



Yosemite's Black Oaks

Why is the park studying Yosemite's black oaks?

The black oaks in Yosemite Valley have been recognized as a valued cultural, scenic and biological resource. Black oak acorns used to be a major part of Native American diets, and traditional acorn collection still occurs today. Additionally, oak groves in the Valley are an iconic scenic feature. There has been a long-time perception that black oaks have been declining in Yosemite Valley and perhaps parkwide. In the last few years, the park has begun studying the oaks to determine if the populations are actually declining.



California Black Oaks
(Quercus Kelloggii) in Yosemite Valley

How did scientists study the oaks and what did the studies show?

Historical Aerial Photography: The first study used historical aerial photographs taken in 1944 and compared them to photographs taken in 2005 in 18 locations to determine if the extent of black oaks was decreasing. An analysis of the photos found that in places where black oaks dominated, the canopy extent of the woodlands examined remained unchanged between 1944 and 2005. In locations where individual tree canopies could be discerned in the photos, it was found that more trees died than were added to the populations through new germination. Since the total canopy cover did not change, the conclusion is that the net loss of trees was offset by the continued growth of surviving trees—there are fewer oaks today than in 1944, but they are larger.

Recruitment Rate Study: Another study looked at the recruitment rate—essentially the “birth” and retention rate—for oak seedlings and saplings. In a set of randomly located plots within areas where black oaks were known to occur in the Valley, all black oaks were inventoried, and assigned to one of several size classes. Researchers also recorded various environmental site conditions that may influence the recruitment rate. Within a healthy tree population, there are many seedlings, fewer saplings, and even fewer adults. In the oak tree populations studied in the Valley—regardless of elevation, soil type, vegetation community, and distance from roads and trails—the expected population structure was not found. The populations were mostly mature adult trees with a fair number of seedlings but few saplings or young adults.

A factor that is operating valley-wide seems to be preventing seedlings and saplings from surviving. Because some sites surveyed had few conifers, this would seem to question the hypothesis that conifers are shading out and killing oaks due to a previous policy of fire suppression—although that may still turn out to be a factor. Oak core samples showing the age of oaks indicates that oak populations were healthy until about 1920 when the populations started to decline. It appears that something began happening at that time that reduced the survival rates of seedlings and saplings, leading to a population structure found today that is skewed in favor of mature, adult trees.

One hypothesis that may explain the decline in black oaks is that the formerly common practice of fire suppression reduced the overall relative dominance of black oaks. Most oak species are adapted to survive fire and may even need fire to persist. Prior to the era of fire suppression, Native Americans used fire as a management tool to favor oaks and maximize annual acorn crops.

How did scientists study the oaks and what did the studies show? continued...

A second hypothesis for current oak decline is that Native Americans intensively managed them in Yosemite Valley and may have actively protected young oak saplings. Written accounts from the first Euro-American settlers to the Valley indicate that centuries of active Native American land management had produced an open oak woodland with few conifers. Today there are fewer oaks and many more conifers. Perhaps the oak populations we see today are returning to a state that existed prior to intensive Native American land management.

A third hypothesis for black oak decline is a change in deer population size and behavior. Factors affecting these may include: a decline in Native American use of deer; changes in deer hunting regulations and practice both inside and outside the park; changes in deer predator management, particularly outside the park; and, changes in development, both inside and outside the park. An increase in deer populations may lead to increased deer browsing on certain plants, including oak seedlings and saplings. There may also be other factors to consider in oak population declines such as changes in hydrology, acorns and seedlings being eaten by rodents, disease and insects attacking acorns, climate change, or some other, as yet unconsidered, factor.

Oaks Along Roadsides: A third study examined what effect roads might be having on oaks. Scientific study of “road ecology” has documented that most animals avoid roads, creating a buffer zone around roads where animals don’t often venture. These buffer zones may then act as refuges for plants that would otherwise be browsed by animals. Researchers surveyed oak populations next to the roads and 10 meters farther away to see if the population structure differed. While the scientists found the same number of seedlings and young adults regardless of their locations, there were more saplings next to the road. This result is consistent with road ecology theory and findings; animals are reluctant to forage close to the roads, increasing seedling survival. More study would be necessary to test that hypothesis. Oaks near roadsides may also be affected by factors such as a fertilization effect from car emissions or additional water from roadside water runoff.

What are the next steps?

These studies represent a first step in establishing a knowledge baseline for Yosemite Valley’s black oaks, pointing the way for future research to help answer questions about what is causing the decline and what may need to be done to conserve them. Future research may look at the potential role of animal foraging and other factors in suppressing oak recruitment.

Public Participation

Public participation is essential for the success of this and all other park projects. Here are some ways to stay involved in the park:

- **Attend a National Park Service public open house** to talk with project specialists and obtain more information on this topic. Visit the park’s planning website (listed below) for upcoming dates.
- **Add your name to the park’s planning list** and receive the *Planning Update* newsletter as well as other planning- related notices. You can also submit your email address to receive the park’s periodic electronic newsletter.
- **Additionally, you can submit comments with your thoughts about this topic or any other project in the park by any of the following means:**

Mail: Superintendent
P.O. Box 577
Yosemite, CA 95389

Phone: 209/379-1365; **Fax:** 209/379-1294

E- mail: Yose_Planning@nps.gov

- **Visit online:** www.nps.gov/yose/parkmgmt/planning.htm to find out about plans and projects or www.nps.gov/yose/naturescience/index.htm to find out about science & nature in Yosemite National Park.



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