

Chapter 15

Whither Working Oak Woodlands?

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Frontispiece Chapter 15. Commodity production and wildlife conservation can be compatible outputs of dehesas and oak woodland ranches as shown by foraging fighting bulls and white storks (*Ciconia ciconia*) sharing a dehesa pasture in the Montes de Toledo region, central Spain. (Photograph by M. Díaz)

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Abstract Comparative research into the human-maintained economic and ecological systems referred to as working landscapes is a rarity in the literature. Nonetheless, developing such comparisons is the end goal of this book. Altogether, 44 field scientists are contributing authors, with some appearing in multiple contributions, but others spelling out the specific knowledge crucial to just one part of a single chapter. In this final commentary, the book's editors lay out the conclusions attained in this extended inquiry, suggest research needs and lessons learned, and raise the issue of policies that are needed, some urgently, to support oak woodland working landscapes. We recognize a number of takeaway lessons from this long-term project, including advances in economic analysis that make it possible to assess the total economic value of a landscape. We have come to, as we journeyed through the production of this volume, an overall conclusion that seems to us important: Just because two places appear similar hardly means that they are alike; oftentimes the variations are far more than skin deep. But with that as an initial concession, it pays to acknowledge how much can be learned from comparative research that matches physical, cultural, historical, economic, and geographical features, and then carefully places likenesses and departures side-by-side, in a deliberate attempt to learn across oceans, landscapes, economies, and societies.

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Keywords Comparative summary • Complex economic and ecological systems • Long-term conservation • Multiple benefits • Cultural geography

15.1 Challenges in Conservation and Management

The dehesas of Spain and the oak woodland ranches of California are ecologically and economically significant environments. Slow growing and long-lived, oak trees record an enduring history of use and human interaction. These landscapes support economies that feed people, livestock, and wildlife through an ecologically diverse agriculture, and are home to prodigious biological productivity and a world-valued habitat shaped by long-time management. We have poked and prodded many aspects of these working ecosystems in this book, but there remains much to do to understand their multiple benefits, how they work, and how they are likely to change. Just what will happen to these landscapes in the future remains a question.

In significant measure this book is about what the oak woodlands of California and Spain are now, and how they have come to be the way they are. But as an analytical and deliberative study, this is intended to serve as a source of questions, with one first among equals: If these oak woodlands are so valuable, how then do we make sure they will endure as productive environments into another epoch of human history? In a world of 7 billion people the answer will require careful policy and rational planning. In this concluding chapter, we suggest tools that are needed to ensure that biodiverse, working oak woodlands survive. Information is a key factor, and we contribute to that in this book. But a farther-reaching goal is to foster oak woodland environments that will continue to be productive places in the future and sustainably support economies that can satisfy local, regional, national, and hemispheric needs into a distant and unpredictable future.

15.2 The Bio-Political Setting

The settings for conservation in California and Spain show some commonalities but with important differences. Commercial operating income in both locales is low, and returns from non-market ecosystem services are comparatively high. These non-market values are minimally prioritized in the policymaking arena, making oaks vulnerable to loss. The processes of oak regeneration and recruitment, and how best to ensure them, are subjects of scientific and popular debate. What is not in doubt is that costs to maintain oaks over the long run tend to outstrip the capacity of landowners to fund them.

15.2.1 California

For 100 years in the United States, the principal strategy for land conservation involved the government setting aside land in public ownership, along with incentives, property tax policy, zoning, and environmental regulations. But in the familiar story of the occupation of the North American continent, arriving European settlers took up the most productive and best-watered areas, which often went on to become cropland. Oak woodlands in California were acquired early on because they constituted an environment that settlers of Mediterranean origin knew how to use for grazing livestock and forage production.

A modern-day consequence of that history is that game and wildlife—including endangered species—often depend on resources and on land that is privately owned. These selfsame private landowners are, as a rule, profoundly skeptical about government involvement in land-use questions, and express particular concern about what they see as over-regulation (Sulak et al. 2004). Ranchers recognize ecological and oak recruitment issues as likely to affect the sustainability of ranching, yet they also see land use planning as a threat to their independence (Liffmann et al. 2000). Somewhat paradoxically, most are nonetheless willing to take advantage of government incentive programs and compensation for drought, floods, or other disasters (Chap. 12). This sets up a complicated relationship between all levels of government (and increasingly non-governmental organizations, or NGOs) that may want to encourage landowners to undertake certain conservation and management practices, and landowners who are chary of management requirements being imposed on them and are reluctant to work with what they regard as an intrusive regulatory bureaucracy.

California, with its Integrated Hardwood Range Management Program (IHRMP), made an investment in research, outreach, and public education for oak woodland landowners starting in 1985 (Chap. 2), conveying what was learned about landowner response to policymakers. Landowners now mostly recognize the value of moderate oak tree cover not only for forage productivity and livestock shelter, but also for protecting watershed values, wildlife habitat, ecosystem services, and for adding market value to land (Standiford and Bartolome 1997; Huntsinger et al. 2010). Studies show that most ranchers no longer thin oak woodlands unless canopy cover exceeds 50 % (Huntsinger et al. 1997). This is an important development because oak woodlands cleared during the post-1945 era regenerated poorly or not at all (Brooks and Merenlender 2001). An increasing number of landowners plant oaks, but the extent and success of these afforestation plantings remains unknown (Huntsinger et al. 2010). The residential real-estate market crash of 2008 and the subsequent financial crisis and economic recession have reduced short-term development pressures throughout most of California. Yet in the future oak woodland ranches—particularly those near large urban centers—will regain their attraction to developers and urban out-migrants. California's land use controls and planning are notoriously weak and subject to the influence of development pressure (Saving and Greenwood 2002). Further, planners may treat

oak woodlands as a place to channel development, because ranching produces lower dollar returns per unit area than crop production or forestry.

Ranchers bank on a rising value of land for development as a major capital asset. Historically, the only way to realize this increase in value was to sell all or part of a property. Many property owners have assumed that when they sell their land, income from the appreciation will make up for poor year-to-year returns of livestock production (Hargreave 1993; Brownsey et al. 2012; Chap. 13). If zoning designations are altered, those urban-derived changes can eradicate this asset without compensation, which consequently encourages rural ranchers to liquidate, selling off land before such re-zoning happens. Traditionally, cash-short ranchers have sold small parcels of their land to gain capital when needed. Surveys show that as much as 1 % of ranch land is sold each year for this reason (Huntsinger et al. 1997; Liffman et al. 2000). The subdivision of ranches brings growth in local population, habitat fragmentation, land use conflicts, and higher taxes—all of which encourage further subdivision, even for ranchers who might have preferred not to break up their holdings. The area of oak woodlands is on the decline, with California losing nearly one-third of its oak woodlands from 1930 to 2002 [Fig. 1 in Sulak et al. (2004)]. Studies by Workman (1986) and recent literature (Chap. 13) show that commercial operating profits from ranching are declining and do not seem to be a promising factor to encourage ranch ownership among the commercially-minded in the future.

For all the development pressure, the California woodland is ecologically a relatively stable landscape. Most woodlands will remain open and suitable for livestock production or wildlife habitat with irregular, limited regeneration and little shrub invasion over a long period without human intervention. Eighty-five percent of woodland understory persists as grassland in the absence of management (Allen-Díaz et al. 1999). In addition, the regeneration and recruitment of oaks is highly variable, seemingly dependent on a host of factors including wildlife and insect populations, grazing, soils, precipitation, aspect, and so forth, with variable outcomes including increases in oak woodlands in some areas (Russell and McBride 2003; Tyler et al. 2006).

15.2.2 Spain

The Spanish *dehesa* constitutes a less stable oak woodland, subject to rapid change without human intervention (Chap. 14). Property development and urbanization is held in check by relatively strong land use controls. But for traditional agricultural operations to persist in these woodlands, owners must make a consistent investment in maintaining the *dehesa* yield of grass for fodder and of other products (Chaps. 3, 5, 6) (Fig. 15.1). Absent that, the volatile woodlands become nearly impenetrable brush within a couple of decades and lose many of the characteristics so valued for habitat, amenities, wildlife, and livestock production. Woodland



Fig. 15.1 A fixture in the dehesa, the pig is a feature of ancient interest in Spain, sufficiently so that granite monuments are erected to *Sus scrofa* in Spanish dehesa communities such as La Alberca, at the southern edge of Salamanca province near the Sierra de Francia. Among the perceived charms of the Iberian pig, historically, is the longevity of cured pork products, a dehesa fixture that traditionally has fed rural (and urban) Spaniards through long winter and spring seasons, before other meat sources are available. (Photograph by P.F. Starrs)

instability makes management of competing vegetation and attention to reforestation more important.

The pressures in Spain tend to be implacable, and in some ways the reverse of those faced by landowners in California. Since the early 1900s, rural depopulation has been the norm in Spain, especially after 1950 as young people left to find work opportunities in cities (Hoggart 1997; Sánchez-Alonso 2000). The economic historian Ricardo Robledo succinctly notes that parts of Salamanca province, with ample areas in oak woodland, are a demographic Siberia, with scarcely a handful of residents per hundred hectares [quoted in Elola 2008]. The results of this are complicated and sometimes untested, as when remaining landowners welcome understory shrubs that are then managed as habitat for game species and a hoped-for but not always realized income from fee-hunting.

In places the results are costly, with fire incidence rising on dehesas, particularly when they include sizable remnant plantings of conifers, as rural populations shrink across the southern half of Spain (Campos 2012b; Pausas and Fernández-Muñoz 2012). Absent the once-resident landowners, ongoing care and cultivation of the dehesa slows or ceases. Concern is so high about Spanish rural depopulation that far-reaching proposals are at times developed and advanced, including in perhaps the most radical form an initiative for “Rewilding Europe” that suggests using municipal lands in western Spain and Portugal as the basis for one of ten

European zones set aside for “wildlife and wilderness” (RE 2012). Yet the model is strikingly reminiscent of the so-called Buffalo Commons proposed in the 1980s for the northwestern Great Plains of the United States, where a similar depopulation has occurred (Popper and Popper 1999; Manning 2011; GPRC 2012). Rewilding Europe promoters claim that “The regional government is already giving shape to a new economy that relies on culture, nature and landscape. And since West Iberia has plenty of wilderness to offer, it is attracting more and more nature tourists each year” (RE 2012). This would be a solution that many would not support, but even its voicing out loud—on a sophisticated website targeting the European Union—suggests a significant difference between the dilemmas facing Spain’s *dehesas* and the oak woodland ranches of California.

While abandonment of cultivation and use is a threat to long-sustained *dehesa* working landscapes, within managed woodlands the oaks are not recruiting at a rate sufficient to replace senescent or dying trees. The long-term maintenance of the *dehesa* requires attention to oak regeneration, which in the best solution available so far in Spain involves an abandonment of livestock grazing for up to 20 years (BOJA 2009; Campos and Mariscal 2003) to allow shrub encroachment and oak regeneration (Chaps. 5, 6; Ramírez and Díaz 2008; Plieninger et al. 2010). There are advantages, of course, to good oak recruitment: the resulting mosaic of open productive and encroached areas within *dehesas* maximizes levels of biodiversity and species richness at the individual property and landscape scales (Chap. 8; Martín-Queller et al. 2011). Long-term forestry-style rotations with everything from seedlings to mature trees in evidence over large areas are as essential to traditional *dehesa* management as is the typical savanna-like landscape with scattered trees, shrub patches, and other landscape elements, a fact fully recognized only quite recently (Chaps. 5, 6, 8; Manning et al. 2009).

15.3 Policy and Research Considerations

Reviewing the comparisons in this book, some particularly important factors that must be considered in the development of policy and research agendas for oak woodland conservation merit highlighting.

15.3.1 *Size Matters*

Partly as a result of historical processes, and partly due to the nature of the *dehesa* and oak woodland ranch enterprise, oak woodland properties tend to be sizable private ownerships. Such properties are at times criticized because they put large areas of land in the custody of relatively few owner-users (Artola et al. 1978; Simpson 1995; Starrs 1998). The term *latifundia* comes from early Roman history (2nd century BC), and in Spain and California alike, large landholdings were

distributed as grants to nobility, church, military orders, and soldiers—in California, without regard for Native American traditional territories or land rights. The legacy effects of those sizable (sometimes vast) land bequests has diminished somewhat as later generations of offspring divide holdings through inheritance and pieces are sold off to provide operating capital, but what remain are still large properties: bigger than homesites, and more extensive than all but the very largest farms or commercial forest plantations ([Chap. 1](#)).

There are distinct advantages to the retention of extensive oak woodland properties in private hands. Unfragmented properties that extend over hundreds and sometimes thousands of hectares yield significant ecosystem services and benefits to society that fragmented or small parcels of land are unable to offer, a benefit well-understood by conservation biologists who see greater value for wildlife and watershed in contiguous areas of habitat ([Huntsinger 2009](#)). In *dehesas* and ranchlands, large properties ensure landscape-scale management practices aimed at maintaining the mixtures of habitats and elements responsible for high biodiversity ([Chap. 8](#)).

But what, it has to be asked, do such landholdings offer the citizenry in terms of environmental quality, ecological function, and quality of life? And, assuming that the public chooses to continue and even increase investment in these woodlands, how can the public be assured of continual benefits from them? The pattern of ownership has been a success in producing large quantities of items that the public values—with oak woodlands home to some of the highest biodiversity of any broad landscape type. In this is an answer to a question often voiced when economic policymakers look at the continued existence of large properties that appear, in terms of economic reasoning, to be underutilized and not producing commercial operating profits at an expected rate. Large properties can and do produce benefits, sometimes for an individual or family, often for society in the form of ecosystem services, and such benefits have until recently been hidden from calculations of economic productivity. For oak woodlands in California and Spain, those economic realities are laid out throughout this book.

15.3.2 People Matter

Brian Fagan, reviewing in 2001 a remarkable study of Mediterranean Europe, argues that “The greatest changes have come since World War II; most rural populations throughout the Mediterranean region have abandoned traditional subsistence economies based on fields and flocks.... Only continued occupation by people gaining their livelihoods locally can maintain the man-made diversity typical of Mediterranean Europe” ([2002](#)). Little wonder that Spanish and California landowners express a prevailing worry, when surveyed regarding attitudes and management practices, about watershed health, wildlife populations, endangered species, urban encroachment, failures in the regeneration of oak woodlands, and even hiccups in their quality of life. These are precisely the concerns that

policy makers are given to voicing, except they are newcomers to such worries, unlike the landowners and resource stewards who have attempted to manage large properties to the best of their ability for decades if not generations (Standiford and Bartolome 1997).

Dehesas and oak woodland ranches are not landscapes that can thrive forever on their own; they are products of a low-intensity historical management which offers specific products that have changed over time. In dollars and euros earned, the commercial operating income (*renta de explotación comercial* in Spanish) of the lands we have examined is relatively low. Nonetheless, landowners persist in retaining their lands, and, in both Spain and California, often work off-property and sometimes at a considerable distance in part to support their dehesa or ranch (Chaps. 1, 2, 10, 12, 13). They glean a sense of well-being, of social and ecological capital production, from their land, and live on it or visit it as they can, investing in land management and what they envision as a legacy of stewardship. Landowners are willing to give up cash income and alternative investments in order to benefit from non-market ecosystem services, many of which are shared with the public. The costs of conservation of lands to the public are effectively leveraged.

15.3.3 Diversity and Ecosystem Services Matter

The most important ongoing attribute of oak woodland ranches is, without a doubt, what twenty-first century policymakers describe as ecosystem services production (Chap. 12). Oak woodland ranchlands of California have an economy of limited commercial products. The cash-product or commercial economy of the dehesa in Spain traditionally counted on remarkably varied outputs—to a degree that offers some unusual economic stability and an enduring defense against risk, based on a high ecological diversity (Chap. 8) that has largely been lost in the recent economic trend toward specialization. But arguably equal to those products in either site are environmental goods and benefits, captured generally by the term ecosystem services, which are a boon to local, regional, and global populations (Chaps. 12, 13). As the ecological economist Robert Costanza writes, “The ecosystems-services concept makes it abundantly clear that the choice of “the environment versus the economy” is a false choice. If nature contributes significantly to human well-being, then it is a major contributor to the real economy... and the choice becomes how to manage all our assets, including our natural and human-made capital, more effectively and sustainably” (2006) (Fig. 15.2).

The oak woodlands of Spain offer expansive habitat for wildlife, and harbor raptors and predators that utilize the dehesa understory along with hundreds of species of animals, plants, and other organisms that depend on oaks, grasslands, and the intimate mixtures of trees and grass that characterize dehesas. Wildlife populations inhabiting dehesas and California oak woodland ranches are particularly valued by biodiversity researchers who reckon Spanish-Portuguese and



Fig. 15.2 Concern about agricultural land loss, including ranch land being converted to small parcel ranchettes, runs strong in California. The conservation easement is one approach that precludes development “in perpetuity” by allowing landowners to sell development rights (Chaps. 12, 13). (Photograph by P.F. Starrs)

Californian oak woodlands among the crucial ecological habitats for species in North America and Europe.

15.3.4 Market and Non-market Opportunities Matter

One way to encourage oak woodland conservation in Spain and California is to develop markets for products that can be produced without reducing the flow of multiple ecosystem benefits from the woodlands. Another is to offer payments for environmental services to influence landowner decisions and management, or to compensate landowners for the current and past provision of societal benefits derived from these woodlands. But ecosystem services and non-market products are decidedly not all about money; they are also about improvements to society, daily life, and the human prospect with gifts from nature the most important contribution to life on Earth.

15.3.4.1 Hunting

Hunting, and especially of big game species, is seen by landowners in the dehesa as a potentially important source of income—a hope sometimes correct, sometimes wrong. Hunting revenue can actually be two-fold, as direct income and averted cost. Fees are paid by hunt organizers in Spain, who in effect rent a property for the one- or two-day duration of a hunt (some landowners do the organizing themselves, but most not), and on a second front, landowners can save on management costs, since the ongoing expenses of clearing brush and planting cereal crops in the understory are reduced—at times to nothing. Hunting income can mitigate a declining cash flow in the dehesa economy for landowners who need cash to cover family livelihood needs. In California, hunting income can enhance profits on properties long managed for livestock. Because fee-hunting occurs on private land, the return on investment for prime big game habitat where hunters are quite likely to meet with success—and perhaps obtain a trophy-quality animal—is difficult to calculate, in either California or the Spanish dehesa.

Nonetheless, selling the opportunity to hunt (and in Spain, selling the meat obtained in a successful *montería*) can increase landowner income in marginal dehesa areas, which can boost property value. And there are strong suggestions from developing research that a mosaic of invading brush or shrubs can function as a nursery for oak regeneration, protecting seedlings from grazing and rooting by livestock or wildlife (Chaps. 5, 8). Hiring a guard or caretaker to prevent poaching and limit access can be an added expense, however, a fact that may encourage intensive land uses to favor game (feeding grain, in Spain) with negative side effects on other wildlife (Díaz et al. 2009). Published data on Spanish and California hunting in oak woodland ranches and dehesas is limited, lacking official price reporting statistics. It is notable that, other things being equal, prime big game habitat has higher land values than properties with lesser quality game habitat (Chaps. 11, 13) (Fig. 15.3).

Hunting, especially of deer and wild boar in Spain and California, attracts a devoted following (Chap. 11). Some of that is recent history: Spain saw an enormous upswing in foreign hunter interest from 1970 to the early 1990s as borders opened and EU residents grew more financially able to pay. Those numbers dropped after the Berlin Wall was brought down, Germany reunited, and Eastern Europe was opened to hunting. But hunting on a dehesa with first-class accommodations and catered dining brings a high premium from an international elite. California has an active guest-ranch and guided hunting industry on oak woodland ranches. It bears mention, however, that hunting is an activity enjoyed by an ever-diminishing share of the Spanish and California population, and particularly in California, a rising anti-hunting attitude poses a potential barrier to landowners profiting from effective game management.



Fig. 15.3 California has lower profit streams for wildlife and game than properties in Spain. Nonetheless, duck clubs in the Sacramento Valley where oaks once prevailed, and hunting clubs along the Coast Ranges (here near San Luis Obispo) and in the western Sierra Nevada foothills offer income to landowners willing to welcome hunters as guests. (Photograph by P.F. Starrs)

15.3.4.2 Diversification

Shared or societal products in California and Spain can run a gamut from the specific, even the unique, to the general. A particular product might include a historically important site that can be visited, a petroglyph of fame, harvestable medicinal or aromatic plants, a hot springs frequented by visitors, leased space for a cell-phone tower, or opportunities for property owners to hunt with friends and invited guests. The more general products are equally varied, such as genetic resources valued by the pharmaceutical industry, animals kept as pets, areas that can be trekked on foot or traversed on horseback, viewsheds and vistas of note, or distinctive wildlife associated with habitat that can be seen in recreational hikes. These are goods of recognizable economic value that are difficult to price, although ongoing research efforts are attempting to track even the marginal products of oak woodlands (Fig. 15.4).

Historically, landowners have often made properties accessible to neighbors or to visitors for gathering various products or hunting. In California, custom and trespass law, make it necessary to ask permission of the landowner to come on to a property, seems something apparently not known by many urban visitors today, and access is further constrained by landowner concerns about the costs of liability should a user come to harm. In Spain, the right to use the property of others may be an element of national or customary law. Traditionally, there were implicit



Fig. 15.4 Oaks, truffles, mushrooms, and fungi—all collectible, and on occasion with high commercial value—are sometimes sold, sometimes collected and consumed by landowners, and sometimes freely-picked by recreationists. Either way, in California and Spain they represent an important ancillary product of an oak woodland environment not always easily inserted into the roster of commodities produced. Those evident here are on display and identified on a table in the Plaza Mayor of Salamanca, where mycology is much appreciated. (Photograph by P.F. Starrs)

agreements that meshed a landowner's use with deference to the needs of community residents. Hunting small game was widely allowed, as was gathering plant material for broom-making along *cañadas* (stock driveways) that crossed a *dehesa*; rockroses were uprooted and converted into essential oils for perfume-making; fodder and harvested products included honey, mushrooms, truffles, and other fungi. But now, landowners can legally bar all access to a property, especially when land is registered as a protected reserve, and there is a possibility of charging for such access. Mushroom collection, for example, is a prized social, edible, and cultural undertaking, and anecdotal evidence suggests that some landowners can earn significant income by selling access to only a few collectors. Landowners do not typically enforce the law if they see recreationists and mushroom gatherers on their properties, since these rarely impact owner privacy. In California, allowing ranch access for birdwatching is new to some ranches, and wildlife or landscape photography classes, or painting and art courses, are sometimes offered in cooperation with landowners—and on occasion taught by them (Fig. 15.5).

The commercialization of oak woodland recreational services, meals, and accommodation is in its infancy in California, with formal *turismo rural* and agro-tourism programs considerably more advanced in rural Spain—many government supported. Guest stays offer an opportunity to increase income and encourage the maintenance of the oak woodland and *dehesa* landscape. If a site degrades through time—loses oaks, becomes overgrown by shrubs, has less wildlife, or is crowded



Fig. 15.5 While it may seem a stretch to attribute religious values to ecosystem services, in this church in Sonoma County, California, the “Church of the Oaks” is arranged around a phalanx of stout oaks that add character and identity to the site. (Photograph by P.F. Starrs)

by new homes—then the value of a property for recreation declines. In Spain, the diversified and somewhat unique nature of *dehesa* production contributes to opportunities in product labeling, as opposed to California production which has been single-product and homogenous for some time. Guijuelo, in Salamanca (Elola 2008) and Jabugo, in Huelva, are experiencing relatively rapid population growth that is linked to the region’s notable denomination of origin hams from Iberian pigs. By contrast, California ranchers believe they have fewer opportunities to significantly increase income with diversified production (Sulak and Huntsinger 2001), especially where land use change is rapid.

15.3.4.3 Carbon Sequestration

New developments for markets for credits from carbon sequestration (Chap. 12) may also offer income opportunities. However, oaks grow very slowly and have low rates of carbon capture as compared to other forest species. On the other hand, the shrubs that readily invade *dehesas* in Spain (and much less vigorously in California oak woodlands) do also accumulate carbon. The net balance is difficult to estimate, but a stand of oaks offers a long-term carbon sink that will exist for 250 years, if managed in a silvicultural rotation (Chap. 9), and provides benefits so long as the trees are standing. Newly planted native oaks can be significant accumulators, since they grow relatively quickly at a young age. “Avoided deforestation” programs, if applied to oak woodlands and agroforestry systems, may hold considerable benefit for oak woodland ranches and *dehesa*, given the

difficulty of demonstrating consistent “additionality” on arid rangelands, the multiple benefits of management for diverse goods and services, and the desirability of a cleared understory for long periods of time along with matured oaks. Exact estimates of carbon sequestration markets for carbon storage and markets for avoided deforestation are works in progress.

15.3.4.4 Mitigation

United States and California laws protecting endangered species and their habitats have created considerable demand for sites for mitigation. To develop a property with a resident endangered species, or to address significant water quality and yield issues, mitigation of environmental impacts may be required. The developer must purchase and set aside for perpetuity habitat that substitutes for the loss on a developed site. Sometimes the habitat to be set aside is required to be much larger than the habitat lost. These strict environmental policies have created a market for mitigation properties and easements. A mitigation easement means that the habitat is on private ground, sometimes part of a working ranch, but in exchange for payment from the developer, the landowner agrees to protect the property, and all future landowners are compelled to protect the habitat as a condition of the property title. Speculation in what are termed “conservation banks” occurs in areas where development is presumed to be on the horizon: private investors buy lands that they believe will provide needed mitigation opportunities, and hence income, to the owners.

15.3.5 Partnerships Matter

Some costs, like expenses involved in regenerating an oak stand, or resisting an outrageously high offer from a real-estate developer, are so high that a partnership with the public may be required to maintain a healthy and intact woodland. Otherwise, too often the sale, subdivision, neglect, or abandonment of land is a result.

Regulation will always be part of the conservation scene, but incentive-based methods may be much more palatable to land managers. Some of the efforts to reduce development of working woodlands in California have largely been led by the private sector through the efforts of non-governmental entities such as The Nature Conservancy, The California Rangeland Trust, and local land trusts as they broker conservation easements on private lands. Although far from perfect as a conservation strategy, conservation easements allow ranchers to preserve a way of life they are overwhelmingly fond of, while continuing to manage their land (Chap. 12; Merenlender et al. 2004). At the same time they represent a vernacular response to what are perceived as ineffectual government land-use controls.

Government and non-governmental organizations can encourage landowners to follow specific practices that are deemed environmentally helpful. These programs take many forms: conservation easements, direct payments for ecological services, assistance with product marketing, or shared-governance agreements that tailor land-use decisions to something more sought-after by a property owner. Each is a form of income, either one-time or ongoing, that makes conservation practices and management that supports ecological products a more desirable path for landowners to follow (Spash and Hanley 1995; Nunes and Nijkamp 2010). With the significant advantage accrued in spreading costs across a society, governments are finding ways of doing this in Europe and Spain, in the U.S. and California. The ongoing global economic crisis that began in 2008 makes this less easy now than during more economically flush times, even as understanding of such principles grows more sophisticated (EEA 2010, 2011; Haines-Young and Potschin 2010).

The actions of oak woodland landowners and managers can increase, or decrease, net water yield. Dehesa and ranch runoff stored in reservoirs may also have an income value (Berbel and Mesa 2007; Berbel et al. 2011). How and whether improved water flow across oak woodlands is a service to be paid by government and/or downstream users is a topic addressed in part in Chap. 12. There are differences between California and Spain, since large percentages of upland areas in California are publically owned. Much of the California water supply comes from mountain snowpack melts and travels down streams and rivers that frequently flow across private land—and landowners often have irrigation or diversion rights to some of those flows. The public-private relationship is a complicated one, and much negotiated, since without rights to water diversion there is no irrigation, and that impedes irrigated crop agriculture. An increasing demand for stored water may result in opportunities to market water to downstream.

15.4 Research Approaches and Needs

A variety research topics and approaches are needed to learn more about the oak woodlands that constitute significant parts of ranches and dehesas, and to make the case for conservation.

15.4.1 *Field-Based Interviews*

In an age of office cubicles, powerful laptop computers, online bibliographic databases of unlimited range, agglomerated datasets, and research institutions that make it difficult for staff to conduct field research, the value of going to the source is at times forgotten. The research included in this volume is based in overwhelming measure on field-obtained information gathered from locally



Fig. 15.6 Landowners in California and Spain (as here) are a tremendous knowledge pool for researchers interested in understanding the stewardship of oak woodland properties. (Photograph by P.F. Starrs)

knowledgeable people who are willing to contribute to our larger knowledge as investigators and field scientists. That makes studies such as this one unusual, and also complicated, since working in Spanish and American English at once is something all of us authors can do, though with varying levels of comfort and skill. Having the ability to work across the boundaries of language and literature was crucial to our efforts (Fig. 15.6).

Field-based research makes four things possible, with each of them absolutely essential to the formulation of sound studies. First, there is no substitute for being there. As the American anthropologist Clifford Geertz noted in a 1988 essay of that title, “being there” is not only important in establishing the credibility of a researcher with peers, it is often the only way to ground truth hypotheses, surmises, and to refine tentative conclusions. Second, places matter, and while some research sites can be treated normatively—as part of a larger whole—sometimes-subtle distinctions can have deep significance, and discussions on-site make those differences evident. They cannot be captured by satellite imagery or aerial photography (although each of those has good uses), and have to be unearthed by researchers able to figure out the right questions, gauging the reactions of those being interviewed, and iteratively recognizing where a following question should go. To acquire such skills requires experience, a degree of patience, and access. Third, variations from place to place are at times subtle, at other times massive, and finding those lines of division and commonality is necessary to understanding the data. Institutional fault lines—regional or county borders, divergent political regimes, census tract edges, boundaries of public-private land—grow more obvious in the field, and explain much. Finally, field-based interviews are as

important for the interviewee as for the interviewer. Information flows in interviews go both ways, and in many respects, the researcher-interviewer is a mendicant, coming with notebook (or digital camera or scanner or digital sound recorder) to gain knowledge from local sources. The local residents are teaching us, and that two way flow of information restores urban–rural connections that are too often lost in the scholarly world where the researcher’s self-image may be as “the expert” and the local landowner or caretaker or policymaker is regarded only as a “source.” Routinely, in their particular world, they are the experts, and the researcher the student.

15.4.2 Attitudinal Surveys: Owners, Managers, Policymakers

Formal surveys employing rigorous methodologies with data analyzed by tested protocols are a remarkable font of information. While methodologies followed in the studies cited in these chapters vary somewhat, the results are carefully balanced to make sure they are representative and accurate within acceptable standards of probability. Questionnaire surveys must be prepared carefully, pretested to make sure that the questions are understandable and answerable, and when that is the case, quite significant conclusions can be reached. Much of the data on owner, manager, and public attitudes toward oak woodlands in California has evolved through studies that began more than 25 years ago (Huntsinger and Fortmann 1990; Huntsinger et al. 1997, 2004, 2010; Liffman et al. 2000; Oviedo et al. 2012), with the studies re-tasked and recalibrated as attitudes change and new areas of interest emerge. Significantly, this research can be considered representative of actual active beliefs, and many of the data on owner attitudes toward economic choices develops from similar methodologies, sometimes pursued in mail or on-line survey, at other times by one-on-one interviews (Fig. 15.7).

Too often, policy decisions are made without a clear understanding of what landowners, managers, and local populations actively care about and want to see happen. When scientific survey data is used to determine landowner resources and needs, management recommendations can be developed that are in concert with the capacities and expectations of communities and landowners. Sometimes the discoveries made in such inquiries are startling, and lead to significant shifts in policymaker decisions, to better accord with what is considered acceptable.

15.4.3 Economic Survey Research

The “million dollar view” attributed to a given ranch or dehesa may not in truth be worth that exact dollar figure, but it certainly has value. Economic surveys, done in the field with an intensive inquiry not only into landowner and community-asserted beliefs, but by examining ledger books and enterprise accounts, can go



Fig. 15.7 Whenever possible, it is important to get information right from the source. Survey-based research can explore local attitudes and beliefs, and inform policymakers, education experts, and technical advisory services what is needed on the ground. Needless to say, a survey needs willing respondents. These Iberian pigs are too busy eating acorns. (Photograph by P.F. Starrs)

beyond assertion to capture economic fact. These are not always what, for example, a municipality that owns a *dehesa* would like to believe is true. An acute scrutiny of financial accounts can reveal other truths that landowners may or may not themselves realize to be the case. Many landowners in California, for example, will admit to keeping an oak woodland ranch intact because she or he likes living there, enjoys solitude and stewardship of an evolving landscape, and wants to see a ranch kept intact; that this comes at substantial cost is clear from a detailed examination of household or enterprise accounts. Such a conclusion should hardly be startling; in the early 1970s, two New Mexico researchers coined the term “ranch fundamentalism” to describe the affinity of ranchers in that state for their extensive properties, and their willingness to work off-ranch to support them (Smith and Martin 1972). Economic techniques have evolved in substantial ways, and the economic surveys shared in this work by Spanish and California researchers (Chaps. 11, 12, 13) demonstrate how case studies can provide the scope, dimensions, and dollar-euro value of landowner, manager, and policymaker choices (Figs. 15.8 and 15.9).

The techniques of economic valuation are gaining sophistication in the scholarly literature and in publically-supported undertakings such as the Andalusian



Fig. 15.8 Near Santa Olalla del Cala (Huelva), the Fundación Monte Mediterráneo has created a shrine of sorts to the holm oak, complete with a text-etched granite monument. The management clearly favors oaks. If evidence of ecosystem value attributed by landowners—in this case, the Dehesa San Francisco supported by German-based EU members—were ever wanted, this tree qualifies. (Photograph by P.F. Starrs)



Fig. 15.9 Presenting a nearly reverential attitude toward a wooded oak landscape is by no means a solely Spanish practice. Oaks in California are often highly respected elements of the countryside, and meet with a respectful treatment. (Photograph by L. Huntsinger)

RECAMAN¹ project. These results are incorporated into the calculation of market and non-market ecosystem service value. Only now is work being completed in a significant area of the dehesa that makes it possible to assess total economic value. Those considerations, this book suggests, should address oak woodland and dehesa fires, oak conservation (recruitment and regeneration), the preservation of threatened biodiversity, hunting policy and economics, the effects of abandonment of extensive multi-species livestock grazing in the dehesa, and official statistics that incorporate ecosystem services as direct dehesa products. Governments will need to extend official accounting systems to include oaks, but metrics already exist that would allow estimating the values of tree growth, costs of dehesa oak disappearance, the production and provision of firewood and cork, and the value of products including cork, grass (forage), acorn, sequestered carbon, water, and other ecosystem services. These would yield the total capital value of the dehesas of Spain in a system easily extended to other areas and even other countries. The language of the estimates involves terminology such as hedonic pricing, contingent valuation, stated choice, and production functions that may prove difficult for the faint of heart, but the end result is a viable and accurate total value, as demonstrated in [Chaps. 12 and 13](#).

Just how important the existence value of oak woodland dehesa and ranchland is can be ascertained by careful economic survey research. This offers another means of determining the value of ecosystem services, along with willingness to pay, which establishes a market price that visitors would pay to see a specific site or to preserve specific ecosystem services. The name economists and policymakers attach to programs that seek to preserve an environment so future generations may make use of it is “option value” and the later has been recognized as “a significant part of the real income of many individuals” (Krutilla 1967, 779). Oak woodlands are rich in preserved options ([Fig. 15.10](#)).

15.4.4 Archival Investigation

The interplay between a human-created ecosystem like the oak woodland and the dehesa can be analyzed in part through painstaking study of ecological data and time series analysis. But the human element in historical landscape creation and change is often best captured through archival research. Routinely that incorporates printed books and maps, newspapers, and manuscript sources, but also folkloric materials: narratives, spoken accounts, literary fiction, poetry, nonfiction, even songs, and through artwork, which at the least can include landscape paintings and portraits, mosaics ([Chap. 2](#)), block-prints, and sketches. And a

¹ The RECAMAN project (*Valoración de la Renta y el Capital de los Montes de Andalucía*) of the Junta de Andalucía, initiated in 2008, is ongoing and applies the Agroforestry Accounting System at the regional scale to measure total income and capital from the montes of Andalucía in Spain.



Fig. 15.10 Livestock feeders, painstakingly hewn from stone, speak to long labors on behalf of livestock generations past, in the Valle de los Pedroches (Sierra north of Córdoba). These are, themselves, significant historical archives, especially when accompanied by knowledgeable “captions” of explanation that are provided by local caretakers and residents. (Photograph by S. García)

cautionary note sounds here: reaching back through time to understand human influence and shaping of past environments is no easy matter, but has to be done. Assertions and speculations are one thing, but data and evidence-based conclusions require painstaking work, sometimes in the archives, sometimes in cooperation with earth scientists, linguists, and anthropologists, sometimes with cultural-historical geographers, botanists, zoogeographers, or plant geneticists.

In California, the earliest sources are necessarily archaeological; the material-culture records of Native American use go back millennia, and only in the last 30 years has a serious scientific understanding of pre-European land management been developed. In Spain, some remarkable use is being made of convent, monastery, and other ecclesiastical records, and of the commercial records of guilds and associations such as the Honorable Council of the Mesta (founded in 1273 by the King Alfonso Tenth the Wise), the Merino sheep-growers association that survived well into the nineteenth century ([Chap. 2](#)).

These information sources are an essential element of ecological and economic history. Mastery of the subtleties of written sources requires skills that extend to ancient scripts and paleography, a broad understanding of past social relations, and the ability to visualize geographical relationships as evolved through time and space. Without drawing comprehensively on such skills, a study such as this risks

offering only a snapshot, a quick view of a moment; we have attempted to go well beyond that.

Ecological sources, including analysis of pollen records, dendro-chronological dating, and well-aged human records, suggest that human tinkering with what would become the dehesa began four- to six-thousand years ago. Gaining an understanding of what was done, what the original vegetation might have been, and how changes were wrought is nothing simple, but definitely worth continued study. Paleoecological studies in California have advanced well in recent decades; comparable research in Spain is proceeding more slowly, though with developing enthusiasm.

15.4.5 Ecological Data Acquisition

Comparative research is particularly difficult, and in some ways this book-length study is an ultimate example of cross-cultural and comparative ecological study. While field research is sometimes encouraged for social scientists (economists, geographers), and humanists (historians, artists, literary scholars), time in the field is not only expected of most ecologists, biologists, soil scientists, and climatologists, it is unavoidable. And, to be fair, the gathering of field data is what many environmental scientists—including veterinarians, animal behaviorists, and wild-life biologists—relish most in their professional work (Fig. 15.11).

There is already data available that captures key ecological traits of working oak landscapes. That data includes records of outstanding biological diversity at most, if not all, spatial and temporal scales; documentation of poor and variable tree recruitment; cataloguing of long to very long life cycles; and the key role of drought. From these data, several hypotheses about the biological causes of these traits have been put forward, as developed in [Chaps. 3, 4, 5, 6, 7, 8](#). Some management proposals are derived from these hypotheses, such as landscape-scale rather than field-scale management approaches and temporal rotations.

However, it is clear that much more data is needed to fully test the hypotheses proposed and to refine management prescriptions. Needs for more data are linked mostly to two main sources of ecological variation: spatial, rooted in the huge areas over which working oak woodlands are established, and temporal, grounded in the high variability of Mediterranean climates and the long life cycles of oaks. For this reason, the set-up and the maintenance of networks of ecological long-term monitoring for dehesas and California oak woodland ranches is essential. A start on monitoring acorn crops is the project of a handful of Spanish and California researchers, as described in [Chap. 7](#), but such monitoring programs should be expanded to include the key ecological interactions influencing tree recruitment (Díaz et al. 2011).



Fig. 15.11 A profoundly human-inflected landscape is evident in this view of the Montes de Toledo, an area as well known for its small- and big-game habitat as for its expanses of oaks and underlying shrubs. A diversity of ecological niches is in evidence, ranging from a narrow gallery forest notching into the hillside, to an extensive area of shrubs on some intriguing soil substrates. Evident are two areas of cleared understory where cereal crops were recently harvested. Many a *dehesa* is a landscape mix of natural and owner-initiated processes, and this site reflects the cycle of clearing and regrowth. (Photograph by M. Díaz)

15.4.6 Local Knowledge

A perhaps predictable divide exists between traditional beliefs and management practices and those that are developed following standard scientific methodologies—and there is debate about which is more reliable (Fuentes Sánchez 1994; Montoya Oliver 1996; all chapters, this book). Evaluating the quality and potential of local and “expert” knowledge usually involves a carefully set up study, or several. Both types of knowledge may turn out to be misguided, too generally prescribed, or simply incorrect. Someone who is brought in for consultation may know everything about one kind of tree, or be the reigning intelligence about a specific silvicultural product; he may be great on theory yet hopeless on practice; or she can be highly skilled in management of cattle or Iberian pigs or soil health or mushrooms and fungi (Fig. 15.12).

As research discussed in this book establishes, sometimes it is scientists, consultants, or resource managers who draw incorrect conclusions and embed them in



Fig. 15.12 Local breeds of cattle (handsome horned retintas, in this case) approach warily, with a Sierra Norte de Sevilla dehesa woodland in the background. This site is managed in part for cattle, in part for Iberian pigs, and to a significant degree for fee-hunting. Managing such a mix of uses demands considerable time-tested local knowledge and the ability of a manager to assess resource utilization and management needs quickly and accurately. (Photograph by A. Caparrós)

the literature—and in practice. Sorting fact from fiction or surmise entails collaboration, transparency, and communication within the community of those involved with oak woodland and dehesa. But landscape-level management demands a broader understanding of synergies between different types of resources, detailed comprehension of soils and parent materials, climate and weather, annual variation, and long-term land use. It also requires the ability to adapt to change and to draw on multiple sources of information. If recommendations are not always successful it is important to try, to experiment, and to see what works. To make that happen effectively, cooperation (and confidence) among landowners, local inhabitants and workers, managers, and scientific experts is essential. From that—and only that—can emerge a plausible economy and land use practice (Fig. 15.13).

15.5 Conserving Working Landscapes: Fostering Policy Development

15.5.1 *Spain*

A rise in official EU and Spanish government interest in the dehesa as a productive landscape began 30 or more years ago, and recognition of the value of the



Fig. 15.13 The cork oak (*Quercus suber*) is, along with the Iberian pig and possibly hunting, the most reliable commercial income source in the dehesa, which makes it a linchpin in the working landscapes where such trees are found. In general, Portugal offers better cork oak habitat than south-west Spain, although there are exceptions to this generalization. (Photograph by P.F. Starrs)

characteristic multiple use management of Spanish oak woodlands was initially satisfied with an emphasis on the traditional production of grass and understory forage, acorns, cork, firewood, and grains (Parsons 1962a, b; Martín Bolaños 1943). Dehesa owners concurred, though recently and with a slightly different emphasis. Oaks today offer an aesthetic accent to the land, but the market for natural resources in the last 50 years has trended toward valuing acorns and grass more than wood products such as firewood or charcoal (Bermejo 1994). The production of grain and cereal crops, which in the mid-twentieth-century helped maintain a shrub-free substrate under and beyond the oak canopy, is today proving worth ever less on the market, especially with concern within the EU's Common Agricultural Policy (CAP) about surplus production of agricultural crops including staple grains. On the other hand, fees gained from selling the rights to hunt a property are a change (Chap. 11) that in the most favorable circumstances can offer sizable added income to landowners.

Edicts, directives, and legislation issuing from the Common Agricultural Policy (CAP) tend to favor high added-value products with strong constituencies and established local markets—cheeses, meats, wines—that thanks to denomination of origin labeling carry the flavor of home and find a ready-made local and sometimes international demand. This fits well with the dehesa. Other changes are somewhat more startling and unexpected. Legal changes in the 1970s (the *Ley de Caza*, or Hunting Law, of 1970) made it easier for landowners to profit from the sales of hunting and game rearing. Re-colonization of the oak understory by shrubs provides game habitat that favors deer and wild boars that can yield a significant income while minimizing cultivation expenses. This has produced significant changes in dehesa

management, especially in game-rich areas, where understory cultivation can be relaxed to allow a mosaic of shrubs, and maintenance costs for clearing the understory are reduced. Biodiversity can be a beneficiary if encroached areas are interspersed with open areas and are also re-opened afterwards in accordance with the traditional rotation of trees and shrubs necessary for the long-term functioning of dehesa farming (Chap. 8). In the absence of managed rotations, local or regional reductions in biodiversity will follow due to crop set-asides, grazing depletion, tree population decline, or landscape homogenization (Díaz 2009; Díaz et al. 2009). As Guy Beaufoy noted in 1995, “by far the largest concentration and the greatest diversity of low-intensity farming systems are to be found in Spain” and he concludes, “Low-intensity livestock raising also has a significant social role, in helping to maintain rural communities in remote areas” (Beaufoy 1995).

California oak woodland and Spanish dehesa managers recognize a government responsibility in conservation of natural resources, but do not want this to impinge on them—in interviews most say they are doing a good job taking care of their property. California ranchers typically comment that they are good stewards of their land, they understand how the land works better than others, and that an increasingly urban American population does not understand them or the ecosystem. Although they recognize a “problem” with oaks, they do not necessarily see the problem on their own property. In California and in Spain owners report that government agencies do a poor job of understanding or working with them. California ranchers often believe government is more responsive to urban needs than to smaller, rural constituencies (Huntsinger et al. 2004) (Fig. 15.14).

In Spain, only an active encouragement of oak regeneration, and rotation through shrub incursions (Chap. 6), will sustain wooded dehesa (Pulido et al. 2010; Senado 2010; Campos 2012a). In California, numerous species depend on grazing and the water developments that accompany ranching (Chaps. 8 and 12). Active support for regeneration may be needed in some areas. Work on the economics of conventional silviculture in oak woodlands shows that private landowners are unlikely to invest sizable funds in oak recruitment and regeneration on their own in Spain or California because of high costs and very slow financial returns. But future generations will benefit from investment in oak woodlands now, whether such investment fosters further research, encourages ecosystem services, subsidizes woodland regeneration by direct public investment, or rewards landowners for not subdividing their properties and keeping them instead in extensive tracts of oak ranchlands.

There are glimmers of government and policymaker awareness that a regeneration problem exists in the Spanish dehesa, as in the 2010 “Report on the Protection of the Dehesa Ecosystem” issued by the Spanish Senate, which concluded that the crisis of natural regeneration in the dehesa is a pressing environmental problem. A variety of corrective measures have been attempted, generally supported by the EU or by autonomous regional governments (Ovando et al. 2007). But widespread recognition of the problem of a lack of new trees has not motivated the Spanish government to cope with or even address the economic effects of diminishing stands of aging oaks. In Spain, the national government



Fig. 15.14 Tree mortality, either through the natural death of old trees or increased mortality driven by recent disease spread or climate changes, should be compensated for by the recruitment of young trees to ensure the long-term persistence of dehesas. The picture shows just the opposite, a decline in tree numbers, as is happening in the National Park of Cabañeros and in most Spanish dehesas. (Photograph by M. Díaz)

from the 1950s through the 1960s imposed an afforestation regime on some landowners that required planting of non-native conifers and eucalypts on land that previously held dehesa and oaks. That established a plantation system of pines such as Aleppo (*Pinus halepensis*), maritime (*P. pinaster*), Monterrey (*P. radiata*), Scotch (*P. sylvestris*), European black (*P. nigra*), and eucalyptus (500,000 ha; mainly *Eucalyptus globulus*), to satisfy government interest in afforestation following the German model. Only in the last 20 years, with direct investment from the European Union (EU) rather than support from Spanish oak woodland policy, has a return to native species brought subsidies back to encourage landowners to remove exotic trees and reintroduce (or reemphasize) holm and cork oaks in the dehesa (Beaufoy et al. 1994; Ovando et al. 2007).

Desire is widespread to preserve dehesa landscapes, but a continuing controversy about costs and benefits and the most socially just ways to work with land-owners, along with particularly tight current budgets, hampers willingness to intervene and preserve. To say that further study is needed is almost a tired cliché. But an important fact about dehesas and ranchlands, as this book should by now have made clear, is that expert knowledge exists and can be put into play by policymakers who inform themselves about the needs of the oak woodland enterprises that constitute such a large portion of the land in Spain and California (Fig. 15.15).



Fig. 15.15 So integrated into village and rural community life is the wild boar that, in some sites such as this town in the Sierra Norte de Sevilla, statues are erected to the boar honoring its place as a feature in the local economy and culture. Survey-based research can further explore local attitudes and beliefs, but a statue is a statue, and this one its own way speaks volumes. (Photograph by P.F. Starrs)

One of the most promising new EU programs is a social contract between dehesa landowners and the public administration that is termed a *land contract*. This contract is in fact a government purchase of dehesa ecosystem services for the public, including both ecological and cultural services. This new policy is based on a compromise between policy demands that follow on political, ecological, and economic goals: to avoid incentives for surplus production, which are forbidden by the World Trade Organization (WTO); to maintain dehesa land operations to help address unemployment in marginal rural areas; and to preserve endangered wildlife and plants and culturally significant animal breeds. The EU is now in a deep budget crisis, yet European citizens show a continuing willingness to pay for protection of natural resources while asking for increased government regulations to improve nature conservation (European Commission 2010a, b). However, in spite of this global economic context, dehesa conservation will continue to be based on promoting livestock rearing (Iberian pigs excluded, as they are economically profitable and easily adapted, thanks to their short production cycle), since today's main policy trend is to support low-intensity agriculture, habitat improvement for wild species, encourage ecosystem services, and discourage production of products that already

are in surfeit in the official view of the European Union's CAP. However, a broader conception is needed to preserve dehesa in the long term, as current policy does not directly address protecting the biodiversity that lies in the core of the current and future benefits from dehesa management.

15.5.2 California

Ranching in California is very much derived in inspiration and technique from the experience of Spanish-Mexican colonists and Native American labor that came to be involved in raising cattle, sheep, goats, and horses starting in the late eighteenth century (Chaps. 2, 10). The livestock economy has proved relatively reliable for ranchers. Those who wish to stay have practiced ingenuity and adaptability in finding means to remain on the land. In terms of products, forage production has always been a dominant focus in California, accompanied by some thinning of oaks designed to stimulate forage growth. Fuelwood and hunting are two other sources of income that have a role in some places and in some circumstances. Concern about the recruitment of new oaks is the subject of years of California-based study, science, and experimentation. Nearly 30 years ago, range scientists and economists understood that an active program, deriving from academic researchers and extension foresters, should undertake research to address regeneration and conservation issues in oak woodlands (Chaps. 5, 6, 7). Conservation easements and government expenditures on cost sharing, advisory, and technical assistance programs aid in these efforts, sometimes forming complex public-private-NGO collaborations. The rapid very recent rise in the prices of supplemental feedstuffs will impact oak woodland ranchers in ways that may be difficult to predict.

The control of oaks in California was consciously relinquished to landowners by the State Board of Forestry, which otherwise controls forest harvest (Chap. 2; Giusti et al. 2004). The University of California's Integrated Hardwood Range Management Program and its legacy of research and extension programs made oak woodland policy, management, economics, and product expansion a significant object of study over more than 25 years, and work continues through University of California auspices and initiatives, with direct outreach to landowners. California in 2004 passed the Oak Woodlands Conservation and Environmental Quality bill, which requires mitigation if a project threatens to have a significant effect on oak woodlands (Giusti et al. 2004).

California has examples of significant ecological and agricultural preservation programs that have simply been ended because of costs, requiring lower-level governments (counties, regions, cities) or non-governmental organizations to take on the debt of farm- and ranch-preservation efforts. The now-orphaned California Land Conservation Act or Williamson Act is one such case, and the long-term effects of its dissolution are likely to be disruptive and encouraging of land development that is not in the interest of oak woodland preservation (Wetzel et al. 2012) (Chap. 12).

15.6 Conclusions

An important policy goal is intergenerational equity: How are we to protect the interests of future generations? All the benefits discussed and analyzed in this book speak to the desirability of preserving oak woodland benefits and services for future generations. “Sustainability” is easy to define—it is the sustained flow of goods and services into the future—but how to measure and accomplish sustainability is not so easy, especially when society and ecosystems are undergoing such accelerated change.

An even larger and more challenging issue involves changes in climate and the collective effect of climate change on sought-after landscapes, species richness, and biodiversity. In that vein, a group of Australian researchers, looking at the superior resistance of scattered trees to the effects of climate change, concluded that “ensuring appropriate levels of tree regeneration, and preventing premature mortality of mature trees, is critical for maintaining scattered trees in landscapes.... The encouragement of scattered trees would require the protection and restoration of traditional cultural landscapes, or the establishment of new ones” (Manning et al. 2009). Avoiding irreversible losses in natural and human capital is included as a goal in wealth calculations by the United Nations (UNU-IHDP and UNEP 2012). Oak woodland dehesas and ranchlands certainly can be considered and fitted within this global conservation framework.

The central question of the new paradigm for conserving nature to enhance human well-being—now and in the future—is just how much judicious and forward-looking management is likely to cost. An intolerance for public spending, particularly in the United States, and a shortage of funds in California and Spain, do limit current options. On the other hand, the societal costs of failing to take action immediately could be far higher than investing right now in dehesa and ranch sustainability. But the public has demonstrated a persistent inability to weigh long-term costs against the advantages of spending money right now, which is the time when problems can be dealt with most effectively. Is it possible to find “win-win” solutions that minimize costs? Can we view public expenditures in this realm as a bridge to a future when such systems can stand on their own with their plethora of public benefits? Or is investing in oak woodlands just a first step down a path of continual public dependency? These questions need answering. In terms of market-based solutions, a dedication to buying wines where a real cork is used, or purchasing certified sustainable woodland products, can contribute in ways that span international borders if consumers are attentive.

There is, in this study, a significant conclusion: Just because two places appear similar hardly means that they are alike; oftentimes the variations are far more than skin deep (Aschmann 1973). But with that as an initial concession, it pays to acknowledge how much can be learned from comparative research that matches physical, cultural, historical, economic, and geographical features, and then carefully places likenesses and departures side-by-side, in a deliberate attempt to learn across oceans, landscapes, economies, and societies.

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