APPROACHES TO CHAPARRAL MANAGEMENT FOR WILDLIFE

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ABSTRACT.

The Soboba Project on the San Bernardino National Forest is an effort to combine several strategies of chaparral management on 12,000 acres of typical southern California brushland. In chaparral, as in any ecosystem, biomass can be made to concentrate in higher trophic levels. Fire is an obvious agent, but different fire regimes applied to different cover types can produce a wide range of results. Burn planning is discussed, including size, season, rotation and alternatives.

Other approaches deal with more subtle agents: structural diversity, the balance of protein and carbohydrates available to herbivores, and topographic factors which allow organic soil production and determine the distribution of water. Oak silviculture is considered as a technique for supplying the basic energy needed to exploit fully the temporary post-fire protein surges. Oaks and other valuable shrubs can be cultivated in conjunction with passive water impoundments which in the short turn provide increased free water and later silt in to become plateaus with stable aquifers and more fertile soils.

A balance of all these elements - carefully applied prescribed burning, water development and silviculture - is described as a program to optimize wildlife numbers and diversity within the limits of natural processes.

INTRODUCTION

In chaparral, as in any ecosystem, biomass can be made to concentrate in higher trophic levels. The premise that solar energy can be maneuvered from the production and maintenance of woody plant tissue into forms more assessible to herbivores is central to most vegetation management programs for wildlife. I re-state it because the apparent simplicity and uniformity of chaparral has led to some rather simplistic views of its manipulation. We should remind ourselves that chaparral is to be treated as an ecosystem, including both biotic and abiotic elements, and our approaches must match, to the fullest extent possible, its strengths and weaknesses as a natural machanism for generating animal biomass.

The Soboba Project is a chaparral demonstration area on the San Jacinto District of the San Bernardino National Forest. After a year of planning, the designers of the project have arrived at this ecosystem approach. I want to outline the development of the plan and our thinking on chaparral wildlife management. We are nowhere near the end of the process, but we might be able to shorten the brainstorming time for others involved in brushland improvement, and to suggest some avenues for research that will bear immediate fruit in this increasingly important field.

A "demonstration area" label is a direction to operate a little like a farmer raising a cow for meat and milk at the same time. Our mandate is simultaneously to investigate and implement the best management practice where little or no groundwork has been laid. For either a scientist or a manager it is a difficult balance to strike; I trust this will help rationalize away the occasional ambivalence of our approach.

We all know by now that the Forest Service policy of vigorous brushland fire suppression has left us with hundreds of thousands of acres of decadent vegetation, increased wildfire danger and decreased quality of wildlife habitat. It is a relatively new idea that has rapidly acquired the status of a cliche, and I do not think I need do more than refer to it.

On our district, we had a classic case: 12,000 "useless" acres south of the Banning-Idyllwild Highway. The Forest Service took charge of it in 1905, and for most of the century treated it in its usual role of over-protective custodian. The area had been little more than a grudging watershed for the San Jacinto River, from its last recorded fire in the 1890's until the inevitable happened in 1974. A fire started on the adjacent Soboba Indian Reservation and burned catastrophically, well into the timbered slopes above the chaparral.

California Fish and Game saw in this an opportunity to claim an area where wildlife could for once be a priority item in the multiple-use scramble. After a couple of years of hounding, they got their way, and a joint planning team was formed, consisting of Fish and Game and Forest Service personnel.

THE ROLE OF FIRE

We came immediately upon the words inscribed in the mind of every neophyte chaparral manipulator: Burn it. This is, of course, not a new idea. Post-fire improvements in animal numbers and diversity have been documented by authors in California since the 1950's. (Biswell 1957; Biswell and Gilman 1961; Gibbens and Schultz 1963; Dasmann et al. 1967).

It is a technique of unquestioned usefulness, but was it all that we needed? Questions about the overall efficiency of burning were raised even before the ranks of its advocates began to swell (Zivnuska 1967). In our own case, preliminary monitoring found highest numbers and diversity of wildlife species in several areas that could not be managed by fire - certain types of oak associations and riparian areas. And as we entered the literature on burning, we could produce only two studies that quantitatively addressed the question of nutritional plane of animals on burned vs. unburned chaparral. The earliest, the classic study of Taber and Dasmann (1957) did indeed show higher populations and better doe/fawn ratios on burned chaparral. The study also showed that a mixture of shrub and herbaceous understory could do as well, or better, than post-fire brushland. A more recent study (Longhurst and Connolly 1970), using somewhat more precise indices of nutritional conditon, could not duplicate these results. They found no significant difference between burned and unburned chaparral. They did, however, agree with the earlier work in one intriguing respect. They established a consistently higher nutritional plane for mule deer occupying a nearby range whose cover was oaks over herbaceous vegetation.

In my view, the ambiguity of the results of the two studies reflected the relative paucity of chaparral at the best of times, and the very short rejuvenation period following fire (Lillywhite 1977). One hypothesis could be that deer must be at the proper population density, and have access to a certain mix of other cover types, before they can fully exploit the rather sparse benefits of prescribed burning. Another way of stating this is that rejuvenated browse might not be the principal limiting factor for deer or other chaparral wildlife, and this burning, while it might be the centerpiece of our management effort over the long run, did not address our problems, or the potential of chaparral, completely enough.

Priliminary inquiries at the Riverside Forest Fire Lab (Green, pers.comm.) brought up more questions about burning. Different intensities or rotation periods on different cover types can produce widely different results. For instance, burning a chamise-annual grass association on a rapid rotation cycle (say 5 years) can convert an area to grass; at a ten year rotation is would be managed as rejuvenated browse.

Other associations and species offer an equal range of choices, and more unknowns. Mountain mahogany (*Cercocarpus betuloides*), a prime deer browse species on our range, is a tricky one to burn, and some authorities believe it responds better to crushing (Biswell and Gilman 1961; Gibbens and Schultz 1963). Fall burning is better than spring burning for nonsprouters. Split-germination ceanothus can require a complex alternating fire and herbicide treatment for best results (Ashcraft, pers. comm). One of the plants we are most interested in is the bush poppy (*Dendromecon rigida*), and virtually nothing has been published on its ecology relative to fire.

So where are we? We know that fire is a cheap and generally good tool for improving habitat. Longhurst and Connolly's (1970) study had cast some doubts on its cure-all properties and suggested, along with the earlier work of Dasmann and Taber (1957) that the oak-herbaceous mix is an extremely valuable microhabitat in chaparral whose management might offer an even greater potential.

Let us address the use of fire first. On the Soboba Project, we have the option of a few years grace before the fuels management problem ascends to priority number one. With the luxury of time, we can lay out a plan which will optimize the benefits of prescribed burning. The process is summarized on Figure 1.

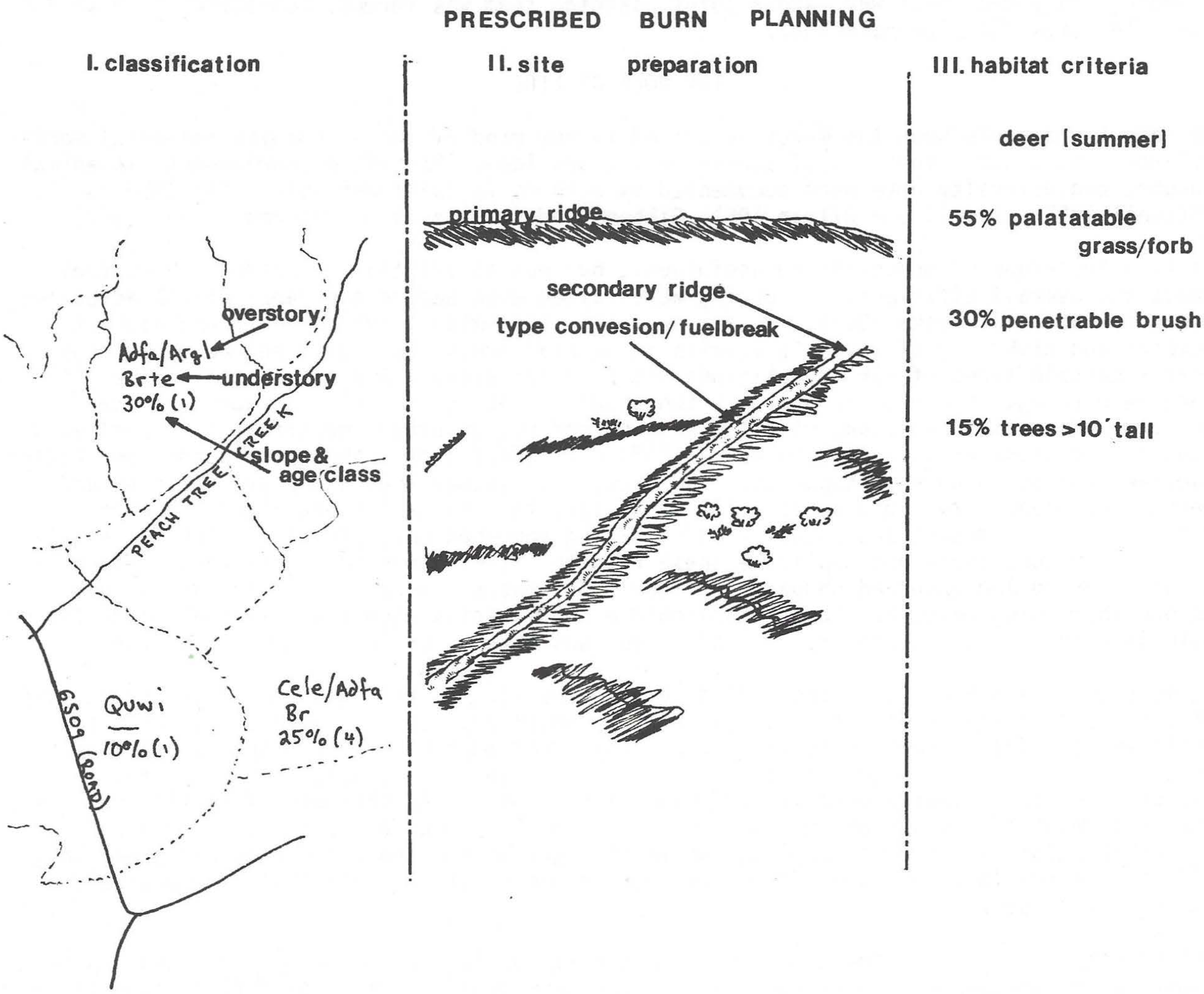

FIGURE 1. Prescribed burn planning.

PHASE ONE: Classification of Vegetation - we have begun this using color infrared aerial photography, with a definition down to about five acre plots. With this much detail, there is a great deal of classification to be done, and the key to getting it finished in a reasonable amount of time is a simple classification system geared to potential manipulations. We record age, dominant species in the canopy and understory, and percent slope, a general index to the practicality of field operations on the site.

PHASE TWO: Site Preparation - here we borrow heavily from the Grindstone model. I should have acknowledged earlier that the Grindstone Project on the Mendocino National Forest is, in spirit, the grandfather of all programs of this type and its lessons are clear and well-advised. The Grindstone "recipe" is to do relatively long and narrow type conversions on secondary ridgetops. In the short run, this program provides green herbaceous feed and structural diversity. In the long run, they serve as control lines for prescribed burning on the adjacent slopes.

PHASE THREE: Habitat Criteria - the Wildlife Habitat Relationships Program is the most succinct source for profiles of cover types for target wildlife species. The program is being developed by various state and federal agencies, with the goal of allowing the land manager to predict the effects on wildlife of management activities. Using the guides for deer, for example, we can characterize optimum summer habitat (Holl, pers. comm.) as: (a) 55 percent palatable grasses and forbs, .3-.6 meters high; (b) 30 percent dense but penetrable grass or brush, .6-.9 meters high; and (c) interspersed trees greater than 3 meters tall. We can do the same thing for another target species, or by making some compromises, for overall species diversity in an area.

The procedure for putting all three phases together will involve first, using the classification system to determine what criteria are already fulfilled on a site. Then we know exactly what is not needed. Second, we develop a concise list of objectives which, when matched with the existing cover and the state-of-the-art on burning, generates a prescription as to what should be burned, and how often.

Burning executed on this basis is more complex than most prescribed burn plans based exclusively on fuels modification requisites, and the interface between the two approaches may cause some problems at first. But everything we have learned thus far indicates that there will be an eventual pendulum swing away from prescribed burning for wildlife unless we do it right from the first. And prescribed burning is new enough, at least on federal lands in southern California, that if we learn how to do it best we can pass our knowldege on to fuels managers, to the benefit of both resource concerns.

OAK SILVICULTURE AND TOPOGRAPHIC MANAGEMENT

Turning to the question of managing oak microhabitats, let us limit ourselves to mule deer for the moment, and take a nutritionists point of view. Apart from vitamins and minerals, which are legitimate concerns but perhaps too elusive to involve use, animals need protein and carbohydrates. Protein is required for growth, especially fetal and neonatal growth, and carbohydrates for the basic maintenance fuel. Mature chamise/manzanita chaparral has short rations for both.

Fire provides a temporary surge in protein and makes certain types of carbohydrates more available (Bell 1973) but often not in the right place at the right time. A pregnant doe entering the winter needs an ample supply of carbohydrates to carry herself through to parturition. She needs a supply of protein rich foods at key points during gestation and lactation. She needs these items but finds that instinct limits her to an increasingly small territory, eventually the eight acres of the fawning area.

A twenty acre prescribed burn, let alone some of the burns now being planned at the scale of several hundred acres, may not be accessible because of its placement. It may be only marginally adequate in the protein it provides, in the quantity or quality of cover for the fawn, and its water supply.

This may be the reason for the importance of the oak-herbaceous association, at least relative to deer, noted in the studies cited. "Green feed", stable grass/forb/legume cover, is a protein source superior to burned chaparral, and the hospitable oak is one of the best carbohydrate suppliers in nature.

Can we manage for it? I think we can, but not with fire; we can extend or reproduce these areas by managing the landforms themselves; by extending our manipulations of the chaparral ecosystem into its abiotic sphere: the topography.

The idea is not mine. It springs from a concept developed in Australia and called "keyline." Its intent is to harness the natural processes of hydrology and soil movement in areas with highly erodable soils and highly seasonal rainfall.

To sketch out our version, we should first look at a normal cover system we would expect to find in chaparral (Figure 2). Below a primary ridge we have a succession of lateral ridges with a chamise/manzanita combination and perhaps some shrub-form live oaks. The soil is predominantly decomposed granite, the slopes in the neighborhood of 30 percent. One of the reasons for chaparral in the first place (de Bano 1974) is that fine soils are continually eroding from the steep ridge system and depositing the flats below as the velocity of streamflow is suddenly reduced. Here we find the deeper, slightly wetter soils which can support more of an oak-parkland type. On the Soboba Project site, these would be coast live oaks (*Quercus agrifolia*) over herbaceous vegetation or some of the more demanding and hydrophytic shrubs such as *Ceanothus integerrimus* or *Rhamnus californica*. Depending on the amount of water in the system, these areas can be classified as riparian, and the association can extend back up the drainage as far as the primary ridge.

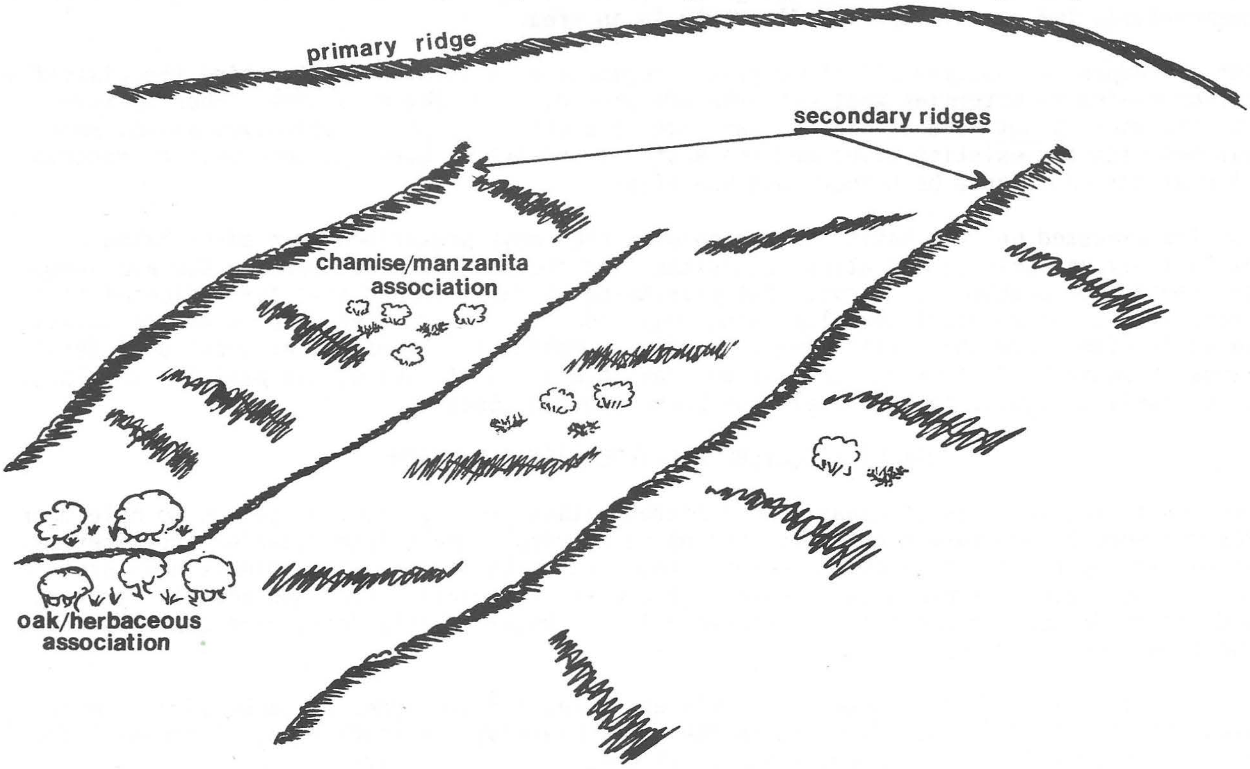

FIGURE 2. Typical ridge formation and cover in chaparral.

The central teaching of the Keyline concept is that this soil-vegetation assembly can be duplicated at any elevation we choose, to create pockets of oak-parkland in otherwise homogeneous chaparral. We accomplish this by first impounding the drainage with a dam (Figure 3). Providing year-round water on such a site is the first of many benefits. In the long run, what we create is a plateau, smaller but topographically identical to the flats below. If we cultivate or manage oak trees surrounding the impoundment (Figure 4), they will eventually, along with the more hydrophytic berry producing plants, become the stable cover on the site, persisting indefinitely after the impoundment has silted in because here, on the miniature flat, the same processes of soil deposition and aquifer formation are taking place.

Putting it all together (Figure 5) gives us one of those models that look good on paper but may never find complete application in the field. Beyond the obvious problems of ridge systems that look more like something that fell off the back of a truck, the science of planting or managing oak trees is in its infancy. We do have some help. The Liebre Mountain Oak Project on the Angeles National Forest gave us enough guidance to establish an experimental nursery for black (*Q. kelloggii*) and canyon live oaks (*Q. chrysolepis*) to plant on this type of site.

The overall scheme, then, is first to impound the drainage and to type convert the adjacent ridge or ridges. The impoundment leads to the creation of a tree-form oak grove and a stable water supply. The ridgetop type conversion gives us an immediate supply of herba-

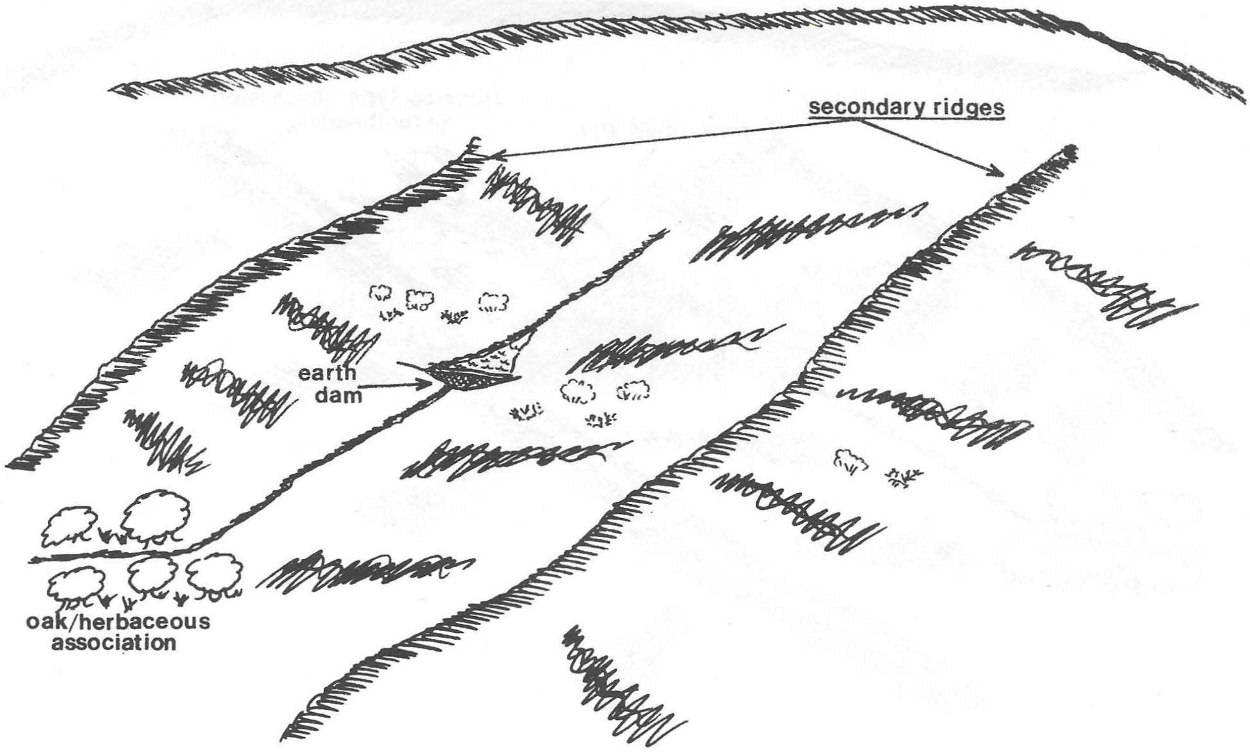

FIGURE 3. Impoundment of drainage.

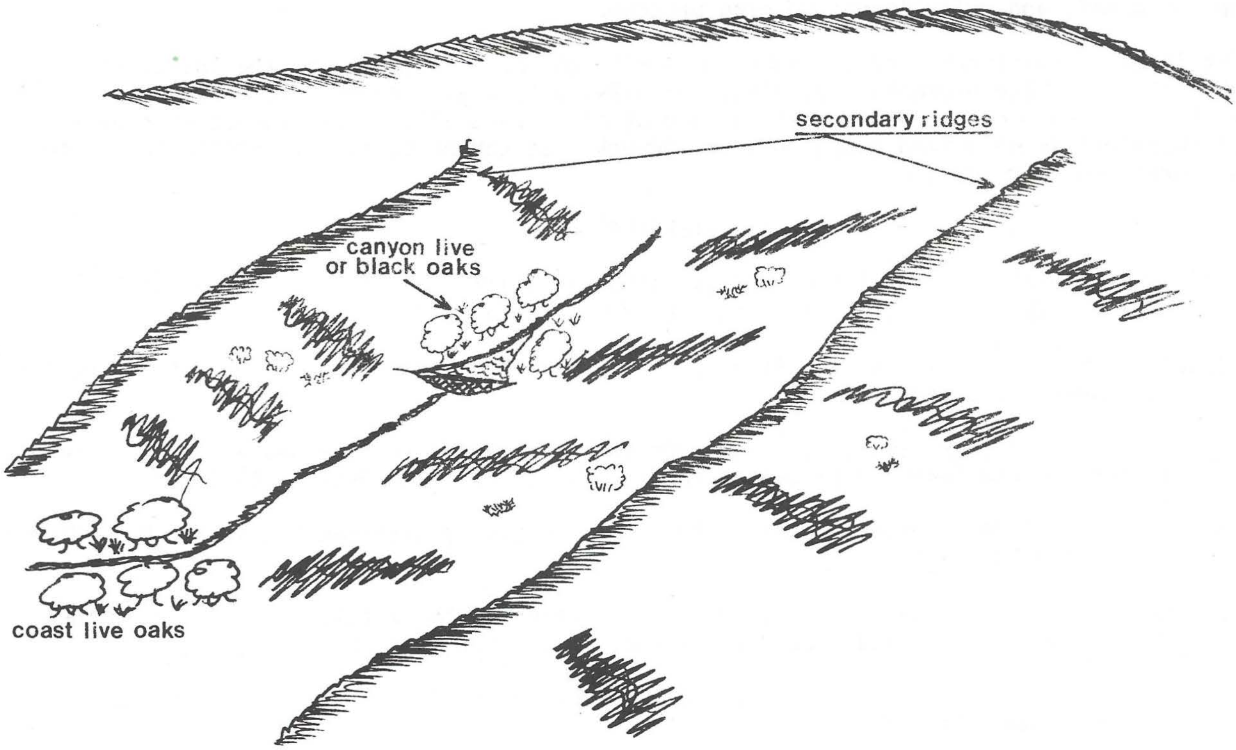

FIGURE 4. Oak silviculture on drainage.

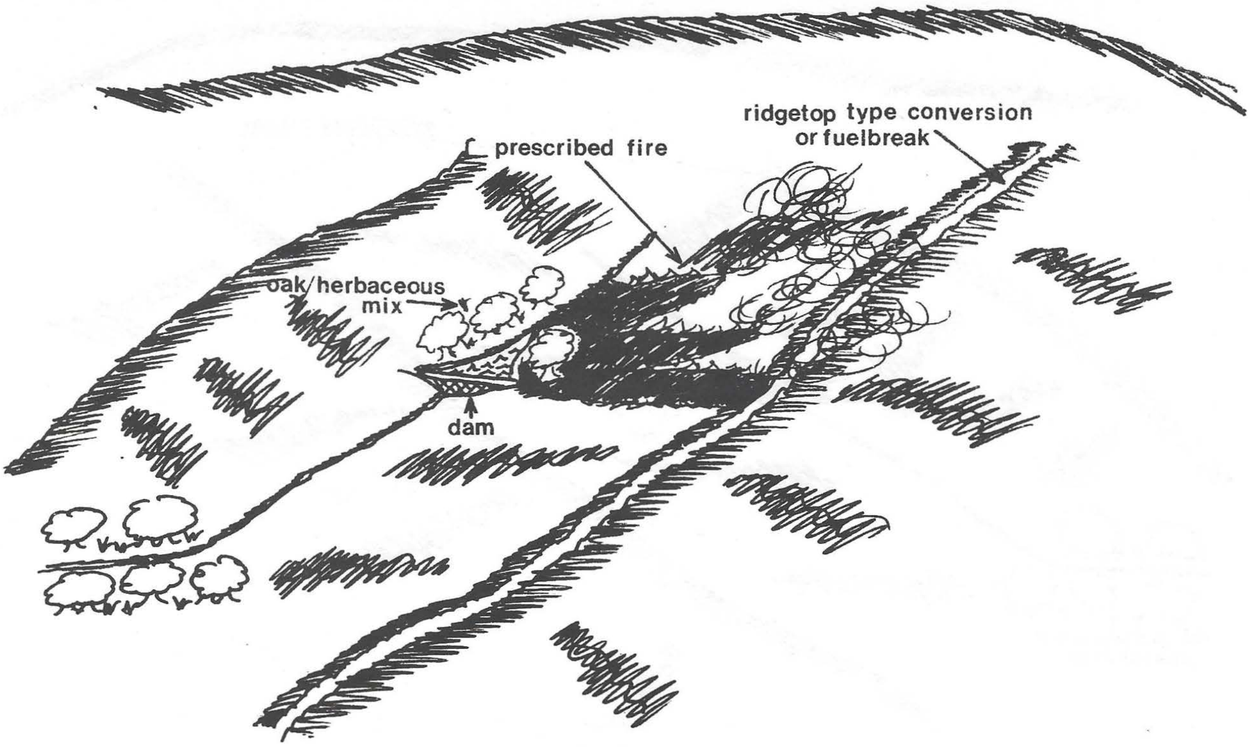

FIGURE 5. Complete management model.

ceous feed, hopefully within the home range of a pregnant doe, and sets the whole complex up for a safe and well-planned burning program.

The largest investment, and the phase requiring the most artifice, is the intial one. Thereafter, all the elements - burning, oak silviculture and topographic management - fall within the realm of processes that can and do occur naturally. The productive capability of chaparral is maximized based on a groundwork that can be sustained indefinitely without any drain on nonrenewable resources.

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