fir to recruit into these oak-dominated woodlands. Douglas-firs that exceed the height of the oak canopy reduce oak growth and vigor, and may eventually lead to mortality and lower adult tree densities.

Turkeys: Wild turkeys (*Meleagris gallopavo*) released in Marin and Sonoma Counties for sport hunting in the 1980s. Heavy acorn predation by foraging turkeys reduces oak recruitment, and the associated soil disturbance may also create conditions favorable to invasive plant species germination.

Poor Sapling Recruitment: A common perception is that oaks are not recruiting in sufficient numbers to sustain populations, but empirical evidence for this problem is sparse. Many factors have been proposed for the apparent recruitment failure in many oak species which varies by species. Some evidence does indicate that browsing pressure from deer and rodents is leading to depressed seedling survival for many oak species.

METRICS USED TO MEASURE HEALTH

Metric	Condition Goal	Status
Metric 1 Hardwood canopy cover	Maintain approximately 2,150 acres of oak woodland with oak canopy cover between 25—60%	

Metric 2 Acres without priority invasive species	High priority invasive plant species at less than 5% cover in oak woodland habitat	
Metric 3 Acres without canopy-piercing douglas-fir	Maintain 90% (1,940 acres) of current oak woodlands without canopy-piercing Douglas-fir	

INFORMATION GAPS

Species Richness: Some measure of the diversity of native species present was identified as an important metric for open-canopy oak woodlands. The goal would then be to maintain species richness at the reference condition for this community type. While some data may be available to support this assessment, there is not currently enough information to make any statement about condition or trend.

Age Structure of Native Trees: Another important metric, which would be useful in determining whether new trees are being recruited at a rate that is sufficient to maintain the total acres and structural integrity of open-canopy oak woodlands over time.