

Hardwoods Management/Regeneration and Horticulture Studies 2009

Project: 057 Artificial regeneration of native California oaks

Leader: Doug McCreary, Natural Resources Specialist
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Objective: For nearly a century there has been concern that several of California's 20 native oak species were not regenerating adequately. Such concern was partially responsible for the establishment of the Integrated Hardwood Range Management Program (IHRMP) in 1986, a cooperative effort between the University of California, the California Department of Forestry and Fire Protection, and the California Department of Fish and Game to promote oak-woodland conservation. This concern led to efforts to both understand factors responsible for poor natural regeneration and to develop strategies to regenerate oaks. Research on oak regeneration has now been going on at the SFREC for nearly two decades and has produced important information that has been key to oak regeneration efforts throughout the state.

Project: 087 Oak regeneration on cleared rangelands

Leader: Doug McCreary, Natural Resources Specialist
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Objective: Efforts to regenerate oaks on California's oak woodlands often must address how to establish seedlings in areas grazed by livestock. This can be problematic since cattle eat acorns and can browse small seedlings. This project was initiated to evaluate alternative practices for restoring oaks on an oak woodland site grazed by cattle. During the last 8 years a portion of the planting site has been periodically grazed and the impacts to seedlings monitored. In addition, some of the individual seedlings were protected with tree shelters and others weren't. Results indicate that oaks can be successfully established in low- to moderately-grazed areas if seedlings are protected with tree shelters. We also found that in the absence of grazing a build-up of thatch can create a favorable habitat for voles and result in higher levels of vole damage to unprotected seedlings.

Project: 210 Effects of Cattle Grazing on Oak Saplings

Leader: Doug McCreary, Natural Resources Specialist
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Objective: A study to evaluate the impacts from cattle to a range of sizes of oaks was commenced at the Sierra Foothill Research and Extension Center in 2002. This study used a blue oak planting that was established at the SFREC between 1988 and 1990 by Ted Adams, a Wildland Specialist at UC Davis. He had established several hundred oaks inside a half-acre plot, fenced to exclude both deer and cattle. At the initiation of the study, there

Project:

210 Effects of Cattle Grazing on Oak Saplings - Continued

were a total of 144 living seedlings and saplings that ranged in height from 17 in. to 14 ft. The plot was divided in half and one half was opened to cattle grazing. This plot was within a 100-acre pasture that is grazed for in the spring as part of the Center's normal grazing operation. Prior to removing the fence for half of the plot, we assessed each seedling in both plots for height, basal diameter, crown spread, and crown height. From these latter two variables we calculated crown volume.

Initial results, collected in 2004, indicated that there is a threshold height, above which oaks may be large enough to withstand cattle damage in low- to moderately-grazed pastures and continue growing. Based on measurements collected in 2004, it appeared that this threshold was near 6.5 ft. Measurements collected in February 2007 reinforced this threshold height as grazed seedlings less than this height were either killed by a combination of clipping and rubbing or were damaged such that height growth was negligible or negative. Saplings initially taller than this threshold height, however, generally grew vigorously and none were killed in the last three years.

Project:

511 Landscape-scale relationships between oak recruitment and livestock management

Leader:

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Objective:

We are investigating the landscape-scale relationship between the timing of grazing and blue oak (*Quercus douglasii*) recruitment, particularly with regard to the release of seedlings into the sapling stage. Our project has three components: A) landscape scale surveys, including monitoring naturally regenerating seedlings and saplings, in multiple pastures with different histories of seasonal livestock grazing management; B) experimental planting of oak seeds (acorns) combined with manipulating defoliation and herbaceous structure; C) a greenhouse experiment to further isolate the importance of timing of defoliation relative to the phenology of herbaceous neighborhood. Results from this multi-level approach will inform management regarding the timing and duration of grazing, suggesting ways to optimize forage production, while simultaneously improving the native representation of the herbaceous community and oak recruitment.

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Project: 706 Testing hypotheses of blue oak seedling and sapling life stage transitions

Leader: Katharine Suding, Assistant Professor, Ecology and Evolutionary Biology
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Objective: We propose to test two hypotheses of blue oak seedling and sapling life stage transitions. One hypothesis for observed low densities of blue oak saplings is that seedling to sapling transitions only occur with the infrequent mortality of adult trees. The “advance regeneration” hypothesis predicts that seedlings must establish under adult tree canopy and not away from the canopy, but are unable to grow to the next life stage under the canopy. Canopy gap formation from adult tree mortality releases the persistent “seedling bank”. The second “sapling escape” hypothesis predicts that in the absence of appropriately severe fire disturbance, mammal browsing causes saplings to become shrubby with many later branches. A strong disturbance that removes all lateral branches but does not kill the sapling can allow rapid growth by a central leader that can escape herbivory. Once the sapling has grown beyond a critical height of about 1.5 m, it can transition to a tree stage.

Project: 713 Nutrient deposition at oak canopies: potential consequences for plant community dynamics and ecosystem processes

Leader: Mary L. Cadenasso, Assistant Professor, Department of Plant Sciences
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Objective:

- 1) Verify that oak canopies receive greater atmospheric N deposition than the surrounding open grassland and understand patterns of deposition with respect to various contributing factors.
- 2) Examine the impacts of enhanced N deposition on community dynamics and ecosystem processes.
- 3) Determine the effect of enhanced N deposition at oak canopies on the spatial patterns of exotic and native species dynamics in California oak savannas.