

When Oak Ordinances Fail: Unaddressed Issues of Oak Conservation¹

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Abstract

The mandate by the California Board of Forestry in 1993 required each of the 41 counties which have significant oak woodlands to develop programs for the ultimate protection of this resource. As of 2001, a few counties have planned for the sustainability of their oak woodlands, but some counties may not be addressing the key components that will determine the overall future status of oak woodlands across counties and regions. Most counties and cities use the individual tree as the fundamental unit of conservation and neglect entirely the need for policies on oak woodland conservation and regeneration. They instead should regard the oak woodland as the functional unit and insist on large-scale regeneration. This paper presents some psychological reasons why the ingredients of some written plans are so inadequate that the plans have a high likelihood of failure. People tend to focus on their immediate environment while ignoring important background information and they base their planning judgments on small data sets, erroneously believing them to be representative of the larger environment. This often leads to poor policy decisions. Suggestions for reframing and broadening components of oak conservation are presented.

Introduction

Tree protection has been an important aspect for American communities for well over a century. As early as 1909, the city of Visalia undertook to preserve oak woodlands through public purchase, and by 1971, had enacted an ordinance prohibiting valley oak (*Quercus lobata*) removals without a permit (Strong and George 1990). During the 1980s the State Board of Forestry considered whether or not the State should mandate oak conservation and decided against it. In 1986 the University of California Integrated Hardwood Range Management Program (IHRMP) was created to provide research and education for the management of oak woodlands. Over the past 20 years, a lot of work has been done on technical and public policy aspects of oak woodlands (Bernhardt and Swiecki 2001, Plumb and Pillsbury 1987, Standiford 1991). In 1993 the State Board of Forestry directed the more than 40 counties which have oak woodlands to develop oak conservation plans. The suggested methods fell into three categories: ordinance, general plan process, or voluntary guidelines. Prior to the Board of Forestry directive, Bernhardt and Swiecki (1991) had compiled information on how to write ordinances for preserving trees. They recognized one of the problems was the public's tendency to save "specimen" or "heritage" trees and allow cutting of younger ones. Rossi (1990) pointed out that

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ordinances sometimes resulted in loss of trees because landowners were cutting trees just under the protected diameter size. Writing and adopting plans has proven to be a great challenge.

Scientists have long known that regeneration is one of the most important factors in the health of the forests. Nearly a century ago Sudworth (1908) and Jepson (1910) noted several oak species were not reproducing well. Griffin (1971, 1973) wrote that both blue oak (*Quercus douglasii*) and valley oak replacement rates were low, as did Callaway and D'Antonio (1991) for coast live oak (*Q. agrifolia*). While adequate oak regeneration occurs in some areas, it is generally less so in the coastal ranges and foothill areas for most species (Steinhart 1978, White 1966). In southern California seedling death due to desiccation is common (Lathrop and Osborne 1990, Pancheco 1987). Muick and Bartolome (1987) surveyed the state and found that while blue oak seedlings were present, recruitment to adulthood was sporadic. Swiecki and others (1993) found wide geographic variability of blue oak sapling recruitment and stressed that many environmental variables are responsible for recruitment outcomes. According to Bolsinger (1988), the Oregon white oak (*Q. garryana*) reproduces only moderately well and in most of its range is only lightly stocked. He mentioned also that blue oak, valley oak, Engelmann oak (*Q. engelmannii*) and coast live oak were not regenerating well. It is necessary to point out that some oak species (especially those in the subgenus *Erythrobalanus*) are regenerating well over most of their ranges. Also, it appears that some species may naturally have infrequent pulses during which all the necessary environmental conditions are met to ensure seedling and sapling survival over time so as to become mature trees. Nonetheless, the trend for oak woodlands is decreasing acreage and lowered density, and impaired regeneration is an important factor.

Causes for poor regeneration have been investigated by many authors (Adams and others 1987; Borchert and others 1989; Gordon and others 1989; Griffin 1971, 1976; McCreary 1989, 1990; Standiford and others 1991; Welker and Menke 1990). Botkin and others (1991) discussed transitional and long term impacts on forests due to global warming. Brown and Davis (1991) discussed the loss of valley oaks in Santa Barbara County due to natural causes over a 60-year period, stressing the fact that there was no replacement into the canopy. They concluded by saying, "...it appears that an active program of sapling propagation is necessary to maintain or increase the size of the valley oak populations in the region."

In the last decade there has been an extraordinary political effort to conserve oaks. Some counties acted quickly in response to the Board directive, and Standiford and Bartolome (1997) commented favorably on Tehama County. By now, most counties have at least written a needs assessment, and many, such as Santa Barbara, El Dorado and Sonoma Counties, are with assistance from the IHRMP well underway with extensive and careful conservation planning. However, in most counties tangible results by and large have not been achieved.

One can enumerate the reasons for the oak woodland losses: residential development, agriculture, woodcutting, wildfire, rangeland improvement and most recently sudden oak death. In this paper, we would like to reframe the issue of oak ordinances and regulations and their lack of success in several ways which will be unfamiliar to many. One of us is a psychologist and naturalist, and we address the issues as friendly critics seeking explanations as to why the process for effective oak woodland protection is taking so long. Our thesis is that planners and citizen groups tend to focus on the wrong things when it comes to oak woodland conservation.

Conversions from Oak Woodlands

The most crucial issues as far as policies are concerned are how counties regulate the conversion of oak woodlands to other uses, and how counties mitigate when losses of oak woodlands occur (*table 1*). These conversions include six categories, and each will be discussed in the context of existing regulations.

Table 1—*Selected counties: highlights of mitigation policies.*¹

Alameda-1994 general plan	General policy of requiring tree replacement
Calaveras-1996 guidelines	suggests tree replacement when removed for construction
Contra Costa-1994 ordinance	pay fees for tree removal; replace when protected tree damaged
Fresno-1997 draft guidelines	suggests tree replacement when removed for construction
Glenn-1994 guidelines	suggests landowner plan should address seedling regeneration
Lake-1995 guidelines	site specific through vineyard regulations, grading ordinance
Los Angeles-1993 ordinance	may require tree relocation or replacement with 2 for 1 with 2 years care; if not feasible pay fees into oak forest fund
Madera (Eastern)-1999 guidelines	suggests to reforest through natural or artificial regeneration
Marin-1999 ordinance	regeneration and replanting encouraged, can be required to replace trees; if not feasible pay fees into tree replacement fund
Mariposa-1995 guidelines	suggests to reforest through natural or artificial regeneration
Monterey-1997 ordinance	may require relocation or replacement at 1:1 ratio; or other requirements as needed to mitigate environmental impacts
Napa-1999 ordinance	required to replace tree on ridge line or hilltop if visible from public roadway
Nevada-2000 ordinance	removal requires inch for inch replacement with long-term maintenance; if not feasible pay fees into tree preservation fund
Placer-1996 ordinance	may require replacement in kind inch for inch, propagation, revegetation; if not feasible pay fees into tree preservation fund
Riverside-1997 ordinance	mitigation required only in case of unlawful removal; same species replanted in same spot within 6 months
San Luis Obispo-coastal zone 1995 ordinance	requires replacement when removed for development or safety
Santa Barbara-2001 proposed ordinance	requires replacement and maintenance; if not feasible pay fees into oak tree conservation fund; management plans may also be required
Santa Clara-1997 ordinance	mitigation required only in case of unlawful removal; may require replacement at 10:1 ratio
Shasta-1995 guidelines	suggests protecting seedlings on rangeland and replacing trees when removed for construction
Sonoma-1989 and 1997 ordinances	for valley oak, must plant seedlings, retain other valley oak, or pay in lieu fees; for other protected oaks, may require replacement or fees as determined by value charts
Tehama-1994 guidelines	suggests replacing trees when removed for construction
Tuolumne-1995 guidelines	suggests replacing trees when removed for construction
Yuba-1996 general plan	general policy to avoid oak tree removal and to encourage protection and regeneration; removal of valley oaks should include replacement program with maintenance and monitoring

¹Counties without mitigation policies: Amador, Butte, Colusa, Kern, Mendocino, Merced, Stanislaus, Tulare.

Specimen Tree Trap

Counties and cities typically spend large amounts of money and time to save the heritage or landmark trees and at the same time ignore the losses in the forest. We call this the “specimen tree trap.” Consider a typical ordinance, say from Santa Clara County. Trees are protected if they have a diameter of at least 12 inches at 4.5 feet above the ground, but only in certain areas of the county. In the agricultural areas, limited firewood cutting is allowed, and the larger the parcel the more cutting that can be done, so that up to 10 percent of the trees of 12 inches or greater diameter may be cut in any one year (Santa Clara County 1995, 1997). Mitigation to control erosion is required in the context of harvesting but not to mitigate the loss of oak woodland habitat. Legally, one could on larger parcels remove all protected trees in just over a decade. There is no provision for replanting trees after harvest. Nonetheless, one best not remove a specimen tree. If a heritage tree in Santa Clara County is cut, the potential fine is \$200,000. In Contra Costa County, removal is limited if the diameter is 6.5 inches or greater (Contra Costa County 1994). However, the idea of saving oak woodlands is barely mentioned and not enforced. There is nothing in either of these ordinances or in the one from Marin County or in many others, about saving woodlands, but there is a great deal about saving the large and mature trees. Since some counties primarily use diameter for determining which trees to protect, as a result saplings are not protected (*table 2*). In contrast to other counties, Marin County at least recognizes and states that it will not address the issue of lack of regeneration (Marin County 1996, 1999).

Table 2—Selected counties: tree removal size which may require a permit.^{1,2}

Alameda-1997 general plan	20 in circumference native, 30 in circumference introduced
Contra Costa-1994 ordinance	6.5 in dbh (or groves of 4 or more trees)
Los Angeles-1993 ordinance	8 in dbh
Marin-1999 ordinance	6 in dbh (this dbh specific to oaks)
Monterey-1997 ordinance	6 in diameter 2 ft agl
Nevada-2000 ordinance	36 in dbh (specific to oaks) or hardwood grove with ≥ 33 pct canopy; Nevada City Area 10 in dbh
Placer-1996 ordinance	6 in dbh when >50 pct of trees removed
Riverside-1997 ordinance	6 in dbh and 15 ft high if on parcel >0.5 acre and above 5,000 ft
San Luis Obispo-coastal zone 1995 ordinance	8 in dbh
Santa Barbara-2001 proposed ordinance	4 in dbh for deciduous oaks; 8 in dbh for live oaks
Santa Clara-1997 ordinance	12 in dbh
Sonoma-1989 and 1997 ordinances	9 in dbh; valley oak has own regulations
Yuba-1996 general plan	6 in dbh specific to valley oaks

¹Counties without diameter stipulation: Amador, Butte, Calaveras, Colusa, Fresno, Glenn, Kern, Lake, Madera (Eastern), Mariposa, Mendocino, Merced, Napa, Shasta, Stanislaus, Tehama, Tulare, Tuolumne.

²There are many exceptions; agricultural and rangelands are often exempt or have less stringent regulations.

The most striking example of the specimen tree trap in northern California is the Danville Oak, located in a median strip of a four-lane road. Its roots are covered with pavement. This is a valley oak, perhaps 300 years old, moderately diseased and senescent. According to the arborist, it will live for perhaps another 50 years with careful management (Peña 2000a, 2000b). The town council voted to spend \$150,000 (later reduced to \$70,000) to put a steel structure around this oak to protect cars and people from tree breakage. However, if one looks carefully at the outskirts of town, one realizes that the real problem for Danville's oaks rests with the development pressure in the hills to the west, where thousands of houses already exist. There is some protection through park dedication in the hills, but the citizens and planners focused their time and a lot of money on the tree and not the forest. This can never result in oak woodland preservation.

Vineyard Conversion

Vineyards are perceived by many as a major cause of oak woodland decline. However, in most places, the new vineyard impact is exaggerated. It is only one important factor in the loss of oak woodlands, and sometimes seems more important than other causes because of the high visibility of some new vineyards. As we begin this topic it is time to discuss some findings from cognitive psychology. Since this paper focuses on public policy of oaks more than psychology, we will keep psychology theory brief, merely making the connection between the two subjects. Please bear in mind that there is a body of experimental evidence regarding human behavior under consideration here, and it has been applied to political processes. Humans typically overestimate the frequency of rare events, say airline crashes and underestimate the frequency of common events, such as herpes (Lichtenstein and others 1978, Light 1983, Slovic and others 1976). The same two psychological misperceptions occur for forest land. We also tend to rely on small numbers to make our decisions (Tversky and Kahneman 1971). We focus on the immediate and visually important things which we believe impact us directly. Merely stating that humans tend to focus on the immediate is of course trivial. What is more cogent is that experimentally, humans have been found to consciously disregard and dismiss that which is not immediate even though people may be well aware there is more information than that which they use. Thus, if a phenomenon is out of sight or simply out of our neighborhood, even if we are cognizant of it we discount its importance. Hence, a rational decision about the Danville Oak was not made and the real problems for oak woodlands were ignored. In our discussions with planning staff, we found that some of the planners knew that their plans only focused on preservation of individual trees, but other planners believed that was all that was necessary. We can state that in talking to planning staff personnel of many counties, no small number are frustrated with the slow pace of oak conservation no matter how defined or delimited.

Many people would be surprised to learn how much oak woodland exists in California. Surveys using different methods and at different times yielded similar and credible results. Bolsinger (1988) estimated that there were 9.6 million acres of hardwood rangeland in California and that 72 percent of the hardwood types were in private hands. The most recent survey is that of Greenwood and others (1993), revised by Biles and Love (1998). According to them, there are 10.5 million acres of hardwood rangelands in 45 counties with about 70 percent in private ownership. Nearly three-quarters of a million acres are reserved in both private and public

sectors. Many citizens would underestimate the total oak woodland acreage and overestimate the number of trees at risk.

With what we have just said in mind, three counties may be used as examples to discuss the conversion of oak woodlands to vineyards: Santa Barbara, San Luis Obispo, and Lake. The Santa Barbara story is now famous as a case study of how to develop plans for tree and oak woodland preservation but it has been a long and often ugly process. It was triggered by a perceived threat, a minor threat, the loss of fewer than 900 oaks on a single project of 500 acres of grazing land converted to grape vines. Had those oaks not been visible to passersby and had they not been *perceived* to be the last of a breed, less attention would have been given to them and the Santa Barbara story would have evolved differently, hopefully to the same end but in a much less divisive manner. In 1995 in Santa Barbara County, there were 8,976 acres of grapes, and in 2000 15,869 acres (California Agricultural Statistics Service 2001). Much of the new planting is on land that was previously devoted to grazing and did not involve clearing oak trees (Leider, personal communication). In response to this one project and fearful of more conversions to vineyards, a long public process was initiated to write an ordinance based on an environmental impact report (EIR), such report and proposed ordinance only covering lands in the private sector. The Santa Barbara County Oak Tree Protection Program EIR reports only the oak woodlands of 198,000 acres on private property in the project area, and omits entirely the oak woodlands on public lands (Santa Barbara County 2001). Looking at the big picture, Santa Barbara County has about three times the amount of oak woodland cited in the EIR, a total of 634,600 acres of hardwood rangelands (Biles and Love 1998), hardly on the verge of extinction. There are 356,000 acres under public ownership, and 278,600 acres in private hands. So this project which resulted in the removal of the oaks on the 500 acres accounted for about 0.2 percent of the privately held oak woodland, and 0.09 percent of the total oak woodland in the county. We know many of these trees on the subject property were valley oaks but their loss was still minor compared to the total. The attention paid to the few oaks which were removed is greater than rationally justified based on total hardwood rangeland acreage. It needs to be said that Santa Barbara County currently is undertaking extraordinarily comprehensive planning for oak woodlands, and it goes well beyond vineyards.

San Luis Obispo County is a little different. They have workable tree and habitat protection in place, but only in the coastal zone. As of 2000, there are 20,425 acres of vineyards, up from 10,055 acres in 1995 (California Agricultural Statistics Service 2001). New vineyards are going in with some oak displacement but most of the vineyards are being developed on pre-existing agricultural land (Trinidad, personal communication). The concern with conversion to vineyards is to some extent based on the concept of perceived acceleration of conversions as well as the total acreage. Data and projections are as yet inadequate to determine final vineyard development.

The types of woodlands in this county are highly disparate. Coast live oak and blue oak habitat are well represented (242,100 and 271,300 acres, respectively), while valley oak habitat consists of only 2,700 acres. However, it is the coastal area, home to the plentiful coast live oak west of the Santa Lucia Mountains which is regulated for tree cutting. The uncommon valley oak, located inland, is without protection and without replanting requirements when one is cut. Just knowing these figures allows us to infer that if people wanted to further protect oaks in San Luis Obispo County, the county should regulate valley oak habitat, where virtually no protection presently exists. Planners there are aware of the inconsistency.

Lake County lost an estimated 500 to 800 acres of oak woodland in the period 1997 to 1999, mostly to vineyard and some to housing (Lake County 2001). There is a strong movement to control cutting trees in some areas, but no replanting requirements despite the County Resolution on oak woodlands management (Lake County 1995). Looking at the background information which does not appear in the County planning document, Lake County has 6,828 acres of vineyard, up from 2,966 in 1995 (California Agricultural Statistics Service 2001). At the same time, it has 237,900 acres of hardwood rangelands, mostly interior live oak (*Q. wislizenii*) and California black oak (*Q. kelloggii*), with significant areas of blue oak as well, but few valley oak remain. This county focuses efforts on specimen trees or the relatively few trees in and around vineyards and subdivisions. It is a classic case of ignoring the background information in favor of the individuating information and using solely the latter on which to base the conservation planning decisions.

Having used these examples where the underlying information was ignored, where the acreage of oak woodlands is markedly underestimated and decisions were made on the basis of a very small amount of land and land use change, we want to introduce a related concept. It is called the base-rate fallacy (Bar-Hillel 1980). This refers to the process of making judgments and predictions based on specific and usually inadequate information instead of taking into account the total information available. In other words, we neglect all the background or collateral information which isn't in clear view and focus on the specific and local information even though that background information is often far more salient than the local information. In the three counties discussed, dire predictions are made on the basis of a limited sample, while the hundreds of thousands of acres of viable woodlands are neither recognized nor factored into the planning. It is critical to study the base-rates prior to drawing up the regulations.

The psychological reasons for this behavior have been studied. One finding suggests that we don't pay attention to the background information because it is abstract and remote, while we feel that the specific information is concrete and salient. The background base-rate information is ignored because people, in spite of the added collateral information, believe that the base-rate *ought* to be ignored (Bar-Hillel 1980). People believe the background information has no relevance to them, nor to the decision process for the problem at hand. Having said that, we will turn to a conversion which is as yet not well studied over the long term, one which will likely be found ecologically more important than vineyards, but to which little public attention is paid and which illustrates the point.

Conversion from Wildfire

Although conversions to agriculture and development are widely reported, aftermath of wildfire is not. There is no large body of literature specific to seral succession of oak woodlands following high intensity wildfires, but general information may be located in Biswell (1989) and Wright and Bailey (1982). Mensing (1992) noted blue oak regeneration in southern California over the last 150 years is associated with fire. Holmes (1990) and McClaran and Bartolome (1989) believe periodic low intensity fires contribute positively to enhanced oak regeneration. Allen-Diaz and Bartolome (1992) found that a prescribed low intensity underbrush and grass burn after fall rains had commenced did not much alter blue oak seedling survival compared to a no burn plot. However, an out of control high

intensity summertime fire with a heavy fuel load is a different matter. We believe these large-scale wildfires in oak woodlands have significant and damaging long term as well as short-term effects to the oak forests for those species which are not naturally reproducing well. We certainly acknowledge that ecological processes span more than human lifetimes, that fire is an integral part of the California oak woodlands landscape and that fire acts simultaneously with other factors to determine forest composition outcomes. But we also maintain that the relatively common occurrences of fire leads us all to disregard the significance.

We mentioned that people tend to underestimate the frequency of common events and with that, the significance of them. Fires are frequent in California. There were fires on the Light Ranch in Mendocino County in 1992 and 1995. These fires resulted in the loss of over 800 mature oak trees, some over 300 years old, including valley oak, blue oak, Oregon white oak, California black oak, interior live oak, oracle oak (*Q. x moreha*) and canyon live oak (*Q. chrysolepis*). We've replanted the area with nearly 1,000 acorns from local trees but without our planting efforts it is doubtful the forest would ever return, at least not for centuries. These trees are gone as surely as if removed by a bulldozer.

Every year tens of thousands of acres burn in California, and much of this is oak woodland. In 1999, on land under California Department of Forestry and Fire Protection (CDF) jurisdiction, more than 285,000 acres burned, and in 2000, over 72,000 acres burned (CDF 2001). The largest single conversion in Mendocino County from oak woodland to other habitat was by one fire in the summer of 1987, burning 42,500 acres in Mendocino County and 10,500 acres in Lake County (Schott, personal communication), much of it blue oak woodland. This specific fire started in July and became a high intensity fire which consumed whole forests. In many acres of the burn, conversion to another habitat type occurred. The fire destruction was enormous, but being humans we don't assess its significance as skillfully as we do a conversion of 300 highly visible acres to a vineyard. All the oak woodland conversions to vineyards in the last decade over the entire state hardly approach one-half the acreage or the number of trees destroyed by this one major fire. When we factor in the number of wildfires we have in oak woodlands over a year or a decade, we can conclude that fire is more destructive to oaks than conversion to vineyards. And destruction of oak woodlands by wildfire is virtually ignored unless the land is close to urban areas. Succession will in time perhaps develop an oak woodland, but given both the limited success of natural regeneration of blue oak and the several centuries required, this conversion is important and long lasting. We know of no large-scale oak reforestation program following a wildfire. The remedy to reduce this type of conversion threat is to prevent the hot fires through proper grazing management and prescribed burning, and if wildfires occur, to give the landowners technical and financial incentives to replant and reforest. Perhaps the role of wildfire in the loss of oak woodlands needs to be addressed and policies developed. Once policies are in place, the above-mentioned management practices can become part of ordinances or general plans.

Wood Cutting

In sparsely populated rural counties, woodcutting is a major cause of the loss of oaks, primarily blue oak. About 6,000 acres per year are harvested. Data from about a decade ago indicated that in Shasta County, net addition to tree volume was significantly less than the amount harvested for firewood while in Tehama County volume was marginally increasing (Standiford and others 1996). Both counties adopted recommendations for canopy retention but the authors point out that only 10 percent of the Tehama County plots and 25 percent of the Shasta County plots actually had at least 30 percent canopy retention. Rural counties by and large have voluntary guidelines for oak woodland management rather than ordinances. This has led to a curious phenomenon, illustrated by Glenn County. Its 1994 resolution to adopt guidelines refers to the “importance of private property rights” and economic viability four times but the guidelines never refer to the need to leave stumps to sprout or to plant new trees (Glenn County 1994a, 1994b). Calaveras, Tehama, Tuolumne, Madera, Mariposa and Shasta Counties have all adopted similar guidelines. In their own way, these counties just as with the city of Danville, attempt to save the older trees and allow the younger ones to be removed, only “suggesting” to keep some of all species and sizes, but there is no requirement in any of these counties to do anything to ensure this outcome. Voluntary guidelines can only suggest, so incentives are needed. The guidelines of these counties as written are a recipe for the permanent loss of the oak woodlands. The remedies for California are simple. Harvest for sustainability (Standiford and others 1990). Encourage or require replacement seedlings and saplings by planting, or mechanical protection of naturally sprouted seedlings. Conduct woodcutting in the same manner as we do fishing. Require a minimum size instead of a maximum, and replacement along with conservation. We utilize the federal Environmental Quality Incentives Program for soil conservation and state Senate Bill 271 funds for riparian restoration. We now need to develop similar cost share programs for oak woodland restoration, perhaps along the lines of the proposed Assembly Bill 242.

Residential and Other Development

In many areas of the state and the urban fringes of all larger cities such as the ones in the Los Angeles Basin where the Engelmann oak is making its last stand, residential development is the pressing problem. In fact, according to Giusti and Tinnin (1993) the single largest threat to the state’s oak woodlands is residential development. Each year 30,000 acres of hardwood rangeland are lost to residential and commercial uses (Standiford and others 1996), and there is little required in the way of mitigation. The more urban counties tend to favor ordinances, and often punitive ones at that. In so doing, they do not really encourage conservation or regeneration, but merely regulate tree cutting as they attempt to save specimen trees. In a few counties, a specified number of seedlings or acorns must be planted when trees are cut. Sonoma County generally requires between a 16:1 to 32:1 replacement ratio and protection to sapling size; Santa Barbara County proposes up to 15 seedlings or 45 acorns for each tree cut, but these regulations are rare among counties. Usually, replanting is required only as mitigation for other procedures on a case by case basis, and thus fails the woodlands. The result is a permanent loss or at best, serious fragmentation.

Sudden Oak Death

As it stands today, no county has the power to remove, treat or spray an oak or other tree or shrub infected with *Phytophthora ramorum* without the landowner's permission. The lack of county authority to deal with this threat is a glaring omission and hopefully will be rectified even as research is still being conducted. In speaking with several planners in the Bay Area, the very region where sudden oak death exists, most were not aware of the 10 host species which this fungus infects nor of the ecological significance of the disease. Fortunately, the State has recently exerted some authority in the matter (Fimrite 2001). Unfortunately, sudden oak death with rampant and uncontrollable spread may cause permanent and large-scale conversion of much of our oak woodlands.

Suggestions and Summary

The problem discussed here is that those of us who care for oaks and forests have a marked tendency to dwell on the specific trees and ignore the forest. We have a belief in the truth of small numbers (Tversky and Kahneman 1971) and we not only disregard the background information, we actually believe it is unimportant. Despite claims, many in the planning business do not look at all the information. Tehama County focuses on private property rights, Visalia on the preservation of specimen trees, and Lake County on vineyards. Unfortunately, this often leads to poor decisions. We are strongly conditioned by our local circumstances and we have a difficult time extending ourselves to see the big picture (Tversky and Kahneman 1974). In being too dependent on direct information, Slovic and others (1976) point out, "...cognitive limitations force decision makers to construct simplified models in order to deal with the world." They further state, "The experimental results indicate that people systematically violate the principles of rational decision making when judging probabilities, making predictions, or otherwise attempting to cope with probabilistic tasks." We need to consider many variables simultaneously, and man has a tough time doing this, for we rely only on the immediate information and ignore the important background data.

Typically, persons in authority decide matters intuitively, what looks good in the short term, what is specific to the immediately perceived problem; in turn they embrace procedures that are easy to explain, rationalize and defend. This strategy won't work to conserve and expand oak woodlands.

However, there are solutions to our cognitive dilemma. First, we must recognize that we are prone to these cognitive errors and then adopt a new viewpoint. We need to be aware that we are dealing with a multivariate problem, which encompasses far more than trees and conversions, and which includes the whole scope of geography and in particular natural disturbance regimes, ecological succession, and expectations on the landscape over time. The planners and interested groups must shift to a multivariate approach and learn probabilistic reasoning. Following are some suggestions.

Plant Seedlings

While there is some controversy regarding the long term efficacy (or even the need) for artificial regeneration, many papers have been written on methods to enhance seedling survival and sapling recruitment (Costello and others 1991,

Costello and others 1996, Griggs and Peterson 1997, Light and Buckner 1999, McClaren 1987, McCreary 2001, Plumb and De Lasaux 1997, Roberts and Smith 1982, Schettler and Smith 1980). Our personal observations and experiments lead us to believe that some intervention (at least in the North Coast Ranges) is essential. Complete artificial regeneration by planting acorns, watering and protecting the seedlings is very successful but costly, and we have found that merely caging seedlings works reasonably well for interior live oak and black oak. However, for some species we see no alternative to a complete artificial program. We believe that artificial regeneration (or at least caging natural seedlings) should become a major part in oak woodland conservation public policy to mitigate natural and human caused woodland losses. When vineyards are established, it is an easy matter to plant, irrigate and protect seedlings from herbivores. Some counties already require replanting but due to the difficulty in propagating oaks to sapling stages, we would encourage counties to require a 50:1 ratio of replacement. This would encompass any and all conversions, whether deliberate such as woodcutting, housing developments and agriculture, or if accidental such as fire or sudden oak death. Don't prohibit cutting, but grow new forests with the help of partial funding from the public sector. Encourage and help pay for planting even when no conversion has occurred. Allow offsite mitigation. Whatever else is done, plant trees on private and public lands alike.

Estimate Probability of Conversion

The current stars in the planning world are in the counties of El Dorado (Greenwood and Saving 1999), Sonoma (Brooks and others 1999) and Santa Barbara (Santa Barbara County Planning and Development Department 2001). The first two are using GIS methods to map and determine the probable places of conversions. This method needs to be expanded and quantified so that one assigns a probability estimate to the type of conversion. In the hills of Mendocino County the likelihood of adding homes is greater than the likelihood of new vineyards, and both are far less likely than fire. In the western hills of Colusa County, the pressure appears to be from woodcutting and grazing improvement, and the likelihood of residential development or vineyards is practically zero. To estimate conversion from oak woodland to some other habitat one needs to use both direct and collateral information. Every acre needs to be assigned a probability of conversion based on all the past information of nearby lands as well as on current uses. This is a complicated multivariate problem, and to estimate these probabilities requires extensive geographic information and maps at least including zoning regulations and legal land use possibilities, census data, current land use, adjacent land use, slope, soil type, climate, proximity to urban centers and transportation. In addition, knowledge of the forest or rangeland itself including species present, age structure, fuel load, and canopy information is needed. Differential protection by species will lead to better management although most counties don't address this issue (*table 3*). The experts also need to be able to predict where oak woodlands can flourish in places where restoration is needed.

What we suggest is that planners need to adopt a probability mode of thinking and correctly assess risk of conversion in each area of every county while at the same time recognizing that it is a dynamic and ongoing challenge. Planners and politicians, bureaucrats and regulators need to learn how to properly identify and evaluate the risks, and proactively conserve the resources. We must keep in mind that potential outcomes are not equally probable, for a steep hillside is more likely to burn than to

become a vineyard, and to date the risk for sudden oak death in the San Francisco Bay area is far greater than in the Sierra foothills.

Table 3—Selected counties: differential protection of oaks by species.

Calaveras-1996 guidelines	suggests retaining some oaks of all sizes and species
Contra Costa-1994 ordinance	all oak species treated alike
Fresno-1997 draft guidelines	suggests retaining some oaks of all sizes and species
Lake-1995 guidelines	valley oak specifically mentioned in Upper Lake-Nice Area Plan
Los Angeles-1993 ordinance	all oak species treated alike
Madera (Eastern)-1999 guidelines	suggests retaining some oaks of all sizes and species
Marin-1999 ordinance	all oak species treated alike
Mariposa-1995 guidelines	suggests retaining some oaks of all sizes and species
Monterey-1997 ordinance	all oak species treated alike
Nevada-2000 ordinance	emphasis on protecting blue oak and valley oak
Santa Barbara-2001 proposed ordinance	differentiates deciduous oaks from live oaks
Santa Clara-1997 ordinance	California black oak receives special treatment when found growing with commercial species
Shasta-1995 guidelines	suggests retaining some oaks of all sizes and species
Sonoma-1989 and 1997 ordinances	valley oak has own regulations; all other oak species treated alike
Tehama-1994 guidelines	suggests retaining some oaks of all sizes and species
Tuolumne-1995 guidelines	suggests retaining some oaks of all sizes and species
Yuba-1996 general plan	differentiates valley oak from foothill oak woodlands

Reserve Oaks on Public Lands

Biles and Love (1998) have calculated for each species the number of protected acres (private and public) it would take in each county to reach the statewide average of protected acres. For most counties, the greatest impact for the conservation of the oak woodlands could come by merely reserving oaks on the public lands. Think of the positive impact in Santa Barbara County if the planners could work with other agencies to reserve forever the 356,000 acres in the Los Padres National Forest and other federal holdings. Instead, they focused on the smaller total acreage in the private sector. Planning departments are either loath to be involved with or not knowledgeable about public lands. Many ordinances, e.g. Santa Barbara and Riverside, specifically exempt federal, state and local public lands from the regulations, although the natural resources know no boundary. Other ordinances ignore public lands altogether. Very few counties, e.g. Santa Clara, apply their regulations to public property.

Planners will say they have no jurisdiction over federal and state lands. When asked if they think these lands ought to be in the reserves, they will reiterate their position and then say they feel the private sector needs regulating. It may be naive but this sounds like a turf issue. But most planners simply do not know how much

federal and state land exists in their own counties. One planner we spoke with thought her county had at most a couple of thousand acres of hardwood rangeland when in fact it is twenty times as much. Even if they are aware of public holdings, these holdings are excluded from county hardwood acreage totals leading to an underestimation and misrepresentation of the extent of total oak woodlands. Once more, we see the belief in small numbers and the underestimation of common events. By reserving oaks on public lands and planting seedlings, it would show a societal commitment to the importance of oak woodlands.

Use Existing Knowledge

In the preparation of this paper, we were struck by how many different rules there are, and with few exceptions how seemingly little communication there is among counties. There is a vast amount of information available, from state and university surveys of species by county, to ordinances and general plans available for the asking, to existing GIS studies on a variety of topics. Generally speaking, the planning documents are singular and do not benefit from the current and useful literature. While uniform regulations throughout the state may not be beneficial, at least a working familiarity with the regulations and guidelines from other counties is a necessity for everyone involved in the management of oak woodlands.

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