PUBLICATION 8234

FOREST STEWARDSHIP SERIES 4

Forest History

LAURIE LITMAN, InfoWright, Stockton, CA; **GARY NAKAMURA,** UCCE Forestry Specialist, Department of Environmental Science, Policy, and Management, University of California, Berkeley

UNIVERSITY OF CALIFORNIA
Division of Agriculture and Natural Resources
http://anrcatalog.ucdavis.edu

Your forest is the result of a long history of physical, biological, and cultural events that have shaped the land and created the plant and animal communities found there. Disturbances at various scales, from geological ones like volcanoes and glaciers to local ones such as fires and forest practices, have interacted with biological forces of plant and animal development and succession to make your forest what it is. This publication highlights some of the major events and eras that have influenced California forests. A historical context is useful to obtain a better understanding of your forest, to help envision what it may have looked like in the past, and to help you predict what the future might bring. It also serves as a reminder that forests are dynamic: what we see now is simply a snapshot in historical time.

Objective

Understand the important influences of historical natural and cultural events on California forests.

Competencies

- *Understand that the forest we see today is the end result of numerous natural and cultural disturbance events.*
- *Become familiar with major shaping events in the history of California forests, including Native American practices, the Gold Rush, railroad land grants, creation of forest reserves, the World Wars, and the passage of numerous environmental laws.*
- *Learn how to find information about the history of your property.*

Related Forest Stewardship Series Publications

- *Forest Ecology (ANR Publication 8233)*
- *Vegetation Management (ANR Publication 8236)*

UC PEER REVIEWED

GEOLOGICAL HISTORY

California natural history includes a great variety of natural activity. Glaciers, volcanoes, earthquakes, floods, and winds have helped build the physical landscape we see today. Geological processes created the mountains, plains, and valleys of California, with their varied elevations and topography. These in turn affect the climatic patterns in the state, most importantly the rain and snow in the Coast Range, Klamath and Cascade Mountains, and the Sierra Nevada, and the rain shadow and dry conditions east of them. Because soil develops from the underlying parent rock and soil characteristics, it varies with the rocks present in a given area. For example, volcanic soils found in the Cascade Range are different from the granitic soils of the Sierra Nevada, and the soils in these areas differ markedly from each other. Soil characteristics also affect the potential for landslides and erosion. Climate, topography, and soil type are major determinants of where different tree species can grow.

CLIMATE

Much of California has a Mediterranean climate characterized by cool, moist winters and hot, dry summers. This type of climate is found only in a few other areas of the world: around the Mediterranean Sea and in South Africa, Chile, Australia, and New Zealand. A Mediterranean climate supports vegetation and wildlife that are able to survive an annual drought period with little or no rainfall and the periodic wildfires fostered by those periods of drought.

Climate appears to go through long-term cyclical changes. California has experienced at least six major cool periods over the past 2.4 million years when glaciers covered large regions of the state and intervals of warmer weather caused the glaciers to retreat. Forest species and communities change in response to climatic variation. Some forests, like the Monterey pine forests of the Central Coast, are remnant populations of what were once extensive forests. In the last 150 years California has experienced a warm, moist period compared with the rest of the millennium; this may partially account for the increased vegetation growth seen throughout the state. Warmer periods also correspond to increased wildfire activity.

NATIVE CALIFORNIANS

When Europeans first came to California they believed they had found a vast untouched wilderness. On the contrary, this was a highly managed environment, much of it maintained by and dependent on the intentional activities of native peoples who had lived here for centuries (fig. 1). It is now believed that some of the remarkable diversity found in California ecosystems is actually the result of these management activities.

The most widely used management tool was fire. Native Californians were skilled in the use of low-intensity fire. Fires were set for a number of reasons: to stimulate new plant growth for food and basketry, to create mosaics of habitat to attract desired animals, to destroy disease organisms, to reduce fuel and prevent major forest fires, and to clear the understory vegetation for easier travel and as protection from enemy ambush. Frequent low-intensity fires killed small trees, effectively stopping forest development and thus maintaining meadows, oak woodlands, and native prairie grasslands. Studies have shown that the distribution of some plant species, such as black oak, can be explained only by their continued maintenance through fire by Native Californians.

In addition to fire, the native peoples employed a number of other management techniques: they sowed seeds, transplanted shrubs and small trees, pruned plants, weeded, and constructed ditches and diverted water for irrigation and erosion control. Use of resources also had an effect on the land. In digging for roots, soil was aerated, which encouraged desirable plants, harvesting of basketry material stimulated plant growth. Native Californian societies also had numerous rituals and rules that limited harvesting of natural resources.

Beginning about 150 years ago, the Native Californian population was decimated by European-American immigrants. About one-third of the population, approximately 100,000 people, died between 1848 and 1855. With the cessation of Native Californian management, the number, range, and diversity of many native plant species and habitat types has declined. The impact of Native Californian management on our forests continues to this day.

Figure 1. Territorial boundaries of California Indian tribes. Most boundaries closely followed topographic and watershed boundaries in pre-Columbian times. *Source:* Heizer and Elsasser 1980, reprinted with permission.

LIVESTOCK GRAZING

Sheep, cattle, horses, and in some areas goats and pigs were grazed throughout the Sierra Nevada from the rancho era (early 1800s) and more expansively through the Gold Rush to the middle of the twentieth century. This caused extensive changes in vegetation and wildlife habitat. Sheep, which John Muir referred to as "hoofed locusts," appear to have caused the most extensive changes; numbering in the millions, there was no limit on grazing before 1900. The animals completely denuded many areas, resulting in severe erosion. Changes in vegetation included replacement of native perennial plants with annual species in upper-elevation hillsides and

Figure 2. Hydraulic mining, 1860–1870, Trinity County. Streams were diverted through flumes, ditches, and pipes to monitors (nozzles) to wash gold-bearing gravels into sluce boxes for separation of the gold. *Source:* Eastman's Originals Collection Group 117, Special Collections, University of California Library, Davis, reprinted with permission.

Figure 3. Central Pacific Railroad land grants (white sections) form a checkerboard private ownership pattern with national forest (green sections) along Interstate 80 and the railroad right of way from Sacramento to Reno. *Source:* Courtesy USDI Bureau of Land Management, 1989.

meadows. In addition, many shepherds set fire to the undergrowth as they left the forests in the autumn to ensure new growth for the following year. Changes wrought by the unregulated grazing are still visible in the Sierra Nevada.

MINING AND RELATED ACTIVITIES

The 1849 California Gold Rush caused significant changes to the California landscape, especially in the Sierra Nevada. The population increased significantly as people came from all over the world to find gold. Rivers were dammed and rerouted to expose the gold underneath. New mining techniques required water diversion on a large scale. Placer mining washed gravel from hillsides into wooden troughs to recover the gold. Pits and heaps of discarded rock can be found along stream bottoms in the Mother Lode counties of the central Sierra Nevada foothills. Large dredges mounted on barges mechanized the mining process, leaving tailings in rows of heaps of washed gravel and stones. Hydraulic mining used high-pressure streams of water to sluice down entire hillsides, sending incredible amounts of sediment into waterways, altering river systems and causing flooding downstream and the sedimentation of San Francisco Bay. This practice ended in the 1890s through federal legislation demanded by downstream communities and farmers affected by the sedimentation and flooding caused by mining activities. The scars and changes from the mining period are still highly visible in the Sierra region (fig. 2).

During the mining era, lumber was milled for water flumes, mine timbers, fuel, and building material. The need for wood caused the first extensive cutting of the Sierra forests in the 1850s to 1870s. The second-growth forests that regenerated have grown and since been harvested in many areas during and after World War II. Some of the largest, oldest trees in the Sierra Nevada today date back to those events.

RAILROAD ERA

Between 1850 and 1870, 10 percent of the area of the lower 48 states was used to pay for, build, and operate the transcontinental railroad and telegraph systems. Railroad corporations were given millions of acres of public land, much of which they sold to timber, mining, and other interests. The checkerboard pattern of the railroad land grants can still be seen on the California land ownership map (fig. 3).

Figure 4. Logging by horse team in the coast redwood forest. Logging roads and trails were often located in a streambed. The effects of this practice are evident in streams to this day. *Source:* Ericson Collection, Humboldt State University Library, reprinted with permission.

Railroad construction harvested the forests east of Lake Tahoe for railroad ties, bridges, trestles, and fuel. Construction of snowsheds over the railroad tracks crossing the Sierra Nevada required 300 million board feet of lumber, and another 20 million board feet per year was required for annual maintenance (in comparison, current annual timber growth in the northern Sierra Nevada is about 2 billion board feet). Completion of the transcontinental railroad across the Sierra in the 1860s opened up markets in the eastern part of the country to California lumber. The lumber industry grew between 1890 and the 1920s, when more than 80 railroad logging companies were operating, opening up formerly inaccessible private forestland to development. Railroad logging primarily harvested pine and redwood; fir and cedar were used for fuel. Many of today's forest roads follow the gentle, even grades of these logging railroads.

LOGGING IN THE COAST REDWOOD REGION

The logging of the coast redwood forests started in the late 1800s, beginning with oxen to move logs and progressing to steam (donkey) engines and railroad logging by the 1930s, in much the same pattern as the other forests of the Pacific Northwest. This method of harvesting resulted in the clearing of entire watersheds and generally progressed from the easily accessed coastal forests up through the inland watersheds. The coastal rivers and streams were used as transportation corridors for the logs, resulting in environmental damage that remains with us today in the form of sediment-loaded streams and degraded salmon habitat (fig. 4). Many current timber harvesting plans must address the cumulative impacts of past harvesting practices and implement mitigation measures to offset the potential environmental hazards posed by the combination of past and present management practices.

WORLD WARS I AND II

Better technology and transportation, principally the use of steam engines, increased logging efficiency in the early 1900s. The demand for lumber increased during World War I, and timber companies constructed spur tracks throughout the Sierra forests to facilitate logging. Demand decreased during the Depression, then picked up again during and after World War II with new timber access roads being built through California forests. Many of the roads through the forest that exist today are a remnant of this period. These logging roads increased access to forests and encouraged development and housing in the forest, creating today's wildland-urban interface. Between 1940 and 1960, timber harvests in the state grew from 2 billion to 6 billion board feet per year.

FIRE AND FIRE SUPPRESSION

Fire has always played a major role in the development of California forests. The frequency of natural fire varies by forest type, but it is thought to be between 10 to 20 years (based on fire scar analysis), except in the moister North Coast redwood forest. Natural fires are generally caused by lightning, but Native Californians burned more

Figure 5. The Beaver Creek Pinery (Ishi Wilderness, Tehama County) has continued to experience frequent, low-intensity ground fires because it is so isolated and difficult for fire fighters to get to. Also, being in a wilderness, managers have been interested in allowing natural processes like wildfire to proceed unhampered unless they pose a threat to life or property. This photo was taken in the 1990s, 5 years after the last wildfire burned through the stand, which is thought to represent the Sierra Nevada forest structure prior to the extensive fire suppression efforts of the twentieth century. For scale, note the people in the center of the photo. *Source:* Courtesy Carl Skinner, USDA Forest Service, Pacific Southwest Research Station.

frequently than would be produced by lightning strikes, in some places annually. In the Sierra Nevada this frequent burning produced a forest dominated by fire-resistant pines (fig. 5).

In the early 1900s, fire suppression became the official policy: timber was too valuable to burn and forest communities were at risk. This policy overlooked the essential ecological role that wildfire plays in the forest ecosystem and also disregarded the fact that, over time, fire suppression allows fuel to build up to levels that increase the risk of uncontrollable fires. Problems with the unnaturally dense forests of today include:

- an increased susceptibility to forest insects and diseases because trees are stressed by competition for limited water
- displacement and reduction of understory plants because of dense shade
- conversion of shrub habitats and other foraging areas to conifer thickets
- displacement of deciduous vegetation by conifers, particularly in riparian areas
- reduction and loss of mountain meadows to conifer encroachment
- reduction in habitat diversity of more open and nonforested wildlife habitats

REGULATION OF FOREST PRACTICES

Gifford A. Pinchot, the first chief of the U.S. Forest Service and an early conservationist, wrote in *A Primer of Forestry* (1885) that

> next to the earth itself the forest is the most useful servant of man. Not only does it sustain and regulate the streams, moderate the winds, and beautify the land, but it also supplies wood, the most widely used of all materials. Its uses are numberless, and the demands which are made upon it by mankind are numberless also. It is essential to the well-being of mankind that these demands should be met. They must be met steadily, fully, and at the right time if the forest is to give its best service. The object of practical forestry is precisely to make the forest render its best service to humans in such a way as to increase rather than to diminish its usefulness in the future. Forest management and conservative lumbering are other names for practical forestry. Under whatever name it may be known, practical forestry means both the use and preservation of the forest.

Because of public concern about unsustainable and destructive resource consumption, the state and federal government became involved in conservation issues in the latter part of the nineteenth century. In 1884, a court decision limited hydraulic mining because of the damage caused downstream by flooding and sedimentation. In 1885 the State Board of Forestry was created to address problems of poor regeneration of cutover forests, large fires, and grazing-related erosion. Federal forest reserves and national parks were created in the 1890s. The U.S. Forest Service was created in 1905, and under the direction of Gifford Pinchot, the forest reserves were redesignated as national forests.

Stewards of the Past

California is rich in history. Much of the historical record, especially of the prehistoric past, lies in the ground. These sites contain information that is precious and irreplaceable. This information is rapidly disappearing, often destroyed inadvertently through activities that could be avoided with proper knowledge and care.

Landowners who have historic or prehistoric sites on their property are the stewards of the past. In their safekeeping is the guardianship of these records for future generations to learn from and experience history. Landowner responsibility goes one step further. Knowledge of the past is considered part of the heritage of all Californians. For this reason, cultural resources are protected by law.

Protected resources include both historic and prehistoric artifacts as well as locations of cultural significance to local Native Americans that do not necessarily have visible features. Important heritage values may include logging camps, emigrant trails, homesteads, and Gold Rush mining towns; ancient Native American villages, campsites, milling stations, quarry locations, and petroglyphs; and sacred places such as sacred peaks, ceremonial dance grounds, trails, guardian trees, cemeteries, and gathering areas.

Where to Look

Archaeological sites are often found in predictable locations, although there are exceptions. Most sites occur near sources of fresh drinking water. Where streams meander through alluvial valleys, the most likely location is often on the edge of the hillslope on slightly higher ground. Sites often occur in or along the margins of natural openings; they may be found along ecotones, where different plant communities come together.

Regional patterns vary. The most obvious indicator of archaeological sites may be Franciscan chert (a rock used in arrow and spear points) in northern California or bedrock mortars (for grinding acorns and grain) in the Sierra Nevada. The presence of oak trees is a good indicator, as they provided Native California people with their staple food—acorns.

Statewide, one of the best ways to identify an archeological site is to learn to recognize middens. Middens are refuse heaps that may contain broken tools, burned bones, charcoal, waste flakes, cooking stones and broken equipment. Middens can usually be identified by localized soil color change (usually black or darker than surrounding soil); an ashy, greasy feel to the soil; or a dark film of fine, sticky dust stains the hands if the soil is dry. Middens often occur in areas such as stream terraces, near springs, or on ridgetops where a camp might have been.

Another important archeological feature is the housepit. These usually circular depressions are remnants of structures or dwellings, usually found in open areas in oak woodland or forests. Characteristics include the occurrence as a cluster of pits on a flat bench near water; and the presence of midden or artifact scatters, an earthen rim, and large rocks

Continued on page 7

Several important laws for forestry were passed in the 1970s. At the national level, these included amendments to the Clean Air and Clean Water Acts as well as the Endangered Species Act. At the state level a number of environmental laws were enacted as well, most notably the Forest Practice Act of 1973, which has resulted in the most comprehensive set of forestry regulations in the United States and arguably in the world.

Tax laws can greatly influence forest practices. Prior to 1976 California had an annual ad valorem (percentage of value) property tax on the value of standing timber on each parcel, encouraging intense harvesting of forests to remove the taxable assets and reduce the property tax. Harvesting 70 percent of the timber value would eliminate the tax until merchantable-sized timber regrew. Since 1976 California timber tax law has changed to a yield tax on timber only at harvest, a tax of about 3 percent of the harvest income. This effectively eliminated the incentive to harvest timber simply to reduce property taxes.

RESOURCES FOR LEARNING ABOUT THE HISTORY OF YOUR FOREST

Every forest has its own history—the history of settlement, resourceuse, local fire and other disturbances, and other events and changes. These historical events may be small compared to regional or statewide occurrences, but at the individual forest scale they can be as important as major events.

Researching the history of your property will help you understand its present condition. Have there been fires? Where did they originate? You could use this information to prioritize where you should establish fuel breaks. If you plan on commercial timber harvest, you will have to document historical and cultural sites in the timber harvest plan. Learn more about the history of your own forest:

- Investigate the history of your property. There are probably many people still around who can tell you about the recent history of your property and the surrounding area. Talk to neighbors and long-time residents to learn about previous property owners, forest practices, timber harvests, insect pest outbreaks, fires, windstorms, floods, and other major disturbances, as well as local events, and other information. Look at old maps, records, and newspaper articles.
- Study your property. Look for clues about past history in the forest itself. Examine stumps: count the rings to determine the age of trees when felled, look at spacing between the rings for clues about climate and

Continued from page 6

sometimes found inside the pits or around its perimeter. Housepit depressions in northwestern California are usually rectangular.

Prehistoric rock art can include petroglyphs (designs pecked, scratched, or ground into the rock) or pictographs (painted designs).

In the Sierra Nevada, bedrock milling stations can be found. These are circular holes or depressions ranging from 3 to 6 inches in diameter that generally occur in clusters on flat-topped rocks or outcroppings. Pestles that exhibit wear on their end(s) may also be present. In addition, grinding basins, or metates, may be seen as oval depressions with polished surfaces.

Map Features of Historical Sites

Many historical clues can be found in a 7.5' USGS quadrangle map. In California forests, look for

- *stream terraces, midslope benches, or ridgetops*
- *flat areas along streams*
- *places where two streams come together, especially the point of land immediately upstream from the confluence*
- *trending ridges, which were used as travel routes through the mountains*
- *springs near ridgetops or ridgetop saddles (a low, flat area between two points of higher ground)*
- *place names such as "Indian Bar," "Arrowmakers Ridge," and so on*
- *historic mines and ranches (these may be historic homesteads in addition to camping places chosen by Native Americans)*
- *margins of interior valleys*

Further Information

For more information on the Forest Practice Rules for the Protection of Cultural Resources, visit the California Department of Forestry and Fire Protection (CAL FIRE) Web site at *http://www.fire.ca.gov/thp/rsrc-mgt.php.*

growth rates, and look for fire scars. Try to visualize what the forest used to look like (fig. 6).

- Find out more about the cultural history of the area. Look in the historical section of the local library for books, talk to the local historical society, and visit the local museum. Look up old newspaper articles to learn what happened in your area.
- Historic photos can show changes in usage, roads, and vegetation. Libraries and government agencies may have old photos. Also check with your local historical society. Aerial photos are available from the Natural Resources Conservation Service (NRCS) (http://www.nrcs.usda.gov/) and Farm Services Agency (http://www.fsa.usda.gov/FSA/webapp?area=fsahome&subject=landing&topic=landing) for private lands, and from the Forest Service (http://www.fs.fed.us/) for National Forest and adjacent lands. Private companies sell aerial photos. County assessor offices may have old maps that show timber inventory and plant cover.
- Access archaeological records. It is possible that an archaeological survey has already been conducted on your property. The most comprehensive source of information on known sites and previous surveys is the California Historical Resources Information System (CHRIS) (http://ohp.parks.ca.gov/default.asp?page_id=1068), the state database maintained by the California Office of Historic Preservation (OHP). CHRIS is administered by eleven Information Centers throughout the state where staff will carry out archaeological record searches for a fee when requested to do so in writing by an authorized person. If no survey has been done, the Information Centers maintain lists of consultants qualified to do archaeological field work in the area.
- Learn about the geological history of your area. Talk to a geologist or do some research at the local library.

Figure 6. A tree's life history can be observed in its rings. This tree cross-section shows annual rings on a 6-inch diameter white fir *(Abies concolor)*. Growing in the shade of larger trees, under great competition for light and moisture, the tree grew slowly for 30 years, as can be seen by the inner 30 rings. About 20 years before the tree was cut it was damaged by fire or logging, creating a scar on one side of the stem. That disturbance killed competing trees and subsequently, this tree grew more rapidly in diameter, producing wider rings. *Photo:* Gary Nakamura.

BIBLIOGRAPHY

Heizer, R. F., and A. B. Elsasser. 1980. The natural world of the California indians. Berkeley: University of California Press.

ENGLISH–METRIC CONVERSIONS

English	Conversion factor for English to Metric	Conversion factor for Metric to English	Metric
inch (in)	2.54	0.394	centimeter (cm)
board foot (bd ft)	0.0027	423.78	cubic meter (m^3)

FOR FURTHER INFORMATION

To order or obtain printed ANR publications and other products, visit the ANR Communication Services online catalog at http://anrcatalog.ucdavis.edu. You can also place orders by mail, phone, or FAX, or request a printed catalog of our products from:

University of California
Agriculture and Natural Resources
Communication Services
6701 San Pablo Avenue, 2nd Floor
Oakland, California 94608-1239
Telephone: (800) 994-8849 or (510) 642-2431
FAX: (510) 643-5470

E-mail inquiries: danrcs@ucdavis.edu

An electronic version of this publication is available on the ANR Communication Services Web site at http://anrcatalog.ucdavis.edu.

Publication 8234

ISBN-13: 978-1-60107-454-6

This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by the ANR Associate Editor for Agronomy and Range Sciences.

pr-12/07-SB/RW