American Indian Influence on Fire Regimes in California's Coastal Ranges*

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Understanding the historical pattern of human impacts on landscapes is critical to correctly interpreting the ecological basis for vegetation distribution. In some parts of the world, such as the Mediterranean Basin, a long and intensive utilization of resources has greatly altered the distribution of forests and woodlands. Was vegetation distribution in the coastal ranges of California similarly influenced by humans before Euro-American colonization?

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Figure 1—*Vegetation mosaic in the coastal ranges of California. Such commonplace scenes in coastal California originated when human-caused fires became frequent enough to open the native chaparral. Photo: John E. Keeley, U.S. Geological Survey, Sequoia Kings Canyon Field Station, Three Rivers, CA.*

Fire-Dependent Landscape

The natural vegetation in much of California's coastal ranges has long been chaparral shrubland. Natural grassland is widespread only on the very arid interior margins of the central and southern coastal ranges. On less arid sites on coastal slopes, the natural dominant cover is shrubs rather than grasses and forbs.

Historically, fire seems to have played a key role in opening up the native shrublands. Today, grasslands dominated by nonnative plants cover about 25 percent of the landscape (fig. 1); less than 1 percent of these grasslands have a significant native grass presence. Ecological studies in the coastal ranges have failed to discover any clear soil or climate factors explaining grassland and shrubland distribution patterns. However, shrubland communities are readily displaced by annual grasses and forbs under high fire frequency.*

Natural fire frequencies from lightning are low in the coastal ranges. Modeling studies and circumstantial evidence, such as fossil pollen and charcoal deposition, suggest that fire return intervals were shorter where American Indians were present than natural ignitions would explain. Today, humans are responsible for the vast majority of ignitions in the region. The same was likely true before Euro-American colonization.

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* Based on Jon E. Keeley, "Native American Impacts on Fire Regimes of the California Coastal Ranges," in *Journal of Biogeography* 29 [March 2002]: 303–320.

* For more information on fire regimes in coastal California, see Jon E. Keeley, "Fire and Invasive Plants in California Ecosystems," *Fire Management Today* 63(2) [Spring 2003]: 18–19.

Even before Europeans arrived, the coastal ranges of California had relatively high human population densities. Agriculture was unknown in the region, and marine or riverine resources were not enough to sustain the high populations. Terrestrial resources were key. For example, we know from archeological evidence that American Indians used mortars, pestles, and other milling devices to grind acorns as well as seeds from native grasses and forbs.

The native shrublands formed dense, impenetrable stands with limited resources for American Indians. Lightning fires would not have been frequent enough to maintain the open shrublands/grasslands that people needed to subsist in high numbers. However, an additional human subsidy of ignitions readily produces such landscape mosaics.

Purposes for Burning

American Indians would have had strong reasons for using fire to convert dense chaparral into an open mosaic of shrubland/grassland:

- ***Increasing seed, bulb, and fruit production.*** Shrublands converted to herbaceous associations would have been dominated by important plant resources. For example, chia was one of the richest sources of fat in the American Indian diet.
- ***Increasing habitat for game.*** Repeated burning produces grassland with patches of shrubland, excellent habitat for game such as deer, valley quail, brush rabbit, and mourning dove.
- ***Increasing water resources.*** Conversion of chaparral to grassland increases annual streamflows by reducing evapotranspiration. By using fire to keep streamflows perennial, American Indians would have obviated the need for seasonal migration when streams dried up.
- ***Reducing hazards.*** American Indians shared the top of the food chain with the highly feared grizzly bear, now extinct but formerly widespread in the coastal ranges. By using fire to reduce chaparral near villages, American Indians would have diminished the threat of being surprised by bears, ambushed by human enemies, or overrun by wildfires driven by dry Santa Ana winds.
- ***Facilitating travel and resource extraction.*** Travel through chaparral is nearly impossible without extreme epidermal abrasion. Frequent burning would have cleared routes for travel and helped reveal mineral resources such as steatite, tourmaline, and clay, which were quarried and used in food processing, hunting, and decorations.

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For many reasons, American Indians used fire to convert a large part of California's coastal landscape from shrubland to grassland. Holocene peoples performed similar agropastoral modifications of ecologically related shrublands in the Mediterranean Basin. Much of the converted California landscape was subsequently maintained by Euro-American colonizers as pasture.

Management Implications

Understanding the role that American Indians played in shaping vegetation patterns in California's coastal range is critical for today's land managers. Woody vegetation was likely the natural dominant cover over large stretches of landscape, including areas that today are grasslands dominated by nonnative species. Attempts to introduce native bunchgrasses in such areas, in the mistaken belief that they were the dominant natural vegetation before Euro-American colonization, might be misguided and will likely fail.

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