

Conservation Planning for Blue Oak Woodlands in the Southern Sierra Foothills

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Problem Statement

Blue oak woodlands are a signature landscape of California. Endemic to the state, blue oaks live in the foothills of the Sierra Nevada and the lower slopes of the Coast Ranges. Real estate development, land conversion and climate change are putting new pressures on this important California community. Regional climate models predict a reduction of current blue oak habitat by almost 50 percent (Kueppers et al. 2005) while a fragmented California landscape threatens to stymie migration into more suitable climates. Seventy-five percent of blue oak habitat falls under private ownership, most of which was traditionally used for grazing livestock (Davis et al. 1998). Modern day economic pressure, however, is pushing landowners to develop. Over 30,000 acres of oak woodlands are converted each year for residential and commercial uses (Standiford and Scott 2001). This urban expansion endangers more than just trees: A Forest Service study found that blue oak woodland is utilized by ninety-two species of birds, including the federally protected Bald and Golden Eagles (<http://www.fs.fed.us/database/feis>). Habitat loss is taking its toll on woodland populations. According to the Sierra Nevada Ecosystem Project (1996) 14 percent of foothill terrestrial species are suffering from declining populations.

The steady loss of habitat from the private sector has significant implications for the management of remaining blue oak woodlands. The Nature Conservancy is one of several organizations interested in blue oak preservation, and is examining the possibility of expanding a million-acre reserve in the Sequoia foothills in order to encompass more blue oak habitat. An effective conservation effort will require a synthesis of ecological data and life history characteristics for blue oak communities of the southern Sierra foothills. These data must include species requirements, minimum viable population size, dispersal ability and regeneration rates. Regional climate model data will have to be integrated with life history characteristics to predict blue oak response to climate change. An intelligent conservation plan will integrate conservation strategies being utilized by both government and non-governmental agencies in the Sequoia foothills region in a collaborative effort to ensure the sustainability of this California endemic.

Project Objective

- Synthesize ecological information and determine habitat parameters required to sustain a viable blue oak community under a changing climate.
- Consider possible migration patterns for blue oaks using climate-change and suitable-habitat models.
- Map current land management status for remaining blue oak habitat
- Correlate current land management compatibility with blue oak community viability.
- Consider economic factors and social priorities in order to create an effective and economically efficient conservation plan.
- Quantify the levels and distribution of ecosystem services of blue oak woodland as possible incentives for compatible management.
- Provide specific recommendations from this plan for The Nature Conservancy's *Sequoia Foothills* project

Project Significance

California's landscape is changing: Historic threats such as habitat fragmentation, invasive species, altered waterways and ubiquitous pollution are both overshadowed and compounded by climate change. This new and significant threat to California's biodiversity is changing our natural environment in unprecedented ways. We are in the early stages of a new era in conservation planning: Land managers and policymakers now struggle to anticipate the needs of our wild populations under a changed climate. Likewise, this project assesses traditional threats in the context of climate change in an effort to conserve an endemic species. Blue oak is charismatic, conspicuous and of significant importance to a broad suite of animal species. Blue oak woodland also occupies a large quantity of valuable real estate, making it one of the more threatened California biomes. Conservation groups and governmental organizations must act quickly and intelligently to preserve both remaining and potential blue oak habitat.

Background Information

Blue oak woodland historically enjoyed an extensive range throughout California, virtually encircling the Central Valley. Early European settlers reduced the area of California's oak woodland via agricultural conversions, fuelwood harvesting and water diversion (McCreary 2004). In the last century, oak woodlands were reduced dramatically to make room for expanded residential developments, commercial infrastructure and agricultural crops; what remained was largely used for grazing cattle. By the end of the 20th century, 87 percent of remaining blue oak woodland fell within grazing allotments (Davis et al. 1998). Concern about the long-term viability of oak woodland was prompted when studies indicated that several oak species, including blue oak, were experiencing low rates of recruitment (McCreary 2004). Blue oak woodland has come increasingly under pressure in recent years, as grazing lands are converted to housing developments. In the central Sierra Nevada in the late 1990s, land values for grazing were less than 20 percent of the land values for development (Johnson 1997). Over 30,000 acres of oak woodlands are converted each year for residential and commercial uses (Standiford and Scott 2001). Climate change adds a twist to an already

difficult situation. Using a regional climate model – based future climate scenario, Kueppers, et al. (2005) found that the potential range of California blue oaks shrinks to 59 percent of modern potential range sizes and shifts northward. Based on the modeled regional climate change, less than 50 percent of protected land area currently containing blue oaks is expected to sustain them under a future ‘business as usual’ scenario of greenhouse gas emissions.

Stakeholders

The Nature Conservancy currently has several projects in California with a major emphasis on blue oak woodland conservation, including the 900,000-acre Lassen Foothills project area, the 1,200,000-acre Mt. Hamilton project area, and the 1,000,000-acre Sequoia Foothills area. These projects span the blue oak range, and have protected numerous properties, through fee acquisitions and conservation easements, with the aim of conserving blue oak woodland habitat. In the Sequoia Foothills, blue oak conservation is still in its early stages and The Nature Conservancy is interested in recommendations on the optimal size, location and configuration of additional blue oak woodland reserves (A. Mas, personal communication).

Possible approach and available data

Due to the fragile state of California’s oak woodlands, there is a large amount of available data on blue oaks:

- A 2005 study by a team of researchers out of Santa Cruz predicts that current blue oak habitat is likely to shrink dramatically due to climate change (Kueppers et al.).
- The Bren biogeography lab is expanding on the Kueppers study by evaluating possible future suitable habitat for California oaks. The results of this research are likely to be available by summer, 2006 (D. Stoms, personal communication).
- The University of California’s Integrated Hardwood Range Management Program is a collaborative program among U.C., the California Department of Forestry and Fire Protection, and the California Department of Fish and Game, designed to address oak woodland conservation, including the economic and ecological consequences of woodland conversion (Giusti et al. 2004).
- Researchers at U.C. Davis are examining scientific issues regarding oak regeneration and policy discussions on how oak woodland systems can be managed sustainably (McCreary 2004).

This proposal utilizes existing data to determine an ecologically and economically sound strategy for expanding blue oak habitat in the foothills of the southern Sierras.

Deliverables

- 1) Group project report
- 2) A strategy for expanding The Nature Conservancy’s *Sequoia Foothills* blue oak reserve.
- 3) GIS maps displaying current ownership status and management compatibility for California blue oaks

References

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