

A Comparison of the History and Management of Oak Woodlands in Britain and California¹

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Abstract

Hardwood forests are principal features of the landscape of both California and Britain and indigenous oak species are important components. In both locales these “oak woodlands” have historically provided a wide variety of commercial and non-commercial products and benefits and are deeply valued and appreciated by those who live in and around them. However, human-induced impacts have reduced the original forest cover in each area and there is concern that oak woodlands are still at risk, especially from impacts associated with increasing residential land-use conversion. While there are similarities in how these woodlands have been managed and used in both locations, there are also striking differences. In Britain the impacts to woodlands have occurred over millennia, rather than centuries, and the reduction in original forest cover has been much more extensive. As a result, the current management strategy includes an aggressive effort to increase woodland cover through government funded planting programs. In California, on the other hand, significant losses of oak woodlands have only occurred in the last two centuries and on a percentage basis, have been far less. Current management focuses on conserving existing oak woodlands through programs of research and education. Hopefully, in both California and Britain these efforts will be successful and help ensure that oak woodlands are sustained and even expanded, so that future generations will have the opportunity to use and appreciate them.

Introduction

Both Britain and California have large areas of hardwood forest dominated by native oaks. In California, these areas are often referred to as “oak woodlands.” However, this term is not commonly used to classify woodlands in Britain. For historical reasons, the main distinction in Britain is between “conifers,” “broadleaved,” and “mixed” woodlands. However, within the broadleaved woodland, oak is the most important species and was the principal species in 31 percent of the area of broadleaved forest at the last census in 1979 (*table 1*).

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Table 1—Species composition of broadleaved forests in Britain in 1979.¹

Principal species	Area (1,000 acres)	pct
<i>Quercus robur</i> and <i>Q. petraea</i>	425	31
<i>Fagus sylvatica</i>	183	13
<i>Acer pseudoplatanus</i>	122	9
<i>Fraxinus excelsior</i>	172	12
<i>Betula</i> spp.	168	12
<i>Populus</i> spp.	34	2
<i>Castanea sativa</i>	24	2
<i>Ulmus</i> spp.	23	2
Others	72	5
Mixed	161	12
Total broadleaves ¹	1,384	100

¹ Between 1979 and 1998 the total area of broadleaves has increased by 271,000 acres. Source: Locke (1982)

The two species of native oaks in Britain are English oak (*Quercus robur* L.) and sessile oak (*Q. petraea* Matt. Liebl.) (Morris and Perring 1974), both deciduous and members of the white oak sub-genera. English oak is generally associated with the warmer and drier south and east of Britain, and sessile oak, the wetter and cooler north and west of Britain. However, the long history of management, the fact that the species readily hybridise, and the large amount of seed imported from the rest of Europe have led to considerable mixing of the two species. In fact there is some discussion whether they are distinct species (Ferris and others 1998).

By comparison, California has 21 species of native oaks, ranging in size from massive valley oaks (*Quercus lobata*) with wide-spreading canopies, to shrublike huckleberry oaks (*Quercus vaccinifolia* Kellogg) that grow less than a few feet tall (Pavlik and others 1995). About half of the California species are deciduous and half are evergreen. The breakdown of hardwood forests in California by principal species and acreage is listed in table 2. Stand characteristics in woodlands can vary considerably depending upon climate, site conditions, species composition, and management history. Compared to more diverse higher elevation conifer forests, however, many of these woodlands are very open and only consist of two or three tree species. Tree growth is often slow, especially on drier sites with shallow soils, and there is concern that in many woodland stands, natural regeneration of several oak species may not be adequate to replace mortality.

Table 2—*Species composition of hardwood forests in California in 1985.*¹

Principal species	Area (1,000 acres)	pct
<i>Quercus douglasii</i>	1,691	23
<i>Quercus agrifolia</i>	1,176	16
<i>Quercus crysolepis</i>	1,102	15
<i>Quercus wislizeni</i>	735	10
<i>Quercus garryana</i>	588	8
<i>Arbutus menziesii</i>	588	8
<i>Quercus kelloggii</i>	441	6
<i>Quercus lobata</i>	221	3
<i>Quercus engelmannii</i>	39	Trace
Other non-oaks	808	11
Total hardwoods	7,351	100

¹From Bolsinger (1988)

The climate of Britain is generally oceanic, warmer than similar continental areas at the same latitude because of the effects of the Gulf Stream. However, there are large regional differences in climate between the southeast and northwest of the country, with southern England much warmer and drier than mountainous northern areas. In contrast to Britain, the main climatic differences in the oak woodlands of California are from east to west. Coastal areas are greatly influenced by the ocean and are cooler and moister than areas further inland. However, the climate for both coastal and inland oak woodlands is considered Mediterranean with the vast majority of rain falling in the fall and winter, and a lengthy dry period, often extending from May until September.

History of Woodland Management in Britain

It is estimated that 5,000 years ago forests in Britain covered as much as 95 percent of the land area. Most of these forests were comprised of mixtures of hardwoods, including the two native oak species. The Neolithic people that populated Britain between 5,000 BC and the arrival of the Romans certainly reduced forest cover, though it is difficult to accurately say how much. They probably used fire to herd game to areas where they could be killed, as well as to improve grazing for both wild and domestic animals. They also cleared large areas for agriculture. Therefore, when the Romans arrived in the first century AD, it is believed that forest cover had already been reduced by about a third from original levels. Increased population in the Roman Era, however, and the need for more food, building materials, and fuel contributed to further forest loss. These losses were exacerbated by intensive grazing that often inhibited the success of young tree seedlings.

After the Norman invasion in the 11th century, the first large scale inventory of forests in Britain was recorded in the Domesday Book, which indicated that forest

cover at that time had decreased to just 15 percent of the land area. After that, losses continued at a rapid rate, as demand for wood mounted and grazing intensified. Large quantities of wood were required for ship building, construction of buildings, fuel, and for other industrial uses, including evaporation of brine for salt, glass works, and the smelting of iron. The demand for large and small size timber gave rise to the practice of coppicing, which is the repeated cutting of the above-ground part of a tree on a 5- to 15-year cycle, depending on the size of timber required. Areas were managed as pure coppice or in combination with large trees as “coppice with standards.” In many areas oak was the most common species of large “standard” trees, but was also worked as coppice. The harvested wood was utilized for a variety of products including tools, implement handles, fencing and fuel. An important consideration for successful coppice management was to limit access by grazing animals, at least during the interval when the new coppice shoots were small and becoming established. Unfortunately, grazing was often not adequately controlled, resulting in poor coppice growth and inadequate natural regeneration to replenish stands, causing further woodland loss. By the beginning of the 20th century, forest cover had decreased to just 5 percent of the total land area.

During the 19th and early 20th centuries Britain relied heavily on imported timber, particularly from its Empire. However, the First World War made it clear how dependent the country was on imported timber and its vulnerability to naval blockades. Because imports were restricted, many existing woodlands were heavily exploited. This led to the formation of the Forestry Commission in 1919 which set the objective of establishing a strategic reserve of timber in the event of another major conflict. Unfortunately, the Second World War occurred before much of the new planting had started to produce timber, so again the existing woodlands were exploited and many were felled.

The management focus of the newly created woodlands, and forestry policy for much of the twentieth century, was plantation silviculture using mainly non-native conifer species. This set the agenda for British forestry for many years. However, in the 1980s, there was a major review of policy on broadleaved woodlands. This led to a string of measures to protect existing broadleaved woodland, particularly ancient semi-natural woodland, and incentives to create new broadleaved woodlands (Forestry Commission 1985).

Today the total forest cover in Britain is estimated to be a little over 10 percent, with approximately two thirds of this consisting of conifers. Conifer planting, however, has been greatly reduced in the last decade since it is now recognized that while these plantations efficiently grow wood products, they do not provide the same range of values inherent in native woodlands, including wildlife habitat, aesthetics, recreational opportunities, and vital ecological functions. Recognizing the importance of hardwood forests and their relative scarcity, the government initiated an aggressive policy to sustain existing woodlands and expand tree cover. By 1996 there were four acres of broadleaves planted for every one acre of conifers. The Forestry Commission owns 48 percent of all coniferous woodlands, but only 7 percent of broadleaved woodlands, so the Commission works with private landowners. As described below, the conservation and planting efforts in Britain are encouraged through a range of grant programs funded from both the public and private sector.

History of Woodland Management in California

In California, intensive use and management of forest resources began later than in Britain. While native peoples occupied the area now known as California for 10,000 years, they probably did not reduce forest cover to a great extent. The common perception is that Native Americans or Indians lived in harmony with nature, doing little to manipulate it. However, there is increasing evidence that they did actively manage woodlands—especially by the use of fire (Blackburn and Anderson 1993). The understory was regularly burned for a variety of reasons, including facilitating access, stimulating new plant growth, improving habitat for game, making it easier to collect acorns, and killing insects that damaged acorn crops. Areas were also cultivated to promote edible bulb production and the yield of materials from plants used in basket making was maintained by burning and pruning. But Native Americans did not convert forests to agriculture as Neolithic people did in Britain. However, burning woodlands probably resulted in the creation and maintenance of cohorts of large oak trees, since many smaller trees would have been killed by fires, and there likely would have been efforts to protect large trees since they are generally the best acorn producers. In the lower elevation valleys, repeated burning would also have promoted more open savannah-like stands with widely spaced valley oaks. This is certainly what the earliest explorers reported seeing in California in the early 19th century.

Starting in the Mission Period in the 18th century, grazing was introduced to the state. Livestock no doubt hampered natural regeneration of oaks through repeated browsing of young seedlings, but the demand for wood during this period remained relatively small, and impacts to existing stands of trees were not serious or extensive. However, both sheep and cattle helped spread the seeds of introduced Mediterranean annuals, which were brought to California for animal feed and forage, and these plants increasingly came to dominate the understory of oak woodlands. This conversion of range vegetation from predominantly native perennial bunch grasses to introduced annuals has been suggested as a possible cause of reduced oak regeneration in certain locales today (Welker and Menke 1987).

The greatest impacts to oak woodlands resulted from the large increase in population and widespread settlement of California during and after the Gold Rush in the mid-1800s. Large areas were cleared for agriculture, especially on the deep alluvial soils of the Central Valley of the state that had previously supported complex riparian communities, often dominated by massive valley oaks. Vast numbers of cattle were also brought into the state, including the English breeds, Hereford and Angus, that dominate range livestock herds today. Many trees were also felled to fuel railroads, steamships, and mines, as well as to supply domestic heating needs, and there was an increased incidence of wildfires. These impacts were often localized near settlements or adjacent to railroads or navigable rivers, and remoter areas were largely unaffected. Interestingly, unlike Britain, the use of oaks and other hardwoods for building materials was somewhat limited since abundant native conifers were generally preferred as a source of lumber. While all of these impacts seriously changed the landscape of the state, California was still a large area with relatively few people, so on a statewide percentage basis, the woodland forest cover lost during the 19th century was relatively small compared to what had occurred in Britain.

In the 20th century impacts to the woodland resources in California continued. Large water diversions on major rivers significantly altered hydrologic regimes, and the ensuing environmental changes adversely affected species such as valley oak that

were adapted to wet conditions and periodic flooding. Fire suppression activities also greatly reduced fire frequencies in many areas and caused a build-up of combustible fuels, increasing the threat of large-scale catastrophic fires. Removing trees on woodlands for “range improvement” was widespread—especially after the Second World War—and approximately a million acres of oak woodland were converted to treeless pastureland between 1945 and 1973 (Bolsinger 1988). Losses from residential and commercial development also increased as cities expanded and previously rural areas were developed. In the 1970s and 80s there were also increases in firewood harvesting—especially in the Northern Sacramento Valley—as more and more people turned to wood to heat their homes after fuel prices went up dramatically following the Arab oil embargo. By the mid-1980s an inventory of hardwood forest types throughout California comparing total acreage in 1945 to 1985 found that the total area had decreased during this interval by 4 percent to a little over 10 million acres (Bolsinger 1988), with 77 percent of this land in private ownership.

Today in California, many of the threats and impacts described above have been reduced. There is almost no clearing of trees to improve rangeland now, and firewood harvesting has stabilized or decreased. Even where large areas are harvested for firewood, there is a much greater tendency now to thin stands and leave a substantial canopy to provide shade for livestock, cover for wildlife, and a much more desirable visual landscape. However, the population of the state continues to grow and residential and commercial development is still taking a heavy toll on woodlands in some areas. Cities are continually expanding outwards and people are moving into previously rural areas, largely because they value so highly the amenity values that the woodlands in these areas provide. Also, as the wine industry has experienced a boom with increased prices for wine grapes, conversions of oak woodlands to vineyards have gone up in the last decade in portions of the state. Concern about this change in land use has not gone unnoticed and several highly visible conversions of woodlands to vineyards have galvanized public support for increased state and local regulation of oak harvesting. There is also concern today about poor natural regeneration of several oak species and whether oak woodlands can be managed sustainably.

Values of Woodlands in Britain Today

Throughout the last 5,000 years, woodlands in Britain have provided essential wood products used for energy, tools and building materials. These areas have also provided habitat for game, as well as locations where grazing by domestic livestock could take place. While the production of wood products from woodlands is still important today, other values of woodlands are now equally, if not more, important. Forests have always been sanctuaries where people could retreat for escape and solitude. As wooded areas have become scarcer in relation to numbers of people in the country, and the relative rarity of large blocks of undeveloped natural land has increased, the value of existing woodlands to provide recreational opportunities has increased. Such areas are especially critical near cities where opportunities to experience natural landscapes are so limited. In general, there is much greater access to forested areas in Britain than in California, since public walking paths in wooded areas have been used for centuries and recent laws promoted by “rambling” (hiking) organizations have resulted in greater access for the general public within many private landholdings.

Woodlands also provide critical wildlife habitat. Many animals are dependent on the food and shelter provided in woodlands, and significant increases or decreases in amount of this habitat type can drastically influence species presence and abundance. In contrast to agricultural fields, which are very limited in structural diversity, woodlands provide a much wider array of habitat elements that can support larger numbers of species. Increases in the numbers and types of wildlife also increase the opportunities for people to see these animals, which is a highly valued recreational experience.

Even when people are not actually utilizing woodlands for hiking, hunting, or wildlife viewing, the presence of these areas can improve the quality of life for nearby residents by providing a desirable visual landscape. Trees enhance the beauty of the countryside and can screen housing developments or industrial complexes. Trees can also reduce noise levels and help filter out pollution.

Finally, while the value of the actual wood products that are extracted from woodlands is often relatively small compared to the other values these areas provide, ensuring a continual supply of wood products through planting programs also provides employment and helps sustain rural economies.

Values of Woodlands in California

The cultural values of oak woodlands in California are similar to those in Britain, and the areas where oaks grow are tremendously valued from an aesthetic standpoint. To many residents and non-residents alike, golden brown hills dotted with gnarled oak trees epitomize what California looks like, and native oaks symbolize important values—strength, beauty, adaptability and longevity. Today woodlands provide sites where people can go and escape the crowded cities if they have public access. Such experiences are rated highly since they provide opportunities to get away, experience nature, and find peace and solitude. Recreational activities vary greatly but include hiking, picnicking, camping, wildlife viewing, mountain biking, hunting and fishing. In addition, many Californians appreciate woodlands simply by driving through them on public roads.

As in Britain, oak woodlands are known to provide critical habitat to a rich and diverse assortment of wildlife. More than half of the 600-plus species of terrestrial vertebrates in California utilize oak woodlands at some time during the year, and the food and shelter provided are essential to their survival. This is a higher number of species than in any of the other habitat type in the state.

Finally, the management of oak woodlands is critical in protecting watersheds and ensuring the quality of water resources. The majority of the state's water is stored as snow pack in high elevation mountains and then flows through oak woodlands on its way to the streams and rivers which support fisheries, farms, and cities. Preventing erosion and sedimentation, providing micro-climate buffering, and furnishing necessary nutrients for in-stream fauna are all critical attributes of robust oak woodlands.

Woodland Conservation in Britain Today

As stated above, woodland loss has been extensive in England. Yet the values hardwood forests provide are increasingly recognized and appreciated. Consequently

there has been widespread support for efforts to “bring back” broadleaved forests through government supported planting programs, and property owners can receive generous grants by undertaking these efforts. The two main aims of the Government’s current forestry policy are (a) sustainable management of existing woodlands, and (b) expansion of tree cover to increase the many diverse benefits that woodlands provide (Anonymous 1991). The Forestry Commission implements this policy with a mixture of legal powers (from the Forestry Act 1967) and financial incentives. The most important legal power is that tree felling is regulated and a licence is required if an owner wishes to fell more than 175 cubic feet of wood in any calendar quarter. Nearly all licenses granted are conditional on the area being replanted, making it very difficult to convert forests to other land uses.

Generous financial incentives are also available to encourage policy objectives increasingly being targeted at public benefits. For example, in certain areas it is possible to get a grant of £1175 (\$1,700) per acre for tree planting, plus additional annual payments. For example, planting grants for broadleaved forests are \$800 per acre. As a rule, 940 trees per acre must be planted and the trees cannot be harvested for at least 30 years. In addition, there can be a supplement of \$350 per acre if the planting site is on good quality land. Finally, an additional \$550 per acre is paid to the landowner if they are willing to provide access to the public. In addition, annual payments of up to \$175 per year for 15 years are available if land is taken out of agriculture. Money can also be paid to:

- Safeguard or enhance the existing special environment value of a woodland;
- Improve woodlands which are below current environmental standards;
- Work to help encourage informal public recreation in existing woodland;
- Encourage natural regeneration through fencing, etc.

In addition to increasing amenity values, these programs are also designed to bring woodlands which are undermanaged or of low commercial value back into production, creating jobs and revitalizing rural areas where industries have moved out or agriculture has become depressed. The sale of wood products from these newly created forests can be an important benefit to rural areas that have come on hard economic times.

Property owners can also receive funding from a wide range of complementary sources including central and local governments, the European lottery, Millennium funds, and the landfill tax. Private philanthropists have also joined in supporting tree planting, including millionaire Felix Dennis, who was recently reported to be spending \$290 million of his own money to plant broadleaves on 30,000 acres (Ahuja 2001). Because of the generous financial incentives to plant hardwoods and restore woodlands, restoration of broadleaved woodlands has been very successful. Between 1994 and 1998 the Forestry Commission Woodland Grant Scheme approved broadleaved planting of approximately 70,000 acres per year. The long-term goal of these programs is to double the forest cover (to 20 percent) in the next half century.

Woodland Conservation in California

Prior to 1980, oak trees in California were often considered weeds by commodity-oriented landowners and public agencies charged with improving production, and there was little concern about conserving woodland habitats. However, in the 1980s, widespread firewood harvesting and an increased public and professional concern about large-scale wildlife habitats led the California State Board of Forestry to re-examine its policies for oak woodlands. There was fear that harvesting in sensitive watersheds might cause erosion problems, and that biomass-fueled power plants might rely on material from hardwood rangelands, resulting in extensive areas of clearing. There was also concern that removal of black oak in high elevation conifer forests would adversely affect migrating deer herds (Pillsbury 1983).

The Board of Forestry appointed two task forces to examine the issues related to the management of oak woodlands and to make recommendations about how to resolve them. There was not unanimous agreement about how to proceed. On the one hand there were those who called for state regulation on hardwood rangelands so that any harvesting would fall under the jurisdiction of the State Forest Practices Act. To accomplish this, hardwoods would have to be declared commercial species. Proponents felt that only by imposing rules regulating tree removal could potential abuses be avoided. On the other side were many private owners of oak woodlands, including livestock ranchers, who were not eager to have another level of bureaucracy and red-tape imposed on them. They pointed out that state regulation certainly hadn't eliminated all management problems in conifer forests, and that most ranchers had a strong land ethic and were good stewards of their property. They wanted a voluntary approach. In 1986, the Board of Forestry decided that it needed more information about the biology and management of oak woodlands and agreed to support the formation of the Integrated Hardwood Range Management Program (IHRMP) to address oak conservation issues in the state (Passof 1987). This Program was 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 encourage long-term conservation through both research and education efforts. The research would focus on understanding the critical biological and management factors potentially threatening the long-term sustainability of oak woodlands. The educational aspect was designed to quickly disseminate any research findings to owners and managers of woodland properties so that they would have the most current, scientifically-based information at their disposal to guide management. The state also encouraged the counties to take actions necessary to ensure that oak woodland resources were not threatened and were managed sustainably. The Board felt that a non-centralized approach would be more effective since many of the threats to oaks were local in nature and local jurisdictions were better positioned to address specific needs. Local approaches have included ordinances, stipulations in general plans, and voluntary guidelines endorsed by county boards of supervisors.

In addition to these efforts, non-profit conservation organizations including the California Oak Foundation and the California Native Plant Society have also become actively involved in promoting woodland conservation through outreach and education, as well as political lobbying.

Conclusions

The approaches for managing oak woodlands in Britain and California today are very different. In Britain, there are strict rules about harvesting existing hardwood stands and well-funded programs to promote the planting of oaks and other broadleaved species. There are also programs to offset costs for converting existing conifer forests to more natural woodlands. These planting programs aim to re-establish native forests in areas where they historically flourished but have been converted to other uses. Though costly, these programs are widely supported by the public who view woodlands as part of their natural heritage and rate highly the amenity values they provide. These programs are also ambitious in that they are designed to double the acreage of forests in Britain over the next half century.

In California, by contrast, oak woodland management today is primarily concerned with minimizing losses to existing woodlands and there are no statewide regulations regarding harvesting or tree removal. There are also few financial incentives to expand hardwood forests through planting, although planting is often required as mitigation for development and some conservation organizations such as The Nature Conservancy have large oak planting projects. Local governments are responsible for implementing rules or programs addressing oak woodland conservation, and these approaches vary widely, depending on local threats to the resource (i.e. firewood harvesting, agricultural conversions, development pressures) and the local political climate. There is an extensive program of research and education, with mechanisms for addressing emerging threats and issues and formulating management recommendations to promote oak woodland conservation. There are also non-profit organizations that advocate tree protection and lobby against activities that they view as threatening the resource.

The differences in the oak woodland management approaches currently in place in Britain and California are strongly influenced by history. In Britain oak woodland losses have been so great that only small remnant stands remain and there is a concerted effort to return the landscape to what it looked like in an earlier era. In California, on the other hand, we still have vast acreages of intact, but altered, woodlands, and there is less of a sense of urgency in protecting what is left.

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