A Sportsman's Guide to Improving Deer Habitat in California

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A Sportsman's Guide to Improving Deer Habitat in California

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Spring staging area for the Buttermilk Deer Herd, eastern Sierra Nevada.
photo by Tom Kucera

Preface

Several years ago, a sportsman interested in improving deer habitat asked our help on a project to widely plant a species of shrub that mule deer are known to favor. While appreciating his energy and desire to improve deer habitat, we knew that the particular shrub he wanted to plant was not native to the project area. Because the species occurred in a region ecologically very different than the proposed project area, we predicted that it would probably do poorly if it survived at all. Thus, we were concerned that the project would be waste of time, money, and people's energy, regardless of the admirable motivations of the sportsmen. When we relayed our concerns to him and suggested different, more ecologically adapted plants, and specific habitat manipulations known to improve the value of habitat for deer, he challenged us to provide this biological and management information in a more complete and readily available format. His concern was that without this type of information it was hard for the sportsmen to know if they were doing the "right thing". While this interaction helped point him in the right direction, it also planted the conceptual seed for this Guide. Therefore, we sincerely hope that this seed grows into better deer habitat conditions throughout California.

I. Introduction

Millions of people in California value mule deer for recreational, ecological, or esthetic reasons. Many of these deer "aficionados" are concerned about the quality of deer habitat and would like to do something to improve it. The purpose of this document is to suggest ways that people interested in improving mule deer habitat can do just that. Whether or not you are a landowner, you have the ability to affect the quality of deer habitat.

In this document we:

1) Introduce the different subspecies of mule deer that live in California and briefly discuss where they occur and how they differ;

2) Describe the eight bioregions most important for mule deer in California, and components of deer habitat within them;

3) Identify which resource-management agencies or landowners have the most influence on deer habitats, describe the planning process that federal agencies follow to make decisions on management activities that affect

deer habitat, and suggest ways that people can get involved and make a difference;

4) Describe various types of habitat improvements often made for deer; and

5) Describe mule deer habitats and ecology by bioregion and suggest hands-on projects that may be appropriate for interested groups such as sportsmen's clubs.

We anticipate that upon becoming familiar with the contents of this Guide, the reader will be more familiar with the habitats and management of deer in California's various bioregions. You will better understand who the "players" are in the management of deer habitats and what types of land-management activities are conducted that affect deer habitat. You will learn how to become involved in the decisions regarding management on public lands that affect deer habitat, and the types of management or specific habitat-improvement projects that benefit deer.

At the outset, we also want to emphasize that improving habitat for deer also will benefit a variety of other wildlife species, from songbirds to small mammals to larger carnivores. We hope that this Guide will provide tools for motivated people to improve the quality of deer habitat, and increase the broader wildlife "richness" in California.

California mule deer in Yosemite Valley.
Photo by Hap Ritter

II. Mule Deer in California

The deer family, or *Cervidae*, has some 40 species worldwide. (A species consists of naturally occurring groups of individuals that share an evolutionary history, interbreed and that typically do not interbreed with other species.) All species of the *Cervidae*, or cervids, share certain characteristics, such as a vegetarian diet that is broken down by bacteria and protozoa for digestion in a complex stomach called a rumen, or paunch. The unique characteristic of members of the deer family, present in no other animals, is their ability to grow and shed antlers yearly.

Mule deer are one of five native species of cervids that occur north of Mexico; the others are the closely related white-tailed deer (for a complete list of species scientific names see Appendix IV on page 93), the caribou, moose, and elk. Only elk and mule deer occur naturally in California. Several species of exotic deer from Europe and Asia, such as the fallow and axis deer, were introduced to California and now occur in certain areas, perhaps most notably the Point Reyes Peninsula in western Marin County. However, the mule deer is by far the most numerous and widely distributed deer in California.

The mule deer's scientific name, *Odocoileus hemionus*, translates loosely from the Latin as "hollow-tooth half-ass". This refers to a characteristic of their dentition and to their large, ass-like ears, from which we get their common name. Mule deer occur throughout western North America, from southern Alaska to central Mexico. Different wildlife specialists have identified between seven and eleven subspecies of mule deer. (A subspecies is a form that is somewhat distinct in appearance and geographically separated from other subspecies. Subspecies can readily interbreed when brought into contact, and often intergrade when they occur adjacent to each other.) The subspecies of mule deer are distinguished largely on the basis of coat color and markings, especially the size of the light-colored rump patch and the amount of black on the tail, as well as body size. Other characteristics, such as the length of the metatarsal gland on the outside of the lower leg, also vary among the subspecies. The California Department of Fish and Game (CDFG) lists six subspecies of mule deer as occurring in California (Figures 1 and 2).

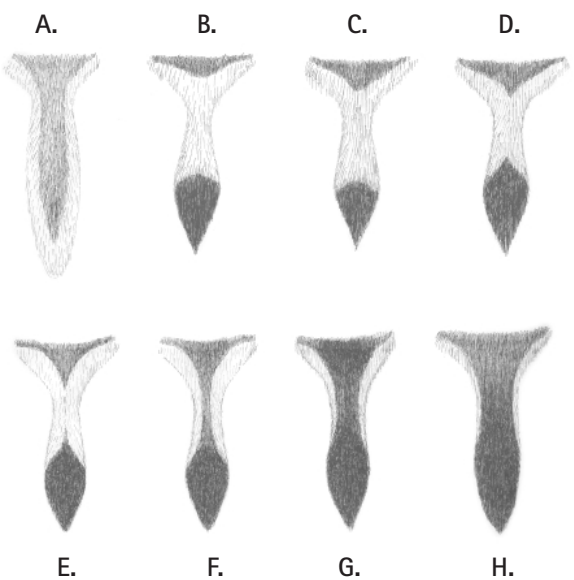


Figure 1. *Illustrations of typical deer tail patterns: A.) White-tailed deer (for comparison), B.) Rocky Mountain mule deer, C.) burro mule deer, D.) Inyo mule deer, E.) California mule deer, (F.) California mule deer (alternate), G.) Southern mule deer, and H.) Columbian black-tailed deer.*

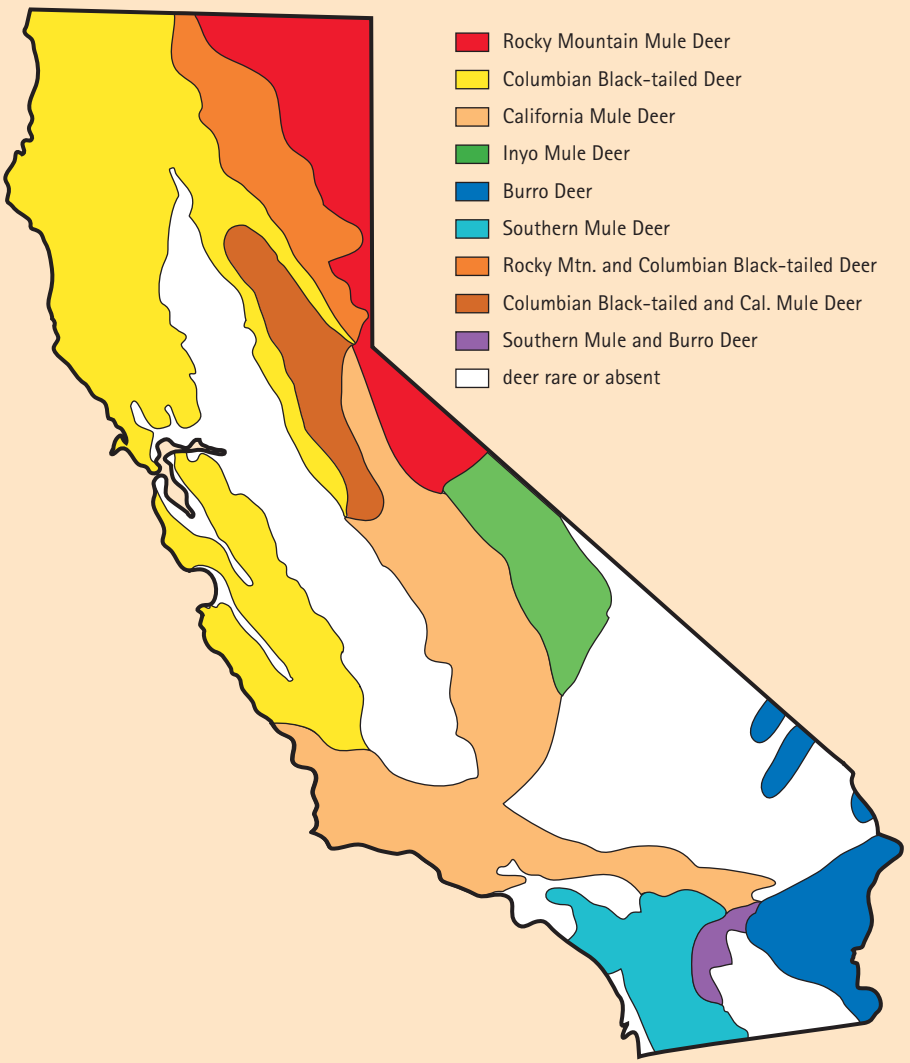


Figure 2. Deer Distribution in California

Source: California Department of Fish and Game

A. Subspecies of mule deer in California

1. The **Rocky Mountain mule deer** is the most widespread subspecies of mule deer, and occurs as far east as Nebraska and as far north as Canada. It was this subspecies that was first seen and described along the Missouri River in 1804 by Merriwether Lewis, who referred to it as a mule deer because of its mule-like ears and tail. In California, it is found mainly east but also west of the crest of the Sierra Nevada and Cascade Range, from the Oregon border to Mono County.

   Most Rocky Mountain mule deer are seasonal migrants. They spend winters on Great Basin Desert shrublands feeding primarily on sagebrush and bitterbrush; many leave the state to winter in Oregon and Nevada. They spend summers at higher elevations in the mountains, often on the west slope of the Sierra Nevada and Cascades in pine and fir forests, and higher in subalpine and alpine zones. Their summer and winter ranges may be quite distant (sometimes 50 airline miles or more). Rocky Mountain mule deer are among the largest mule deer, and are distinguished by a relatively large, white rump patch and a tail that is black only at the tip.

2. The **Inyo mule deer** occurs only in California, ranging east of the Sierra Nevada in Mono and Inyo counties. Like the Rocky Mountain subspecies, it is migratory, with low-elevation Great Basin Desert winter ranges and higher-elevation summer ranges, often on the west slope of the Sierra Nevada. Although a bit smaller it closely resembles the Rocky Mountain mule deer. Most wildlife biologists believe the Inyo mule deer is simply a southern form of the Rocky Mountain mule deer.

3. The **Columbian black-tailed deer** occurs in much of northern California. It lives in coastal areas from the Oregon border to about Point Conception in Santa Barbara County, and occurs inland to the western slope of the Sierra Nevada and Cascade Range north of Lake Tahoe. South of the San Francisco Bay area, it occurs and hybridizes extensively with the California mule deer. As its name implies, Columbian black-tailed deer have entirely black tails; they also have a relatively small rump patch. The subspecies extends as far north as British Columbia. When Merriwether Lewis saw them along the lower Columbia River, he thought they were a separate

Rocky Mountain mule deer

Columbian black-tailed deer

These two deer illustrate the tail pattern differences between the subspecies.
Photo by Steve Guill

species, but this distinction did not hold among modern deer specialists.

The range of the Columbian black-tailed deer encompasses a variety of habitats, from the wet coastal forests of Del Norte County to coastal grasslands of Marin County to oak woodlands and woodland chaparral of Monterey County. Inland, they range seasonally from annual grasslands and pine forests through fir forests and higher. Some populations, such as in the western Sierra Nevada, are migratory, and spend winters at lower elevations and summers in the mountains where they may share summer range with Rocky Mountain mule deer. Other populations, especially near the coast, are resident; that is, individuals live year-round in an area of about 1 square mile or less.

4. The **California mule deer** occurs in coastal areas from south of the San Francisco Bay area, where it hybridizes with the Columbian black-tailed deer, south through the Tehachapi Range to the San Bernardino Mountains near Los Angeles. In the western Sierra Nevada, California mule deer occur from Lake Tahoe southward. The California mule deer has less black on the tail than does the Columbian black-tailed deer, and has a bigger rump patch; the tail often appears to have a black line down its length. There are both migratory and year-long resident populations of California mule deer.

5. The **southern mule deer** occurs south of the Los Angeles area in the coastal mountain ranges and continues into Baja California, Mexico. The black strip on the tail of this southernmost subspecies is considerably larger than that of the California mule deer, with which it is often confused. Southern mule deer are mostly resident, non- migratory animals; although some will move to lower elevations during periods of snow.
6. The **burro mule deer** is strictly a desert variety, found in the interior desert near the Colorado River. Specialists have discussed whether this is a valid subspecies or just a type of the more widespread desert mule deer that occurs in Arizona, New Mexico, and southwest Texas. Its habits are not well known, but extensive seasonal movements have been documented.

B. Bioregions of California

A major reason that California has so many different wildlife and subspecies of mule deer is the enormous physical and ecological diversity of the state. For example, in a day, one can easily travel from redwood forest to sagebrush plains, or from snowy mountain passes to cactus desert. California's size and diversity have provided many varied opportunities for mule deer to find suitable habitat. Following is a brief description of the eight bioregions recognized in California. These bioregions help us better understand relationships between deer and their habitats and thus design the most appropriate management strategies.

1. **North Coast/Klamath**. This bioregion extends from the Oregon border to San Francisco Bay. It extends inland to the montane forest of the Sierra Nevada and the Cascade Range and to Great Basin sagebrush steppe, and to the Sacramento Valley. The climate is humid temperate and marine near the coast; inland, summers are dry and the winters are rainy. Vegetation nearer the coast includes redwood forest, mixed evergreen forest with Douglas-fir and rhododendron, and mixed hardwood forest. Inland, vegetation includes Douglas-fir with chinquapin, red and white fir, and ponderosa pine, with subalpine conifer at higher elevations.

   Important deer habitats include riparian areas, shrub communities dominated by blue blossom ceanothus and deerbrush, and Oregon and black oaks with openings of annual and perennial grass.

2. **Cascade/Great Basin**. This bioregion includes the area east of the Klamath Province from the Oregon border south to Mt. Lassen and east to Nevada, including the Modoc Plateau. The summers are dry, and winters range from relatively mild and wet in the west to cold and harsh in the east. Sierran montane forest is most common at higher elevations, with mixtures of white fir, subalpine conifer, and ponderosa and eastside pine. To the east, sagebrush steppe and juniper savannah are most common.

   Important deer habitats include big sagebrush and bitterbrush, riparian and wet meadow complexes, and mountain mahogany.

Figure 3. Bioregions of California

Source: California Department of Fish and Game

Aspen habitat found in the North Sierra/Cascade and South Sierra Nevada bioregions. Aspen habitats are important to mule deer as foraging sites and areas where fawns are born and reared.

Photo by William F. Laudenslayer, Jr.

3. **North Sierra Nevada/Cascade**. This bioregion extends from Mt. Lassen to the south rim of the Lake Tahoe Basin. It is bounded on the west by the Sacramento Valley and on the east by the Great Basin. Its summers are dry and winters are cold and wet. Sierran montane forest predominates, with alpine communities at the higher elevations. On the west the vegetation mixes with the yellow pine forest and blue oak woodlands of the Sacramento Valley, and on the east with sagebrush steppe and eastside pine.

   Important deer habitats include high-elevation meadow and riparian areas with willows and stands of brush dominated by species such as mountain whitethorn, mid-elevation stands of black oaks, and low-elevation stands of blue oaks and buckbrush on the west side of the mountains and bitterbrush and sagebrush on the east side.

4. **South Sierra Nevada**. The South Sierra Nevada bioregion extends from the south rim of the Tahoe Basin and the South Fork of the American River to the Kern River drainage. The western boundary is the blue oak-foothill

Typical summer range habitat found in the South Sierra Nevada bioregion.

Photo by Tom Kucera

pine and chaparral of the San Joaquin Valley. On the east, the boundary is the Great Basin plant communities including sagebrush steppe and piny-on-juniper woodlands. Summers are dry and winters are cold. Sierran montane forests predominate, with ponderosa pine, white and red fir, sub-alpine conifers, and lodgepole pine forests and montane chaparral.

Important high-elevation deer habitats include meadows and willow-dominated riparian areas. Mid-elevation areas offer stands of brush such as mountain whitethorn and bitter cherry. At lower to mid-elevation, black oak and deer brush stands are key forage, and at low elevation, stands of buck brush and birch leaf mahogany on the west side of the mountains and sagebrush and bitterbrush on the east, are important for deer.

5. **Central Coast**. The Central Coast bioregion extends from San Francisco Bay south to the Santa Monica Mountains of western Los Angeles County. The western boundary is the Pacific Ocean; the eastern boundaries include the coast ranges and interior Joshua tree and creosote scrub in the south. Summers are dry and winters are rainy. Blue oak, chaparral, and annual

Oak woodland habitats of the Central Coast bioregion–Fort Hunter Liggett, California.

Photo by Paul Wertz

grassland are dominant vegetation types furnishing important deer habitats through the year.

6. **South Coast**. The South Coast bioregion extends south from the Santa Monica Mountains in Los Angeles County into Baja California, Mexico. It is characterized by dry, warm summers and rainy winters. Vegetation is largely coastal sage, oak woodlands, and chaparral; these, plus riparian areas and meadows, all provide deer habitat through the year.

7. **Inyo/Desert**. Between Lake Tahoe, the Mojave Desert, and east of the Sierra Nevada, this bioregion includes mountainous terrain and vegetation interspersed with arid valleys. Winters are cold and harsh, and summers are dry. Vegetation is strongly affected by elevation, ranging from creosote scrub, bitterbrush, and sagebrush at lower elevations through pinyon-juniper to subalpine conifers and alpine communities.

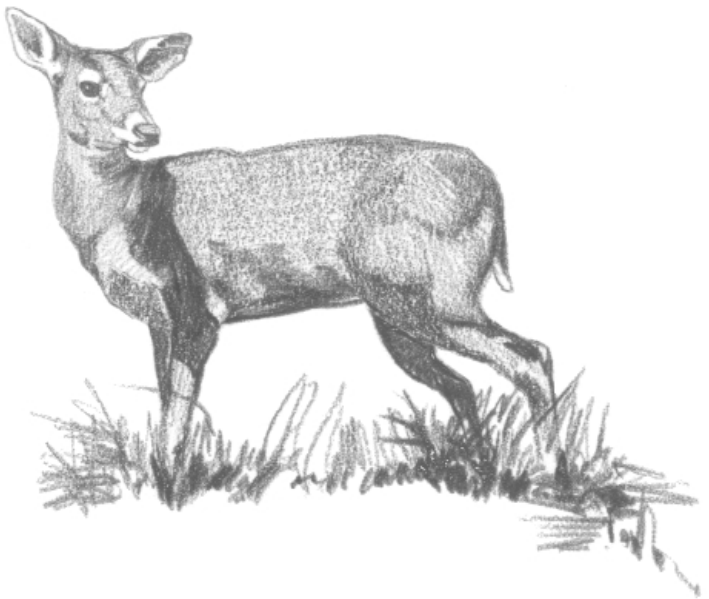
   Important deer habitats include high-elevation riparian and meadow areas and stands of mountain mahogany. Pinyon pines provide occasionally

Typical habitats of the eastern Sierra Nevada. Aspen, conifers, sagebrush, bitterbrush, and riparian areas (streams, seeps, and small meadows) offer diverse forage and cover areas for mule deer.

Photo by Tom Kucera

abundant pine-nut crops that deer like to eat. Bitterbrush and sagebrush are valuable low-elevation habitats.

8. **Southern Desert**. This bioregion, including both the Mojave and Colorado deserts, begins with the creosote and Joshua tree vegetation near the White-Inyo mountains in Inyo County. It continues through the Colorado Desert to the Mexican border. Climate is dry in all seasons, with hot summers and mild winters. Important deer habitats include desert washes, areas where strip-rains have produced annual vegetation and anywhere near water.



C. What Influences Deer Numbers and Health?

An animal's habitat provides it with food, water, and protection from predators and the elements. The amount and quality of the habitat is what determines the number of deer in an area; its "carrying capacity". Carrying capacity is often thought of as the maximum number of animals that a particular area can support. When determining carrying capacity many deer biologists consider animal condition as a good indicator. It is commonly recognized that the number of deer that can be supported in "good" condition may be much lower than the maximum number possible. Some people distinguish "maximum" and "optimum" carrying capacity, the former varying with good and bad years when deer numbers build up and crash, the latter being the relatively stable number of deer that can be supported in good condition on a sustained basis.

Regardless of how carrying capacity is defined, it is a function of the habitat, which provides those things deer require to live and reproduce. Even in the "best" habitat, however, deer numbers do not increase indefinitely. Those things that prevent further growth are termed "limiting factors". These may be food supplies, weather, disease, predation, etc., and they usually act in concert. Thus, a drought (weather) can reduce food supplies, or heavy winter snow can restrict access to food and increase vulnerability to predation. Limiting factors may be different in different areas and habitats, and may differ at different periods in the same area. Hence, the goal of habitat management for deer is to identify the current factors that limit a deer population and design and conduct habitat management projects to address the situation.

There are several important concepts to keep in mind when thinking about deer habitat and how to improve it. Two of the most important are plant succession and spatial scale.

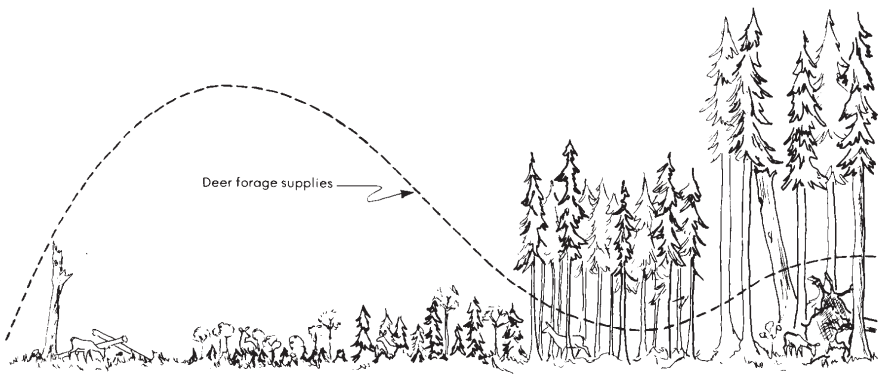
1. Plant Succession

In understanding deer and their habitats, it is often useful to refer to the ecological concept of plant succession. Succession is a process that is initiated following a disturbance of some kind causing a change in vegetation that follows a predictable pattern. Certain plant species or types of species replace or "succeed" each other over time in a predictable fashion. For example, following a hot forest fire that leaves just bare soil, a hillside will soon be dominated by small

herbaceous plants ("forbs" and grasses) and shrubs. These are so-called "early-successional" stages. If left alone for some time, decades or longer, the site eventually may be dominated by trees, a "late-successional" stage. Similar patterns of changes follow other disturbances such as timber harvest or livestock grazing. The particular species of shrubs and herbs will differ across the state, but the process is similar. Management often is designed to alter the pattern of vegetation change following a disturbance to achieve a particular goal.

Succession is important for deer in California, except in very dry areas. Typically early successional stages provide the best deer habitats. Shrubs, which are usually the major component of a deer's diet, typically provide the best nutrition when they are young because they are high in protein and in physical reach of deer. Older shrubs are both poor in nutrition and may have grown too tall for deer to use. Thus, later successional stages, in which trees or old shrubs dominate an area and exclude herbs and young shrubs, often provide poor habitat for deer because they provide few of the nutritious, young plants that allow deer to thrive.

Later successional stages, most notably "old growth," while not important feeding areas for deer, often provide security ("hiding") and thermal cover. We



New clearcut	Seedling conifer	Advanced regeneration	Second growth timber	Old growth forest
Forb - grass - sedge	Shrub - herb	Young tree - shrub	Minimum undergrowth	Moderate undergrowth
1-5 years	6-10	10-20	20-200	200 +

Figure 4. *Generalized representation of the relationship between deer forage supplies and the successional process as influenced by timber harvest and plant succession.*

Graphic from: Wallmo and Schoen (1981). Forest management for deer. Pages 434-457 in O.C. Wallmo, Ed. Mule and black-tailed deer of North America. Wildlife Management Institute, University of Nebraska Press.

These two photographs were taken from the same U.S. Forest Service lookout tower (Klamath National Forest, Pony Creek), approximately 60 years apart.

Top: *Taken in August 1935. Note the amount of early successional vegetation (quality deer habitat) that exists in the area.*

Bottom: *Photograph is of the same area taken in August 1992. Note that the early successional vegetation has been replaced by conifer stands (poor deer habitat), as a result of succession. This type of habitat change (decrease in the amount of quality deer habitat) has occurred on millions of acres of California's key deer ranges. The result of this declining carrying capacity is lower deer numbers statewide.*

Photo by George Gruell

recognize the overall value of these old-growth wildlife habitats, and do not suggest that all of California's wildlands be managed for early successional habitats. However, we do strongly urge that those lands that are managed to produce early or mid- successional stages for various management objectives (e.g., timber or livestock) be managed to enhance habitat quality for deer.

One of the most common and important disturbances affecting deer habitats in California is fire. For tens of thousands of years, fires caused both by lightning and Native Americans burned much of the state, especially chapar-

ral and conifer forests. Many of the plants most favored by deer in these habitats, such as deerbrush, need fire to stimulate their seeds to germinate, or sprout from burned stumps. Early explorers and naturalists described forests of the Sierra Nevada as open and parklike due to frequent, usually low-intensity and relatively cool ground fires.

This has changed dramatically in the 20th century. Policies and practices regarding fire suppression have allowed vegetation in much of the state to succeed to dense, closed-canopy forests and stands of old and decadent chaparral, much to the detriment of deer. Photographs taken at the same place over long intervals of time document these changes. When fires do occur, they are hot, catastrophic wildfires. Following these, forest managers often seek to avoid or minimize the duration of the early successional stages of vegetation by planting conifers and suppressing shrubs with herbicides, which further decreases the value of the habitat for deer.

In areas of low rainfall, such as east-side Sierra Nevada winter ranges, fires may have an extremely detrimental effect on deer habitats. In these dry or desert habitats, fire may kill and prevent the re-establishment of vegetation (e.g., bitterbrush, sagebrush, mountain mahogany) that deer need to survive.

2. Spatial Scale

Another important issue to consider regarding deer habitat is spatial scale. The density of deer in California varies from one deer in tens of square miles in desert environments to tens of deer per square mile in some of the most productive habitat. Typical summer-range densities of migratory deer, however, may be from 2-10 deer per square mile; some non-migratory deer occur at even higher densities. A little arithmetic shows that even a relatively large-scale disturbance, say a 10,000-acre wildfire (about 20 square miles), may affect habitat for a few hundred deer at most. Management activities or disturbances in smaller areas, from several tens to several hundreds of acres, by themselves can have only a small benefit. However, when many small treatments are linked together over time, they can be significant.

Thus, if you want to improve deer habitat in a meaningful way, think big! This can be done either by influencing management on large pieces of land, or by a collection of many smaller projects that together have a large impact. An example of the former would be to require that post-fire rehabilitation practices

Wintering Rocky Mountain mule deer in Round Valley near Bishop, California. Important forage plants are bitterbrush, sagebrush, perennial grasses and annual grasses and forbs. Wildfires in many of these east-side habitats have virtually eliminated the bitterbrush, reducing overall carrying capacity for mule deer.
Photo by Tom Kucera

on an entire ranger district on a national forest allow a flourishing shrub understory to develop. Examples of the latter include rehabilitating all the springs on a B.L.M. Resource Area, replanting 50 acres of winter range each year for 20 years, or reduction of livestock on a series of grazing allotments over time.

In summary, the two most important principles for creating or improving deer habitat in much of California are: 1) in areas with substantial rainfall, introduce frequent disturbances of appropriate types to create and maintain early-successional vegetation; and 2) influence management on an appropriately large scale. The early-successional plant species favored by deer contain the best nutrition; land-management policies that remove disturbance from an ecosystem and allow succession to proceed to later stages often create poor deer habitat. Policies and projects that reflect an isolated, small-scale approach to habitat improvement may be ineffective and a waste of money.

III. Who Manages Deer and Deer Habitats?

California is complex not only ecologically, but administratively as well. In addition to extensive private land ownership, there is a variety of state and federal agencies whose missions and activities affect mule deer and their habitats. The CDFG estimates that of a total of about 100 million acres in California, there are approximately 64 million acres of deer habitat. Approximately 60 percent of this deer habitat is administered by the federal government, including nearly all the summer ranges of migratory deer. Patterns of land ownership across the state are shown in Figure 6 on page 31.

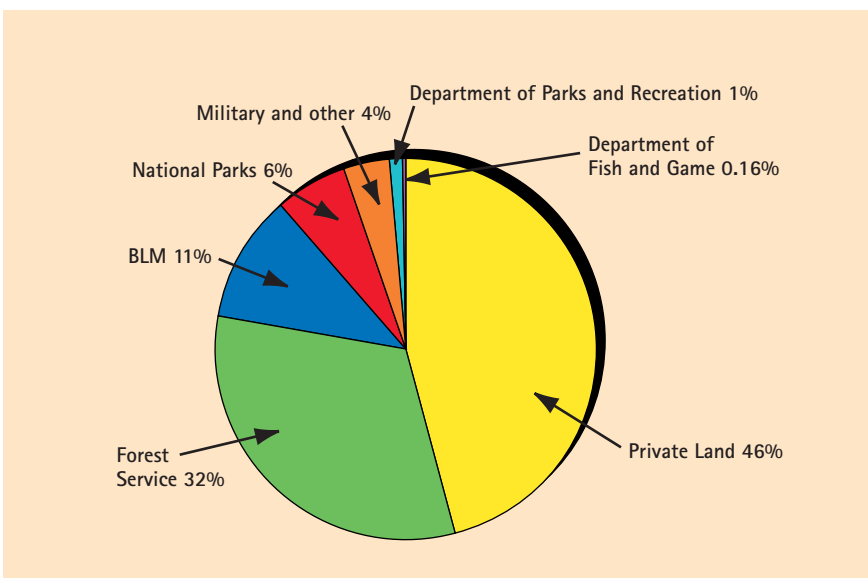


Figure 5. Who's Minding the Habitat?

About 64% of California's 100 million acres is deer habitat. How much of it is managed to benefit deer? The pie chart above, shows the ownership of the state's 63.7 million acres of deer habitat.

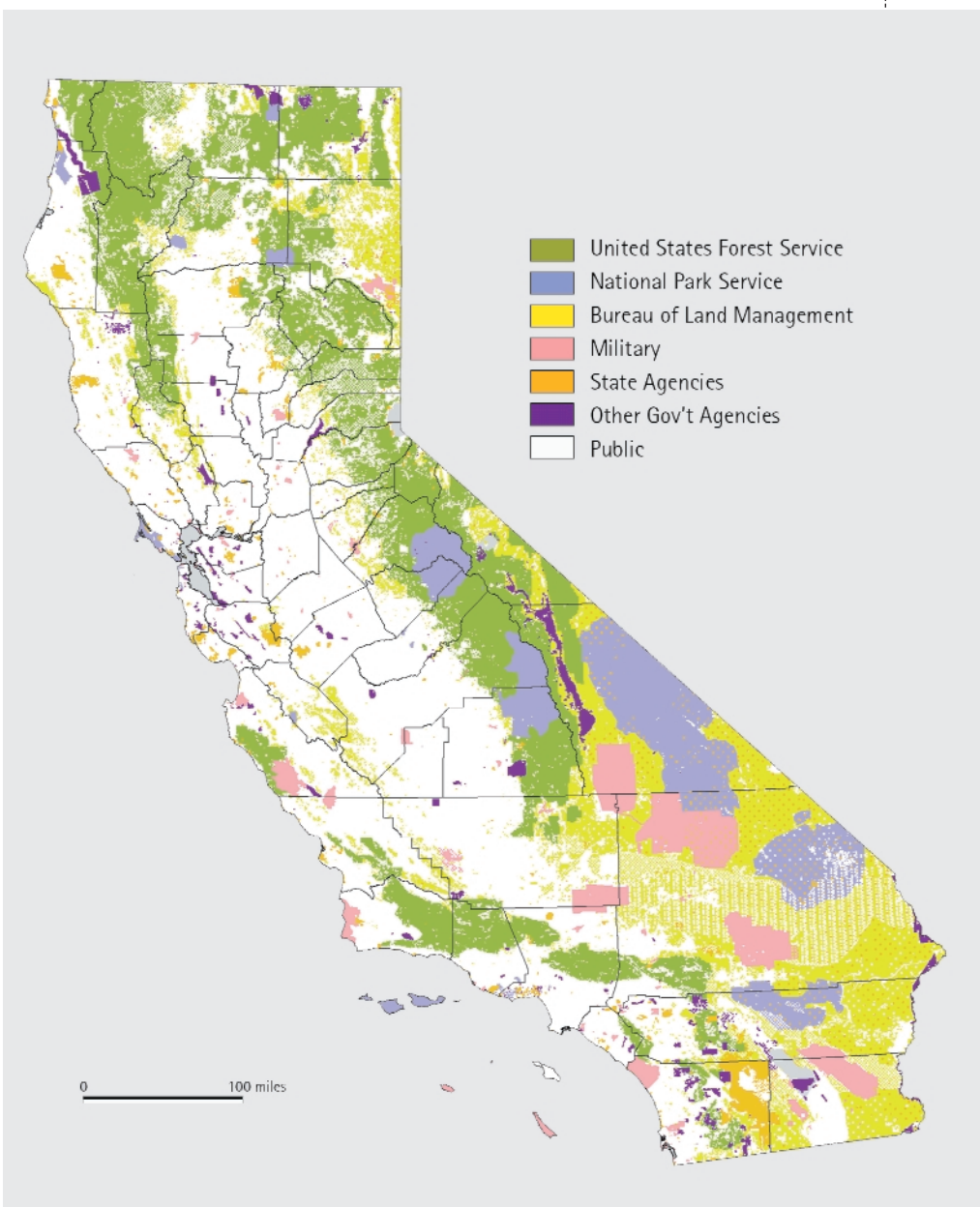


Figure 6. Land Ownership

source: Teale Data Center

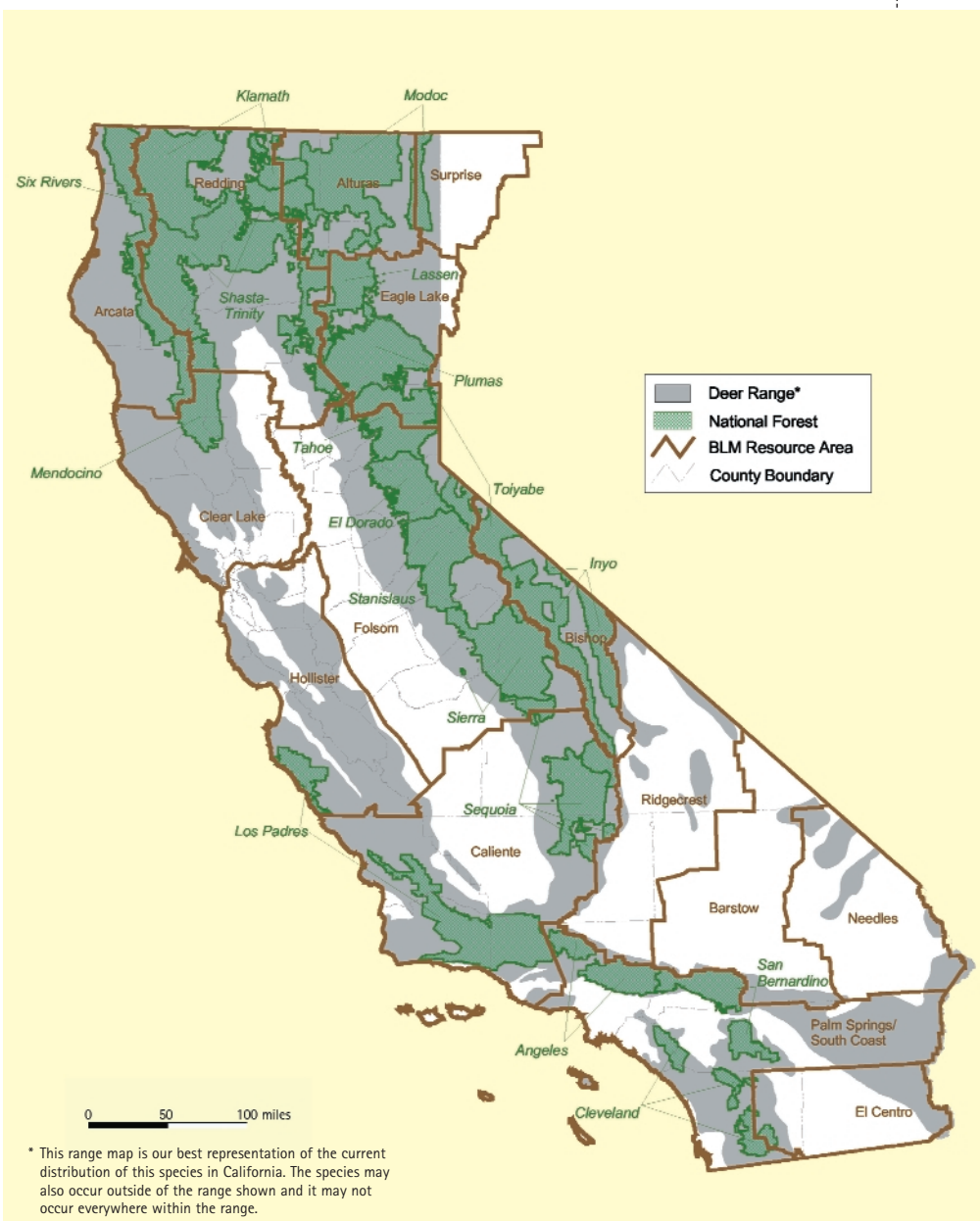
To best determine where to put one's efforts in improving deer habitats, it is important to know the "players" in deer management and their roles. The following are the most important.

A. United States Forest Service (USFS)

An agency within the United States Department of Agriculture, the USFS is the largest public land agency in California. About one-fifth of California's approximately 100 million acres, or about 20 million acres, are managed by the USFS. As shown in Figure 5, on page 30, most of these acres are deer habitat. Thus, activities on lands managed by the USFS have enormous implications for California's deer.

In the California region of the USFS (Region 5), there are 18 national forests. These forests extend from the Six Rivers National Forest at the California/Oregon border to the Cleveland National Forest in San Diego County. (See Appendix I on page 86 for a list of the addresses and telephone numbers of USFS offices in California). Each forest is headed by a forest supervisor, who makes decisions on land and habitat management directions for that particular forest based in part on review by a staff of technical specialists, including hydrologists, botanists, and wildlife biologists. National Forests are organized into Districts. Implementation of forest management direction is accomplished at the District level, where the District Ranger and staff conduct field activities.

USFS management actions that may affect deer habitat include timber harvest, road construction, livestock grazing, and revegetation activity following fire or timber harvest (including suppression of "undergrowth"). The USFS has a "multiple-use" mandate, and must by law take all resource uses into consideration when planning management actions.



* This range map is our best representation of the current distribution of this species in California. The species may also occur outside of the range shown and it may not occur everywhere within the range.

Figure 7. Deer Range, National Forests and BLM Resource Areas

source: Department of Fish and Game

Some of these may benefit deer habitat; some do not. As a federal agency managing public lands, the USFS actions are open to public review and comment. Interested parties may review proposed management actions and suggest alternatives. In the section IV on page 38 of this Guide we discuss how this is done.

B. Bureau of Land Management (BLM)

The Bureau of Land Management is an agency within the U.S. Department of the Interior. It was formed in 1946 to manage what remained of the "public domain" lands after transfer to individuals, states, and national forests and parks. By law, the BLM is required to manage in a way that accommodates many uses of the land, including livestock grazing, timber harvest, mining, and wildlife habitat.

The California State Office of the BLM, headquartered in Sacramento, administers about 7 million acres of deer habitat in California (figures 5 and 6 on pages 30-31). The agency is organized into 14 Resource Areas, from Arcata and Redding to El Centro. (See Appendix II on page 91 for a list of addresses and telephone numbers of BLM offices in California.) The most important BLM activity affecting deer habitat in California is livestock grazing. In addition, timber harvest and mining administered by BLM can have significant implications for deer habitat. Like the USFS, its actions are open for public review and comment; see Section IV on page 38 for a description of this review process.

C. National Park Service (NPS)

An agency within the U.S. Department of the Interior, the National Park Service administers national parks, seashores, and historical monuments that, in California, include more than 3.5 million acres of deer habitat. Compared to other management agencies, NPS conducts little active land management; for example, there is no commercial timber harvest or livestock grazing in national parks. However, policies such as allowing natural fires to burn, programs of controlled burning, and restriction of camping and the use of pack horses in and near meadows can yield very important benefits for deer habitat.

D. Private

About 29 million acres of deer habitat in California, or nearly half of the state's total, are privately owned. These include conifer, hardwood, and shrub habitat types. Large industrial timber companies own about 4 million of these acres. The management of these private lands varies with the economic needs and the wishes of the landowners, from large, industrial forestry concerns to livestock grazing, to hunting clubs, to second homes. CDFG's Private Lands Wildlife Habitat Enhancement and Management Area (PLM) Program is directed toward private landowners, seeking to reward them for improving wildlife habitat on their lands. In addition, private consultants can provide valuable information on deer habitat improvement. A list of private consultants working in this field can be obtained by contacting Wildlife Extension at the University of California, Davis at 530-752-1496.

E. California Department of Fish and Game (CDFG)

The California Legislature formulates the laws regulating the management of fish and wildlife in California. It has delegated authority to the Fish and Game Commission (Commission) to regulate the take and possession of wildlife, for example, to set seasons and bag limits. It is the responsibility of CDFG to carry out the policies of the legislature and commission.

In California, the goals of deer management are to encourage the conservation, restoration, maintenance, and utilization of California's wild deer populations. Deer are managed on a herd basis; that is, single deer herds or groups of herds with similar management and habitat requirements are identified and managed accordingly. Eighty Management plans have been developed for the 111 recognized deer herds. These plans describe the ecological and political settings of the herds, list current problems, and propose solutions. The component of deer herd management plans of most interest to readers of this Guide is the one dealing with habitat.

CDFG is organized into seven regions, with a central headquarters in Sacramento where policy direction and oversight is conducted. Deer management is located in the Wildlife Programs Branch, under the supervision of a Branch Chief, deer program coordinator, specialists, and staff. Policy implementation is accomplished at the regional level. Each region has a Regional Manager, senior wildlife biologist supervisors, and a staff of field biologists. Actual herd management occurs at the regional level. (See Appendix III on page 92 for a list of addresses and telephone numbers of CDFG offices.)

The CDFG has management responsibility for determining and enforcing the season and bag limits for deer hunting. However, CDFG has direct responsibility for less than 1 percent of the state's deer habitat. Thus, because CDFG owns or has direct control over relatively little land, its

ability to affect the health, condition, and total number of deer, is limited. Other entities, especially federal land management agencies, manage the majority of publicly owned deer habitat in California.

F. Counties

Counties own or directly manage little deer habitat. However, counties can and do affect deer and their management directly and indirectly. For example, the implementation of county general plans can result in urban development in deer habitat. California law also gives selected county boards of supervisors veto power over proposed antlerless or either-sex hunts. Historically, these hunts have been controversial in California, but are a common component of deer management throughout the nation. Although antlerless hunts are properly considered population management and not direct habitat management, they can have important habitat implications. An antlerless hunt may be the only way to reduce a deer population to nearer the long-term carrying capacity of its habitat, or to allow overbrowsed vegetation to recover. If you are interested in an antlerless hunt that has been proposed by CDFG, but is being opposed by county supervisors, make your opinions known to the supervisors. Attend board meetings, testify, and write letters supporting the proposal. This is one area where your actions can have an almost immediate impact.

County Fish and Game Advisory Commissions are composed of volunteers appointed by County Supervisors that have an interest in wildlife issues in the county. One of their responsibilities is to direct the expenditure of a part of the monies collected from fines for hunting and fishing violations. These funds can be used to support deer habitat improvement projects. Additionally, they often have significant input on proposed antlerless and either sex deer hunts.

IV. The Land-Management Planning Process

The best way to influence management on public lands is to become known to the managers and express your interests to them. It is important to get to know the CDFG wildlife biologist(s) in your bioregion of interest. He or she will know what specific projects or practices in an area are affecting deer habitat and can often suggest ways to put your concern and energy to best use. Get to know the USFS forest supervisor and district ranger, or BLM resource area manager, and their technical support staff of wildlife biologists and range managers. It is critical to let them know that there are people interested in deer and in improving deer habitat on our federal lands. Ask to be on any citizen advisory committees they may have and participate in them. Request notification of proposed land-management activities and the supporting environmental documentation, and submit your comments during the appropriate periods.

Opposite Page: *Northeastern California BLM livestock allotment. Riparian areas such as these wet meadows and seeps are a critical habitat component for mule deer and other wildlife in Great Basin ecosystems. Competition in these areas from livestock can be a significant limiting factor.*

Photo by Eric Loft

A. Federal

As described in the previous sections, the USFS and BLM are the agencies that manage the majority of the deer habitat in California. Thus, the best way to affect deer habitat is to influence management on these public lands. This is your land, and federal land managers are working for you. But, you must make your opinions and wishes known to the federal land managers and become involved in the review process of management decisions. You will also need patience. Simply commenting or writing letters does not ensure that you will be successful. Things may happen slowly, and you will not always get the results you want. Often there is a variety of competing interests trying to influence land management, and you must provide your opinions clearly, at the appropriate time, and in the appropriate way.

Formal interactions with agencies are often necessary, and you must know the process for commenting on agency plans and decisions. USFS and BLM operate under several of the same federal laws and both must manage for multiple resources, but they differ in some of the specifics of the land-management planning processes for actions that may affect deer habitat. To be effective you need to understand the system. Much of the following information is based on two excellent documents. One, *How to Appeal Forest Service Project and Activity Decisions*, by The Wilderness Society (900 Seventeenth St., NW, Washington D.C. 20006-2596, 202-429-2612), deals with a variety of types of management activities. The second, *How Not to Be Cowed*, by Johanna Wald (available from the Natural Resources Defense Council, 414-777-022), discusses how to influence grazing decisions on BLM lands. If you are serious about wanting to benefit deer habitat by influencing management of public lands, these documents will help to guide you through the process. They even contain examples of the types of requests and comments you may wish to make.

Federal agencies must follow the National Environmental Policy Act

(NEPA), which requires them to identify and describe the environmental impacts resulting from any proposed "action" and its alternatives. These actions can include finalizing or amending a forest plan, which provides overall direction to management on an individual forest, or proceeding with a particular timber sale. NEPA requires that federal agencies solicit input from the public during the early stages of project planning. This "scoping" phase is your first opportunity to influence agency planning. According to NEPA, federal agencies must prepare an Environmental Impact Statement (EIS) whenever they propose an action "significantly affecting the quality of the human environment." Often, an agency will first prepare an Environmental Assessment (EA), a relatively brief assessment of environmental impacts of a proposed project. If the EA indicates the effects will be significant, the agency prepares the EIS; if not, it issues a Finding of No Significant Impact (FONSI), and conducts the proposed action without an EIS.

1. U.S. Forest Service (USFS)

The USFS is the largest land management agency affecting deer habitats in California (Figure 5 on page 30), and its activities are particularly important to deer populations (Figure 6 on page 31). Because so much land and so many forests and activities are involved, it is probably wise to identify one or a few national forests or ranger districts of particular interest to you and to concentrate your efforts to influence projects there. The locations of national forests in California are shown in Figure 7 on page 33.

Your best chance for success will be in convincing the USFS to modify a project or activity to benefit deer habitat during the initial "scoping" stage of the public involvement process, well before significant time and money are expended and the final decision on the project is made.

You must get on the USFS mailing list to be informed of the status of various projects. Send letters to the appropriate forest supervisors and district rangers explaining the general type of activity for which you wish to receive notices. (See Appendix I on page 86 for a list of the addresses and telephone numbers of USFS offices in California). For example, you might request information on all NEPA projects, or on timber sales or grazing allotments on a certain ranger district, or just for a particular proposed road, timber sale, or

recreational development. (See The Wilderness Society's handbook for examples of such requests.) You will then be notified about appropriate projects and the period for public comments on them.

The USFS must provide a 30-day period for public comments on proposed management activities. This period begins on the first day after publication of the official notice for the particular activity or project. If you do not comment within this 30-day period, you will not have established "standing" and thus will not be allowed to file an appeal later if you disagree with the final decision for that project. In your comments, you need to include: 1) your name, address, and telephone number; 2) the specific title of the document in question, such as "Deer Ridge Timber Sale Environmental Assessment"; and 3) specific facts or comments that you want the agency to consider in making its decision, and why. These might be such things as enhancing deer habitat by minimizing brush suppression following timber harvest, excluding livestock from an aspen stand, or not building a campground along a migration route. Making comments during this stage of project planning may produce the best results. You may be able to modify a project by suggesting better alternatives before it is begun and avoid a time-consuming appeal.

The final decision on a project is made in a Notice of Decision. When the Notice of Decision has been made, if you think that it is particularly bad for deer habitat, you may file an appeal if you have established "standing" by having commented on or expressed an interest in the activity during the comment period. There are several types of decisions you may appeal: 1) you may appeal decisions evaluated in an EIS; 2) decisions in an EA, but found to have non-significant impacts (FONSI); or 3) timber sales documented in a decision memo. The appeal must be filed within 45 days of the Notice of Decision. There are no extensions. The agency then has 45 days to decide on the appeal. This agency review of an appeal provides the opportunity for higher-level decision-makers within the USFS to review controversial decisions made by their subordinates.

If you decide to participate in influencing decisions regarding management on USFS lands, and especially if you decide to file an appeal, closely review the document *How to Appeal Forest Service Project and Activity Decisions* mentioned previously. It contains much more detailed information on the steps in the USFS planning process, and has examples of letters to

forests asking to be put on mailing lists for NEPA documents, commenting on projects, and appealing a decision. However, the goal is for an appeal not to be necessary. Instead, potential conflicts should be resolved prior to a decision being rendered. This can only occur if there is active and consistent discussion throughout the planning process. It is critical that a partnership between the agency and the persons interested in deer be established.

2. Bureau of Land Management (BLM)

The BLM is required by law to manage public lands according to comprehensive land-use plans that incorporate the principles of multiple use and sustained yield. Multiple use means that fish and wildlife, ecological preservation, recreation, and watershed are given equal consideration in developing land use plans along with economic resources. Sustained yield requires a long-term perspective in management to ensure that the land's productive capability is maintained.

BLM makes decisions about livestock grazing at two levels: at the Resource Area level by developing Resource Management Plans (RMPs); and at the allotment level by issuing permits for the specific grazing allotment, developing Allotment Management Plans (AMPs), and making decisions based on monitoring. Decisions at both of these levels are important for deer habitats, and the public is entitled to be consulted at each level. Issues to be considered at both levels include numbers of livestock, amount of utilization of forage, range "improvements," condition of areas, water quality, and wildlife habitat. See Figures 5 and 6 on pages 30-31 for the distribution of lands managed by BLM in California and the locations of BLM Resource Areas, and see Appendix II on page 91 for a list of the addresses and telephone numbers of BLM offices in California.

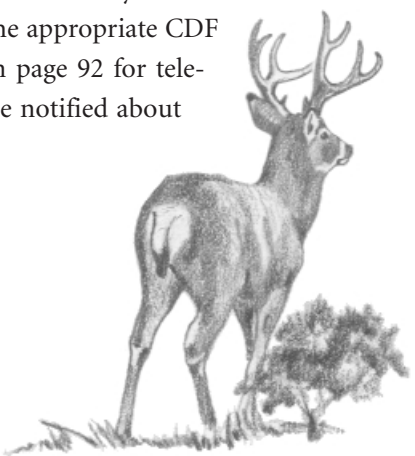
There are three opportunities to comment on RMP's and influence their treatment of deer habitat: 1) when the EIS is being "scoped," that is, when issues are being identified; 2) upon release of the draft plan; and 3) after the RMP is issued. "Scoping" is the process of identifying the issues to be considered in the EIS. Deer habitat can be such an issue. Comments on the draft plan can call attention to areas you think are inadequate in managing for deer habitat. After the final RMP is issued, you can monitor BLM's compliance with the plan and implementation of priorities established in it.

In contrast to the RMPs, on which anyone may comment, only "affected interests" can participate in BLM decisions at the livestock allotment level. To become an "affected interest," request in writing to the BLM Resource Area Manager that you wish to be designated an "affected interest" in a particular area. Explain how you are affected by grazing in that particular area; for example, you hunt or observe deer there and are concerned how grazing is affecting deer habitat. Request the appropriate documents for the area, such as the RMP and EIS for the area to become familiar with the plans. Then, you can determine whether allotment permits, AMPs, and decisions based on monitoring conform to the land use plan.

Again, it will be useful to obtain and thoroughly study a copy of *How Not to Be Cowed*. This booklet not only has much more detail than presented here, but also has sample letters that you can use as models for your own.

B. State of California

Much of the privately owned forestland in California is managed for timber production. The California Environmental Quality Act requires that the potential environmental impacts of timber management be disclosed. Before harvesting timber on private lands, the landowner must file a Timber Harvest Plan (THP). The THP is reviewed by, among others, CDFG personnel. THPs are open to the public, as are the pre-harvest inspections of proposed harvest areas. Call the California Department of Forestry and Fire Protection (CDF) Area Forester at the appropriate CDF regional office (See Appendix III on page 92 for telephone numbers and addresses) to be notified about THPs in your areas of interest.



V. Habitat Improvements

There is a large body of knowledge on manipulating habitats to benefit deer. A good, comprehensive source of information is the book *Techniques for Wildlife Habitat Management of Uplands* by Neil F. Payne and Fred C. Bryant (McGraw-Hill, 1994). In addition to the landowner and local wildlife experts, this is a good reference to consult when planning any particular deer habitat improvement project. We will discuss several types of habitat improvement practices in general terms here; more specifics are included in the bioregional sections. It is critical that you keep the big picture in mind when planning habitat improvements, as discussed before in Section II(C) on page 25.

Any particular projects you are considering should be discussed with and reviewed by local experts, and must be appropriate for local conditions. Consider deer habitat in the larger context of tens of thousands of acres, and not just the particular project area you are working in. For example, when working with a federal land-management agency on a particular controlled burn, you need to focus beyond the individual site and be sure that the project will work in concert

Opposite Page: *Using a drip torch to initiate an "understory" burn can significantly improve deer forage. Key deer forage plants often respond well to periodic burning such as this burn project in mixed conifer-hardwood stands of the South Sierra Nevada bioregion.*

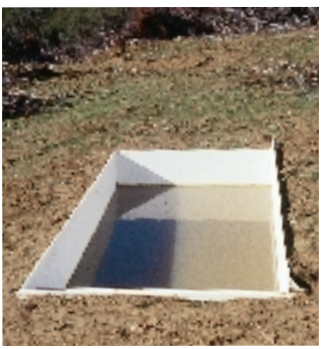
CDFG File Photo–Region 4

with other burns in the entire watershed. It is the sum total of all the burn projects that will have a positive effect on the deer population, not the individual burn itself. Get suggestions from, and coordinate your efforts with, the CDFG field biologist in your area, and with other agency personnel as appropriate.

A. Water

The availability of water influences the distribution of most wildlife populations. Obviously, the need for water is most apparent in arid regions. However, simply putting water in an area that lacks deer does not ensure that the deer population will increase. Developing a water source without regard for the availability of food and cover is a waste of time and money. In arid areas where water developments may be helpful to deer, consideration also must be given to livestock and feral animals such as burros that may use the water. In some cases this interaction may lessen the positive effect of the water project for deer.

In their book, *Techniques for Wildlife Habitat Management of Uplands*, Payne and Bryant discuss several ways to make water sources available to livestock and wildlife. Additionally, they offer designs to exclude livestock. They also present designs for a variety of water sources, both natural watering points such as



Left: *Big game guzzlers, such as this one in the Central Coast bioregion, collect rainwater and make it available to deer and other wildlife during the dry part of the year.*

Right: *Using a tractor to create small ponds provides water for deer and other wildlife.*

Photos by Phil Pridmore

Left: *CDF helitorch burns chaparral in the South Coast bioregion. Because of dense chaparral the only practical way to effectively burn large areas is to use a drip torch suspended from a helicopter.*
Photo by Jim Davis

Right: *Cool "understory" burning in conifer stands creates deer forage while not harming the trees.*
Photo by Ron Bertram

springs and seeps and artificial watering points such as guzzlers and reservoirs. An organization called Desert Wildlife Unlimited (619-344-7073) is particularly experienced in water developments for burro mule deer and other wildlife in southern California. All plans for water developments must be carefully thought-out, however, and discussed with the local CDFG and other agency personnel.

B. Controlled Burns

Any ecological change, including fire, will benefit some species and harm others. It is also true that fire can benefit deer habitat in some areas and destroy it in others. Much of California's vegetation is adapted to fire; it may be particularly flammable, or may sprout or its seeds germinate after fire. The young, rapidly growing vegetation that appears after burns in fire-adapted vegetation is highly nutritious and valuable for deer. Classic examples of such vegetation are in California brushland areas, where plants like deerbrush and whitethorn follow fires and provide valuable forage.

Fire can also degrade deer habitat. On drier ranges, such as those that receive less than about 10-15 inches of rain per year, plants may not respond positively to being burned. This becomes more true as the area becomes more arid. The effects of fire on bitterbrush, for example, are quite variable. In some areas, under certain

Top: *Chamise responds well to fire. Note the young sprouts at the base of the burned plant. These sprouts are excellent deer forage during the spring. However, chamise will be used by deer throughout the year when available and palatable.*

Photo by Jim Davis

Below: *The use of a "ball and chain" can help prepare a site for burning or act as a form of mechanical disturbance, setting succession back and encouraging sprouting.*

CDFG File Photo–Region 3

On gentle terrain a tractor can be used to prepare a site for burning or act mechanically to disturb the habitat, creating early successional vegetation favored by deer.

Photo by Ron Rempel

conditions such as high soil moisture, bitterbrush may resprout after burning and improve a winter range. In other circumstances, burns may kill bitterbrush and allow cheatgrass (a non-native, annual grass) to become established. The cheatgrass may then burn frequently, every 5 to 7 years, preventing the reestablishment of bitterbrush and sagebrush and resulting in much poorer deer habitat.

Thus, when evaluating burning as a management tool to improve deer habitat, you must take into consideration the location and general ecological conditions, plant species present, amount of yearly rainfall, and the season. For example, if your goal is to improve the amount and vigor of ceanothus brush species, a desirable deer forage, you must know which species of ceanothus grows in the area. Species such as mountain whitethorn and tobaccobrush are vigorous sprouters and can be managed with winter or spring burns, when fire hazard is low. With other species, you should avoid burning in the spring, which may eliminate them from the area burned. In some areas, especially those with higher precipitation or during wet years or seasons, burning may be beneficial and should be encouraged; in others, fires should be avoided or suppressed. As always, discussions with local experts must be part of planning the project.

The management of forests following large wildfires is of great concern to those interested in deer habitats. Following extensive wildfires, forest managers often want to plant conifers and suppress the brush that competes with them. It is the resulting brush after fires that is so valuable to deer. Brush suppression often is done chemically, with aerial spraying of herbicides over large areas or through hand application. This activity can greatly decrease the value of such fires to deer habitat.

Riparian habitat composed of meadow vegetation. Adjacent to the meadow is a stand of aspen. These riparian and aspen habitats are important to deer— especially lactating does.

Photo by Eric Loft

C. Riparian

Riparian areas, those associated with standing or running water, provide important deer habitat in several ways. The lush vegetation associated with watercourses provides cover for fawning and concealment, and provides nutritious forage. In many locations of the state, riparian areas offer the only green vegetation in late summer. Consequently, it is these areas that frequently receive the heaviest use, both from livestock and from wildlife, including deer. Controlling livestock stocking rates, typically by fencing or herding, is the best way to manage these areas. The reduced browsing pressure then allows plants to regenerate. This process may be accelerated by planting riparian vegetation such as willows. However, after the vegetation has recovered, browsing pressure must be controlled or the riparian habitat again will be degraded. In some areas, especially northwestern California, excessive deer browsing also can have detrimental effects on these riparian areas.

D. Planting and seeding

One way to revegetate degraded or burned land is to plant or seed desirable vegetation. Willow cuttings are often planted in riparian areas to rehabilitate streams, springs, or meadows that are overgrazed; bitterbrush is often planted from seed on winter ranges that have been burned or mechanically treated. Oaks can be planted from acorns or seedlings.

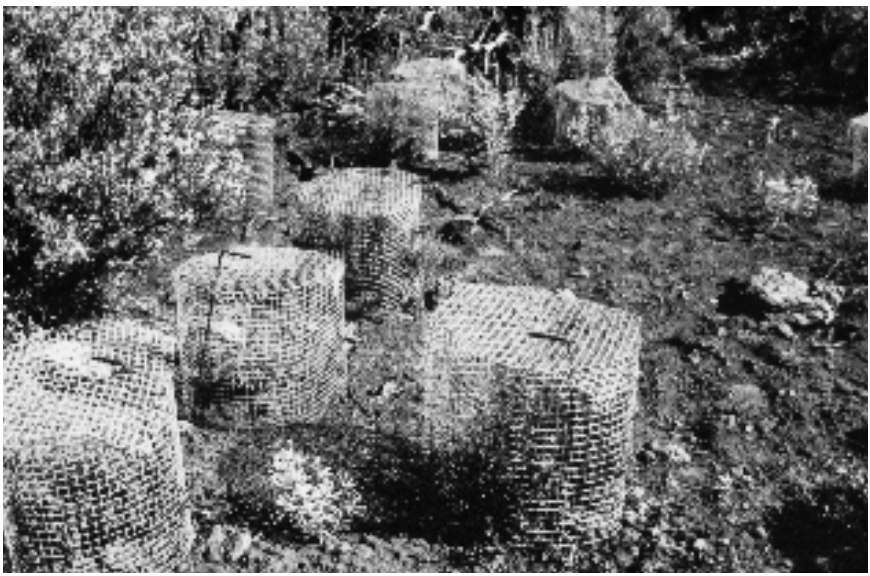
Several important factors need to be considered when evaluating the possibility of planting or seeding. The first is that plant species native to the project area should be used. Planting mountain whitethorn on a Great Basin winter range, or bitterbrush in coastal oak woodlands, would be a waste of time, money, and effort because the species do not naturally occur in these areas and would not survive. Second, use seeds or seedlings from local sources. For example, acorns collected from blue oaks on the coast, adapted to relatively cool, moist conditions, would probably do poorly if planted in the hot, dry

Opposite Page: *Interior live oak acorns. Acorn mast, when available, compose a large part of a deer's diet during the fall and early winter. Acorn production is often unpredictable. Therefore, maintaining a diversity of oak species increases the probability that acorns will be available each year.*

Photo by Kent Smith

A tractor is often used to prepare a seed bed to establish deer and other wildlife forage.

CDFG File Photo–Region 4



It is often necessary to protect new plants from deer, livestock and rodents. Excessive foraging can retard or completely eliminate new plant development.

CDFG File Photo–Region 3

Sierra foothills. Third, the plants to be used, even if native to the area, must be appropriate for the local ecological conditions. For example, willows require moist soil; they will not grow on rocky uplands. Thus, if you are interested in rehabilitating an area by planting or seeding, learn what plants are native to the area, appropriate for the particular ecological conditions, and provide good deer habitat. Discuss your ideas with the local CDFG biologist, and with USFS or BLM biologists, botanists, or range conservationists.

For the most comprehensive source of information on planting and managing oaks and oak woodlands, consult the Integrated Hardwood Range Management Program at the University of California, Berkeley (510-643-5429). Several of their publications are of particular value for planning habitat improvement projects in oak woodlands. *Guidelines for Managing California's Hardwood Rangeland* (University of California Division of Agriculture and Natural Resources Publication 3368; 1996; $15.00) is a recent, comprehensive guide to managing oak woodlands. The pamphlet *How to Grow California Oaks* by Douglas D. McCreary discusses issues such as col-

lecting acorns and the maintenance and protection of seedlings and lists nurseries producing native oaks in California. Two documents by Sharon G. Johnson, *Wildlife Among the Oaks - A Management Guide for Landowners*, and *Living Among the Oaks - A Management Guide for Landowners* present information on how people can manage and enhance oak woodlands for wildlife habitat and other environmental values.

E. Fences

To exclude animals from certain areas such as springs, creeks, and meadows, it is often necessary to construct a fence. There are many fence designs appropriate for various objectives, such as excluding livestock and accommodating wildlife, or excluding both livestock and wildlife. Some fences are permanent, others can be easily lowered seasonally to allow animal passage or to avoid damage from snow. The Payne and Bryant book *Techniques for*

Protecting important deer habitat, such as this aspen stand, from livestock, can be as simple as felling trees at the margins of the stand to block livestock access.
Photo by Brian Barton

Fence construction is an important consideration. Note that the fence has five strands of barbed wire, with the bottom wire nearly 24 inches off the ground. A "deer friendly" fence should be no more than 4 strands of barbed wire with the bottom wire 18 inches above the ground to allow fawns easy passage, while blocking access to young livestock.

Photo by Brian Barton

Fences constructed with more than four strands of barbed wire can increase deer mortality. This six strand barbed wire fence was too much for this deer to negotiate.

Photo by Ken Mayer

Wildlife Habitat Management of Uplands presents many fence designs for various purposes.

The practice of felling trees to block access by livestock to riparian areas or aspen stands, although not technically fence-building, accomplishes the same goal, and has been successful in particular cases.

F. Funding of Projects

There is a variety of programs that can supply funds for wildlife habitat enhancement projects. Here we mention only a few. More information is available in a document titled *Cost Share and Assistance Programs for Individual California Landowners and Tribes* available at no cost from Cooperative Extension Forestry, Department of ESPM, University of California, Berkeley (telephone 510-642-2360). Some of the programs most relevant to deer habitat include the following:

1. The **Vegetation Management Program** (VMP) of the **California Department of Forestry and Fire Protection** (CDF) has as its goal the use of fire to control unwanted vegetation that creates wildfire hazards. Benefits may include improving wildlife habitat. In this program, CDF conducts prescribed burns on private lands, and pays up to 90 percent of the cost. Contact the VMP program manager, CDF, Sacramento at 916-653-9447.

2. The **Private Lands Wildlife Habitat Enhancement and Management Area Program** (PLM) of CDFG provides incentives to private landowners to enhance wildlife habitat on private lands. The landowner must develop a 5-year management plan and conduct habitat improvements. In return, the landowner is provided by the Commission and CDFG flexible, biologically sound hunting seasons and bag limits. The fees collected by the landowner for hunting on the land are used to offset the costs of habitat improvements made on the property. Contact the appropriate CDFG Regional Office, or the statewide PLM Program coordinator at 916-653-1777.

3. The **California Riparian Habitat Conservation Program** (CRHCP) of CDFG seeks to protect, restore, and enhance riparian habitat throughout the state. It offers grants to local, state, and federal agencies, resource conservation districts, and non-profit public benefit corporations for restoration projects such as fencing. Contact the program coordinator at 916-445-1072.

4. The **Deer Herd Management Plan Implementation Program** of CDFG seeks to restore and improve deer habitat in California. Any public organization with land-management responsibilities wanting to improve deer habitat may submit project ideas under this program. Contact the statewide program coordinator at 916-653-7203.

5. The **Mule Deer Foundation** is a private, non-profit organization that is dedicated to improving North America's mule and black-tail deer populations. It funds a variety of habitat-improvement, research, and other projects, such as this document, to benefit mule deer. They can be contacted at 888-375-DEER.

6. The **California Deer Association** is a private, non-profit organization that is dedicated to improving deer habitat and populations in California. It funds a variety of habitat improvement, research, and other projects to benefit mule deer. They can be contacted at 831-757-0142.

Columbian black-tailed deer often find dense conifer stands useful as escape cover in the North Coast/Klamath bioregion.

Photo by Tom Kucera

VI. Mule Deer in Bioregions of California

A. North Coast/Klamath

1. Deer Habitats and Ecology

Most deer in the North Coast/Klamath bioregion are migratory, spending winters at lower elevations and summers in high mountain areas. An important exception to this general pattern occurs among deer in areas near the Pacific coast, particularly in CDFG hunting zones A, B1, and B4, where most deer are year-round residents.

Summer ranges of the migratory deer are typically in conifer forests, where deer rely on important shrubs such as mountain whitethorn, deerbrush, snowberry or tobaccobrush, and buckbrush, along with various species of wild cherry. In the fall, oaks and the acorns they produce are very important for deer. Acorns provide an abundant source of nutrition during the period when much of the vegetation is dry and of low quality. Deer spend winters at lower elevations where herbaceous vegetation begins growing after fall rains. Filaree and clovers are important forages here. Also important for wintering deer, especially on the eastern side of this region, is chamise-dominated chaparral. The non-migratory deer are most abundant where there are openings, such as oak woodlands interspersed with grasslands and riparian areas, and less abundant in redwood and Douglas-fir stands.

2. Limiting or Important Habitat Factors

The shrubs upon which deer in the North Coast/Klamath bioregion rely, especially on the summer ranges, are disturbance-dependent. That is, they grow more abundantly and healthier where the land has been disturbed, such as with a fire. The downward trend in deer habitat in this region is related to the absence of disturbance, especially on summer ranges. With decades of successful fire suppression, the canopies of most of the coniferous forests have closed, allowing little light to reach the forest floor and preventing the growth of ground vegetation. Most of the shrubs that are present are older, mature plants. Young, early successional stages of shrubs, the kind that provide the best deer habitat, are rare. Thus, shrubs in the conifer-dominated summer ranges are mature and dying; in chaparral, with the suppression of fires, shrubs become overmature and decadent. Consequently, deer habitat suffers.

Also of concern in this bioregion is the condition of oak woodlands and riparian areas. The removal of hardwoods for firewood and other purposes and the lack of oak regeneration may have long-term negative consequences for deer habitats. Oaks provide forage, shade, and visual cover for deer and, perhaps most importantly, crops of highly favored acorns. Fire can be used to protect and enhance these hardwoods. Riparian habitats, those associated with streams, and wet meadows are degraded by heavy livestock use on both summer and winter ranges. This removes cover used, for example, to hide fawns, as well as succulent forage. Particularly along much of the coast and in

Degraded meadow riparian areas such as this reduces overall habitat quality for deer and other wildlife.
CDFG File Photo–Region 4

the southern portion of the region, many areas have been affected by heavy browsing by the deer population. Alder and willow are highly favored by deer, and are some of the only green forage left in late summer and early fall, the time of most nutritional stress in this bioregion. Heavy browsing by deer can remove them from a streamcourse.

Land ownership in this bioregion has important implications for deer habitat. Much land is privately owned here, both by large industrial timber companies and smaller ranching and timber operators.

3. Major Land Practices

The most dominant land management activity in the Klamath/North Coast bioregion is timber production; the second is livestock grazing. The most important landowners are the USFS and private (Figure 5 on page 30). Urbanization is a local problem on some winter ranges. The biggest effect of urbanization may be to reinforce the need for fire suppression in many areas, redirecting fire suppression to the rural-urban interface.

4. Habitat Improvement Practices

Several aspects of timber production can be modified to benefit deer habitat. Remember, what is needed is to produce early successional vegetation, namely shrubs and herbs, and then not hurry it along into later successional types such as closed-canopy forest with a poorly developed understory. Patch cuts, which open the tree canopy, will favor deer especially when the shrubs are not suppressed after the trees are removed. The practice of biomass thinning, in which small-diameter conifers are cut and chipped for burning in electrical-power generating plants, has the potential to open the canopy and favor growth of the understory; however, such benefits are yet to be documented in practice. Mechanical removal of vegetation does not provide the same factors, such as heat and mineral input, that fire does, and by stimulating tree growth, it may suppress the understory.

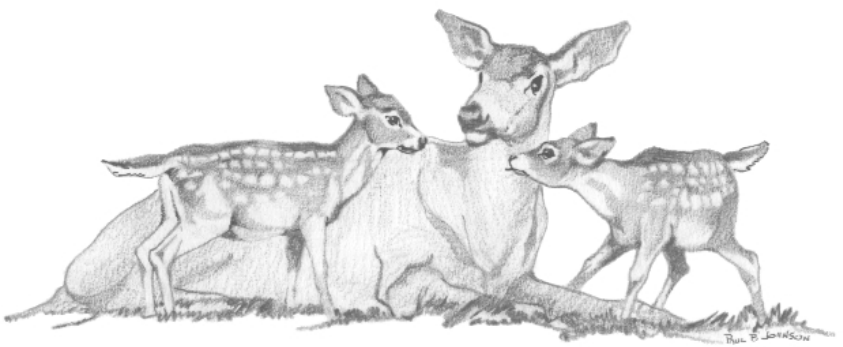
The dense forests that result from decades of fire suppression are subject to infrequent but catastrophic wildfires that may burn tens of thousands of acres. Post-fire management of these lands can have important consequences for deer habitats. These post-fire brushfields, some of the best deer habitat being produced, are unwanted by foresters because the shrubs suppress the growth of the conifer trees that are planted for later harvest. Suppression of brush to "release" the conifers, frequently with herbicides, is often practiced. Those interested in maintaining and improving deer habitat, especially on public lands, should demand management that allows shrubs to grow along with the conifers.

On chaparral and other shrublands, controlled burns are to be encouraged. Contact local CDF officials or CDFG personnel to find out how you can support plans to burn overmature shrublands.

Fencing can prevent access by deer and livestock into riparian areas and allow alders and willows to regenerate. One type of fence that has been shown to be effective and economic in this bioregion is a curtain fence. This is a six-foot fence hung with #12 wire from a 1/8 inch, high-strength cable. It is stretched long distances (up to 400 feet) between trees, eight or nine feet off the ground. The fence is tensioned horizontally and staked to the ground. A project on Feliz Creek in southern Mendocino County using this fencing, funded in part by the California Forest Improvement Program (CFIP), showed almost immediate results in regrowth of alders. After one year the

trees were up to six feet tall. Benefits were not just for deer habitat; steelhead also returned to the stream, and no doubt a variety of songbirds and other wildlife benefitted. For more information on this type of fencing and to see a demonstration, contact the University of California's Hopland Research and Extension Center (707-744-1424) in Mendocino County.

Degraded riparian areas and oak woodlands can be improved by planting riparian vegetation such as willows and oak seedlings and acorns. See the previous section on Planting on page 50.



B. Cascade/Great Basin

1. Deer Habitats and Ecology

Most deer in the Cascade/Great Basin bioregion are migratory, although there are some populations of deer that remain all year on areas used as winter ranges by migratory animals. Great Basin shrub habitats are the most important winter ranges. These are dominated by bitterbrush, big sagebrush, and mountain mahogany; juniper woodlands and even cheatgrass-dominated areas with trace amounts of shrubs also are occasionally used. Many deer in this region cross the state line and winter in Nevada. Management authority for them is shared with the Nevada Department of Wildlife (NDOW). In addition, some populations summer in Oregon and winter in California, and these are managed in cooperation with the Oregon Department of Fish and Wildlife.

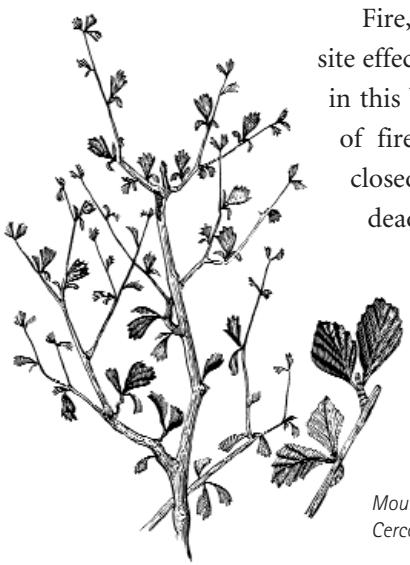
In summer, higher elevations with montane shrubs such as mountain whitethorn, tobaccobrush, deerbrush, bitterbrush, and areas with willows,

Opposite Page: *Common habitats of the Cascade/Great Basin bioregion include bitterbrush and big sage similar to this deer winter range in Lassen County.*
Photo by Eric Loft

aspens, and cottonwoods are most important. Forbs (small herbaceous annual plants) and grasses are eaten in the spring and early summer. Oaks–both black oak and Oregon white oak–and the acorns, leaves, and mistletoe they produce are especially important in the fall and winter. Acorns in particular provide an abundant source of nutrition during the period when much of the vegetation is dry and of low quality.

2. Limiting or Important Habitat Factors

The availability and condition of montane shrubs at higher elevations and Great Basin shrub-steppe habitats on winter ranges are the most important factors in this bioregion. These habitats provide both food and cover, but primarily food, for deer. The distribution and diversity of shrubs, the size of the "patches" in which they occur, and their relationship to water and the quality of cover are of primary importance. Also of concern is access to snow-free winter ranges; migration corridors free from human developments or disturbance must be maintained. Riparian areas are frequently degraded by livestock and, in places, wild horses.



Mountain Mahogany
Cercocarpus betuloides

Fire, or its absence, has profound but opposite effects on summer and winter deer habitats in this bioregion. On summer ranges, decades of fire suppression have resulted in dense, closed-canopy forests with an understory of dead or decadent shrubs that provide little nutrition for deer. In contrast, on many

winter ranges, fire carried by the introduced cheatgrass has burned off the bitterbrush and sagebrush that deer require to get through winter. Once established, cheatgrass is nearly impossible to eradicate. It forms a carpet of fine fuel that burns frequently and prevents reestablishment of the more desirable shrubs such as bitterbrush and big sagebrush. This can effectively destroy deer habitat permanently.

The establishment of residential developments on private lands in Nevada and California also is of concern to deer managers. Both CDFG and NDOW review proposed developments with county planning departments, and occasionally oppose them because of their impacts on critical deer habitats. This opposition is often supported by conservation organizations.

3. Major Land Practices

Timber production and livestock grazing are the most important land management practices affecting deer habitats in this bioregion. The most important landowners are the USFS and BLM (Figure 5 on page 30). Most timber harvest occurs on deer summer ranges in the form of selective logging and salvage. Fire is actively suppressed. Fuels reduction and biomass harvest from densely stocked conifer forests, in which small-diameter stems are removed from the forest stand, are also common practices. On the winter ranges, the major land management activity is livestock grazing. The proliferation of subdivisions is becoming increasingly important in the loss of deer habitats

4. Habitat Improvement Practices

The absence of large-scale disturbance has resulted in the diminished quality of deer summer habitat in the region. Like in other Northern California bioregions, what is needed is to produce early successional vegetation, namely shrubs and herbs, and then not hurry it along into later successional types such as closed canopy forest with a poorly developed understory. More patch cuts, which open the tree canopy, will favor deer. So will not suppressing shrubs after trees are harvested. On moist areas of summer range that have been degraded by livestock, fencing of riparian habitat and planting willows, if subsequently protected from grazing, can be effective.

Controlled burns should be encouraged on summer ranges. Reforestation

Big sage is an important shrub species in the Cascade/Great Basin bioregion.
Photo by Paul Wertz

following catastrophic wildfire should accommodate the development of understory shrubs, important components of habitat for deer and other wildlife. Broadscale application of herbicides to suppress the understory should be discouraged. Fuels reduction and biomass thinning have the potential to open the canopy and favor growth of the understory; however, such benefits are yet to be documented in practice. Mechanical removal of vegetation does not provide the same factors, such as heat and mineral input, that fire does, and by stimulating tree growth, it may suppress the understory.

On the winter range, the major land management activity is livestock grazing. Appropriate livestock control is important here, so that some of the annual production of forage is available for deer and does not go entirely to livestock. Fires that kill bitterbrush and sagebrush and allow the spread of cheatgrass should be suppressed; firebreaks around critical shrub habitats may be appropriate. Planting bitterbrush following fire on east-side ranges can rehabilitate deer habitat. Seed used should be from a local source, and young plants must be protected from browsing by wildlife and livestock for several years.

Stands of mixed conifers are common in the North Sierra Nevada/Cascade bioregion. In this "thinned" stand a well developed understory is present which deer use as a forage and escape cover. Unfortunately, many of these mixed conifer stands are overgrown by conifers, offering little or no understory vegetation for deer and other wildlife.

Photo by Tom Kucera

C. North Sierra Nevada/Cascade

1. Deer Habitats and Ecology

Mule deer in the North Sierra Nevada/Cascade bioregion are mostly migratory. They spend summers at higher elevations in conifer forests with montane shrubs such as deerbrush and mountain whitethorn and with riparian areas with willows, aspens, and cottonwoods. Oaks, especially black oak, and the acorns, leaves, and mistletoe they produce are important in the fall. Acorns provide an abundant source of nutrition during the period when much of the vegetation is dry and of low quality.

Winter ranges are on both sides of the mountains. On the east side, Great Basin shrub habitats are the most important winter ranges. These are dominated by bitterbrush, big sagebrush, and mountain mahogany; juniper woodlands and even cheatgrass-dominated areas with trace amount of shrubs also are occasionally used. Many deer in this region cross the state line and winter in Nevada, and management authority for them is shared with the NDOW. West-side winter ranges

At higher elevations Jeffery pine habitat is a common summer range component of the North Sierra Nevada/Cascade bioregion. Note the understory of mountain whitethorn and manzanita. The mountain whitethorn is excellent deer forage that can be rejuvenated through fire or mechanical means.

Photo by Joe McBride

extend from the black oak woodland belt down to the woodland-grass areas below 2,000 feet. Again, acorns are highly favored food when they are present.

2. Limiting or Important Habitat Factors

The absence of disturbance on summer ranges, caused especially by long-term fire suppression policies, has allowed the growth of dense, closed canopy forest that provides poor quality deer habitat. Heavy livestock use has degraded many riparian areas, removing forage and fawning and thermal cover for deer. Human developments have negatively affected some winter ranges.

3. Major Land Practices

In the North Sierra Nevada/Cascade bioregion, timber production and livestock grazing are the most important land management practices affecting deer habitats. The most important landowner is the USFS, although much of the lower elevation is private (Figure 5 on page 30). Most timber harvest occurs on deer summer ranges in the form of selective logging and salvage. Fire is actively suppressed. Fuels reduction and biomass harvest from densely stocked conifer forests, in which small-diameter stems are removed from the forest stand, are also common practices. On the winter range, the major land management activity is livestock grazing.

4. Habitat Improvement Practices

The absence of large-scale disturbance has resulted in the diminished quality of deer summer habitat in the bioregion. As in other Northern California bioregions, what is needed is to produce early successional vegetation, namely shrubs and herbs, and then not hurry it along into later successional types such as closed canopy forest with a poorly developed understory. More patch cuts, which open the tree canopy, will favor deer as well as not suppressing shrubs after trees are harvested. On moist areas of summer range that have been degraded by livestock, fencing of riparian habitat and planting willows, if subsequently protected from grazing, can be effective.

On summer ranges, controlled burns should be encouraged. Reforestation following catastrophic wildfire should accommodate the development of understory shrubs, important components of habitat for deer and other wildlife. Broadscale application of herbicides to suppress the understory should be discouraged. Fuels reduction and biomass thinning have the potential to open the canopy and favor growth of the understory; however, such

benefits are yet to be documented in practice. Mechanical removal of vegetation does not provide the same factors, such as heat and mineral input, that fire does, and by stimulating tree growth, it may suppress the understory.

On the winter range, the major land management activity is livestock grazing. Appropriate livestock control is important here, so that some of the annual production of forage is available for deer and does not go entirely to livestock. Fires that kill bitterbrush and sagebrush and allow the spread of cheatgrass should be suppressed; firebreaks around critical shrub habitats may be appropriate. Planting bitterbrush following fire on east-side ranges can rehabilitate deer habitat. Seed used should be from a local source, and young plants must be protected from browsing by wildlife and livestock for several years.

Degraded riparian areas and oak woodlands can be improved by planting riparian vegetation such as willows and oak seedlings and acorns.

Biomass harvesting in overgrown conifer stands can significantly improve deer habitat by opening up the stand and encouraging the establishment of a well developed understory. However, this does not always occur if the stand is not opened up enough to allow sunlight to reach the forest floor, thus allowing the establishment of shrubs. When this occurs, little deer habitat improvement is achieved.

Photo by Tom Kucera

D. South Sierra Nevada

1. Deer Habitats and Ecology

Mule deer in the South Sierra Nevada bioregion are mostly migratory, spending summers at higher elevations and winters lower on both sides of the range. West-side winter ranges are between about 1,500 and 4,000 feet of elevation in areas of wedgeleaf ceanothus (buckbrush), manzanita, mountain mahogany, redberry and canyon and interior live oak. At the higher portions of the winter range are stands of yellow pine and black oak; at the lower elevations are blue oaks and grassland. Important forage species are wedgeleaf ceanothus, mountain mahogany, bear clover in some locations, as well as numerous other shrubs. Seasonally, forbs such as clover, filaree and numerous other herbaceous forage plants and annual grasses become important after fall rains initiate plant growth. Acorns from all oak species are especially important. East-side winter ranges are mostly Great Basin Desert shrub communities with bitterbrush and sagebrush, and also pinyon pine and mountain mahogany.

Opposite Page: *Typical summer range found in the South Sierra Nevada bioregion.*
Photo by Tom Kucera

Summer ranges in the South Sierra Nevada are from about 5,500 to 10,000 feet elevation and higher, although most habitat occurs between 5,500 and 8,500 feet, and most of this is on the west slope. It is here where the greatest abundance of cover, food, and water occur. Preferred forage on summer ranges includes mountain whitethorn, bittercherry, and willow, as well as a variety of herbaceous species. Meadows, streams, and seeps are important habitat components, especially for pregnant or lactating does.

Migration routes to and from seasonal ranges frequently contain holding areas, where deer delay migration from a few days to a month or more. Areas with herbaceous forage at the base of slopes seem to be used as spring holding areas. In the fall, areas at the top of slopes with oaks and other browse are used.

2. Limiting or Important Habitat Factors

Fire suppression throughout the range has resulted in the absence of the earlier successional stages that are favorable for deer. Fire is the most important factor in restoring young mountain whitethorn and other favored browse species. Heavy grazing by livestock in meadows and aspen stands on summer ranges removes forage and cover necessary for fawning habitat. Urban development in the foothills is removing some winter range and mandating continued fire suppression policies. In places where wildfires have occurred, post-fire treatments with herbicides and conifer planting diminish habitat value for deer.

3. Major Land Practices

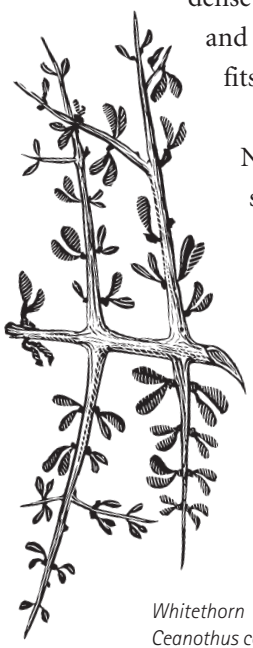
On the summer range, timber harvest and livestock grazing are the most important land-management practices. On the winter range, livestock use is widespread, but urbanization and recreational development is an increasingly important factor affecting deer habitat. The most important landowner is the USFS, although much of the lower elevation is private (Figure 5 on page 30).

4. Habitat Improvement Practices

The absence of large-scale disturbance has resulted in the diminished quality of summer habitat for deer in the region. As in several other California bioregions, what is needed is to produce early successional vegetation, namely shrubs and herbs, and then not hurry it along into later successional types such as closed canopy forest with a poorly developed understory. More patch cuts, which open the tree canopy, will favor deer, as will not suppressing shrubs after trees are harvested. Oaks should be retained wherever present. On moist areas of summer range that have been degraded by livestock, fencing of riparian habitat and planting willows, if subsequently protected from grazing, can be effective. Wedgeleaf ceanothus and redberry also can be planted to enhance deer habitat value.

Controlled burns should be encouraged on summer ranges, and reforestation following catastrophic wildfire should accommodate the development of understory shrubs, important components of habitat for deer and other wildlife. Written comments to USFS officials regarding post-fire management are very important. Broad-scale application of herbicides to suppress the growth of the understory should be discouraged. Fuels reduction by thinning dense forest stands has the potential to open the canopy and favor growth of the understory; however, such benefits are yet to be documented in practice.

On winter ranges on both sides of the South Sierra Nevada, the major land management activity is livestock grazing. Appropriate livestock control is important here, so that some of the annual production of forage is available for deer and does not go



Whitethorn
Ceanothus cordulatus

entirely to livestock. Livestock allotment planning (e.g., timing of grazing and performance standards) on the public lands is a key consideration. On the east side of the Sierra Nevada, fires that kill bitterbrush and sagebrush and allow the spread of cheatgrass should be suppressed; firebreaks around critical shrub habitats may be appropriate. Planting bitterbrush following fire on east-side ranges can rehabilitate deer habitat. Seed used should be from a local source, and young plants must be protected from browsing by wildlife and livestock for several years.

On the west-side winter ranges, an aggressive program of controlled burning of shrubs should be encouraged. Degraded riparian areas and oak woodlands can be improved by planting riparian vegetation such as willows and oak seedlings and acorns. Seasonal road closures in key deer wintering areas has also been recommended as an important measure to protect deer at this critical time of the year.

E. Central Coast

1. Deer Habitats and Ecology

Chaparral and oak woodlands comprise the most habitat for deer in the Central Coast bioregion. On steep or harsh sites, chaparral can be dominated by a single species, chamise. On sites with deeper soils, chaparral includes a variety of other species including buckbrush, hollyleaf cherry, redberry, manzanita, and scrub oak. Oak woodlands contain a variety of oak species, including blue and valley oak, and several types of live oak. Understory vegetation in the oak woodlands is mainly annual grasses and forbs, such as wild oats and filaree. Riparian areas along streams, with willows and wild rose, are particularly important components of deer habitat both in chaparral and oak woodlands.

Mule deer in the Central Coast bioregion are not migratory. They spend the entire year on home ranges of a square mile or less. However, they may shift activities within their particular home range seasonally to take advantage of preferred conditions. For example, they may use south-facing slopes more in winter and north-facing slopes in summer, or spend more time in riparian

Opposite Page: *Blue oak-pine habitat common to the Central Coast bioregion. Both blue oak and live oak provide excellent deer forage in the form of acorns, leaves, and mistletoe.*

Photo by Jared Verner

vegetation during fawning in spring or seeking succulent forage in late summer. When acorns are available, deer will spend more time foraging in oak woodlands. Areas offering edges between grassland, oak woodlands and chaparral usually support higher deer densities.

The period of greatest nutritional stress for mule deer in the Central Coast bioregion is the late summer and early fall. Adult does experience the demands of lactation and fawns are weaned at that time; most vegetation is dry and of poor quality. If available at this time, riparian vegetation is especially important. These poor nutritional conditions are reversed only with the availability of acorns in the fall, or with the onset of rains that initiate production of grasses and forbs.

2. Limiting or Important Habitat Factors

Fire is an essential component of chaparral; many chaparral plants sprout vigorously after a fire, and the seeds of some species will germinate only after a fire. Historically, low intensity fires frequently occurred in this bioregion. In the past 40 years or so, with the emphasis on fire suppression, fires have been more intense and of larger scale. Low-intensity, frequent fires tend to produce a mosaic of forage and cover that is favorable for deer; large, intense fires tend to produce a deficiency of cover for several years, followed by several years of abundant forage. In all cases, after about ten years, chaparral shrubs have matured and habitat capacity for deer is reduced. Thus, programs of frequent controlled burns in chaparral habitats will produce high-quality habitat for deer, if conducted at a sufficiently large scale. Contact local CDF and CDFG personnel to find out how you can support plans to burn chaparral.

Riparian areas, which provide water, succulent forage, and thermal and fawning cover, are important components of deer habitat. If degraded, they may need to be protected from livestock for several years until they recover. In some of the drier areas, the water provided by seeps, springs, and guzzlers is essential for local deer.

3. Major Land Practices

Much land in the Central Coast bioregion is privately owned, with some USFS land (Figure 5 on page 30). The dominant activity in oak woodlands historically has been livestock grazing, and this remains true in many areas. Removal of oaks, both for range type-conversions and fuelwood, has been recognized as a threat to habitat quality for deer and many other wildlife species. Intensive agricultural development, including dryland farming, row crops, and extensive vineyards surrounded by deer-proof fences, has removed deer habitat. Finally, residential development has locally important effects on deer habitat in the Central Coast, causing direct habitat loss and increasing the need for fire suppression.

4. Habitat Improvement Practices

Probably the single most valuable habitat improvement practice for deer in the Central Coast bioregion is burning. In chaparral habitats, an aggressive program of controlled burning should be encouraged. Contact local CDFG and CDF personnel to find out how you can support such programs. Mechanical treatments of chaparral such as crushing also can stimulate new growth.

Fencing may be necessary to prevent access by deer and livestock to riparian areas so that willows and other vegetation can regenerate. As described previously, a curtain fence has been shown to be effective; see the previous section on the North Coast for more information on this type of fence.

Degraded riparian areas and oak woodlands can be improved by planting riparian vegetation such as willows and oak seedlings and acorns (See the previous section on Planting on page 50).

Chamise
Andenostema fasciculatum

Typical chaparral habitats with tree-dominated ravines in the South Coast bioregion–Santa Margarita River, California.

Photo by Mark Hoshovsky

F. South Coast

1. Deer Habitats and Ecology

Most mule deer in the South Coast bioregion do not migrate, but are year-round residents. However, some deer inhabit higher mountain ranges. Riparian habitats, oak woodlands, coastal scrub, and meadows without an overabundance of cattle are important for mule deer. Principle browse species are hollyleaf cherry, mountain mahogany, chamise, and several species of oak. Herbaceous forage plants include annual grasses and various types of lotus and lupines. Oaks not only provide browse, but are especially important for their acorns, which supply valuable nutrition in the fall when most other vegetation is dry and of low quality.

2. Limiting or Important Habitat Factors

Loss of habitat to an increasing human population, largely due to urban

development, and decrease in habitat quality by fire suppression are the major factors adversely affecting habitat for mule deer in the South Coast bioregion.

3. Major Land Practices

Much of the land in the South Coast is privately owned, or managed by USFS (Figure 5 on page 30). Livestock grazing is the predominant management activity on non-urbanized areas. Human recreational activities, especially in riparian areas, has been shown to have a negative affect on deer and their habitats.

4. Habitat Improvement Practices

Burning chaparral at an appropriate scale is one of the most important habitat improvement practices in the South Coast bioregion. Degraded riparian areas and oak woodlands can be improved by planting riparian vegetation such as willow and oak seedlings and acorns. Limiting recreational use by humans where appropriate can improve conditions for deer.

Live Oak
Quercus wislizenii

Great Basin habitats, such as this meadow, are common on the east slope of the Sierra Nevada. Overgrazing by livestock on some winter ranges have negatively affected deer populations.

Photo by Eric Loft

G. Inyo/Desert

1. Deer Habitats and Ecology

Mule deer in the Inyo/Desert bioregion use a variety of habitats, including pinyon-juniper woodlands, mountain mahogany, desert scrub, and, where they occur, riparian areas, aspens, and meadows. In the higher ranges such as the White Mountains, deer are migratory, descending to lower elevation desert scrub habitats in late winter to take advantage of spring "green-up". In much of the year, they are restricted to areas within two miles of water.

2. Limiting or Important Habitat Factors

The availability of free-standing water is important for deer in this bioregion, particularly during summer and fall. Riparian areas associated with springs and the occasional perennial stream are often heavily impacted by livestock and feral donkeys. Roads associated with stream courses in canyon

bottoms also can degrade riparian habitat, removing forage and cover needed by deer and a variety of other wildlife.

3. Major Land Practices

Much of the Inyo/Desert bioregion is managed by the National Park Service (Figure 5 on page 30). Outside these national park lands, mining and livestock grazing are major land uses, especially on lands managed by BLM. Mining often removes habitat and results in greater access for humans. Grazing and its impacts to water and riparian vegetation can result from both cattle, and feral burros.

4. Habitat Improvement Practices

One of the most useful things that can be done is to assist the agencies that manage grazing is to monitor the livestock allotments and document abuses. Grazing allotments are supposed to be monitored, but agencies rarely have the personnel to do it. Obtain a copy of the Allotment Management Plan for the area that you are particularly concerned about and determine the "on and off" dates for cattle, and the number of cattle that are permitted. Visit the area to document use not in compliance with the plan. Count and photograph the cattle; take photographs of overgrazing, muddy springs, or waters fouled by burros. Request the agency's monitoring data for livestock use, and be sure it is being used to determine livestock stocking rate and season of use.

The old adage "you can't judge a book by its cover" holds true for the value of desert habitats to mule deer. While deer densities are low in the Southern Desert bioregion, some of the largest bucks in the state are taken each year in these arid environments.

Photo by Mark Hoshovsky

H. Southern Desert

1. Deer Habitats and Ecology

The Mojave and Sonoran deserts of California support some of our driest and hottest habitats in the state. It comes as no surprise, then, that these areas support some of our lowest deer densities. The deer that inhabit our southern deserts are also the least understood ecologically in California. These animals, while not migratory like those in the Sierra Nevada, do move long distances in response to changes in the availability of water and forage. Summer rains in the desert cause the germination of annual grasses and forbs, and deer will move to take advantage of this forage. Desert washes and the vegetation in them are especially important for providing cover and food, and free-standing water in the summer seems to be essential for maintaining burro mule deer.

2. Limiting or Important Habitat Factors

The availability of free-standing water in the summer in areas with otherwise appropriate vegetation is thought to be the most important habitat factor for mule deer in most of our southern deserts.

3. Major Land Practices

Mining and livestock grazing are the most important land-management activities in the southern deserts; most land is managed by BLM (Figure 5 on page 30). Modern mining, with its intensive impacts to hundreds of acres of desert lands, can destroy important islands of burro mule deer habitat. With the establishment of numerous national parks in the desert, off-road vehicle use has become more concentrated and a cause of concern for deer.

4. Habitat Improvement Practices

The most common habitat improvement practice in desert areas is developing water. However, water alone will not provide habitat for mule deer if other habitat components such as appropriate forage is not present. The goal

Water can be the most important limiting factor for deer in the Southern Desert bioregion. Therefore, establishing big game guzzlers at strategic locations can provide significant benefits to deer.

Photo by Leon Lesicka

of a water development is to open an area of otherwise appropriate habitat to mule deer by providing year-round standing water. Controlling or limiting off-road vehicle use on open public lands can also benefit deer.

There are a variety of designs for water developments in desert areas. If you are interested in promoting water developments to benefit mule deer and other wildlife in the desert, contact the CDFG and BLM biologists in your area of interest to see how you can be of assistance. Donations of labor and funds will be welcome.

VII. Acknowledgments

Primary funding for the development and printing of this Guide came from The Mule Deer Foundation (MDF) and California Department of Fish and Game (CDFG). Additional support was provided by the Division of Ecosystem Sciences, Department of Environmental Science, Policy, and Management (ESPM), University of California, Berkeley. Mr. Tom Lupo and Ms. Ann Mahaney of CDFG graciously prepared the maps of land ownership and deer habitat in California.

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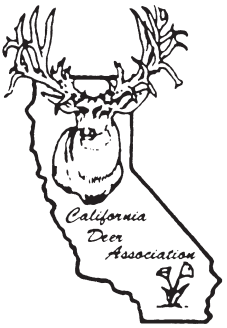

Appendix I.

Addresses of U.S. Forest Service Offices in California

Angeles National Forest

Forest Supervisor
701 N. Santa Anita Ave.
Arcadia, CA 91006
(626) 574-1613

Arroyo Seco Ranger District
4600 Oak Grove Drive
Flintridge, CA 91011
(818) 790-1151

Mount Baldy Ranger District
110 N. Wabash Ave.
Glendora, CA 91741
(626) 335-1251

Saugus Ranger District
30600 Bouquet Canyon Rd.
Saugus, CA 91350
(805) 296-9710

Tujunga Ranger District
12371 N. Little Tujunga Canyon Rd.
San Fernando, CA 91342
(818) 899-1900

Valyermo Ranger District
29835 Valyermo Rd.
Valyermo, CA 93563
(805) 944-2187

Cleveland National Forest

Forest Supervisor
10845 Rancho Bernardo Rd. Suite 200
Rancho Bernardo, CA 92127
(619) 673-6180

Descanso Ranger District
3348 Alpine Blvd.
Alpine, CA 91901
(619) 445-6235

Palomar Ranger District
1634 Black Canyon Rd.
Ramona, CA 92065
(760) 788-0250

Trabuco Ranger District
1147 E. Sixth St.
Corona, CA 91719
(909) 736-1811

Eldorado National Forest

Forest Supervisor
100 Forni Rd.
Placerville, CA 95667
(530) 622-5061

Amador Ranger District
28820 Silver Dr.
Pioneer, CA 95666
(209) 295-4251

Pacific Ranger District
Pacific Ranger Station
Pollock Pines , CA 95726
(530) 644-2349

Georgetown Ranger District
7600 Wentworth Springs Rd.
Georgetown, CA 95634
(530) 333-4312

Placerville Ranger District
4260 Eight Mile Rd.
Camino, CA 95709
(530) 644-2324

Inyo National Forest

Forest Supervisor
873 North Main St.
Bishop, CA 93514
(760) 873-2400

Mammoth/Mono Lake Ranger District
P.O. Box 148
Mammoth Lakes, CA 93546
(760) 924-5500

White Mtn/Mt. Whitney Ranger District
798 North Main St.
Bishop, CA 93514
(760) 873-2500

Klamath National Forest

Forest Supervisor
1312 Fairlane Rd.
Yreka, CA 96097
(530) 842-6131

Goosenest Ranger District
37805 Hwy 97
Macdoel, CA 96058
(530) 398-4391

Happy Camp Ranger District
P.O. Box 377
Happy Camp, CA 96039
(530) 493-2243

Salmpn/Scott River Ranger District
11263 North Hwy 3
Fort Jones, CA 96032
(530) 468-5351

Ukonom Ranger District
P.O. Drawer 410
Orlean, CA 95556
(530) 627-3291

Lake Tahoe Basin

Forest Supervisor
870 Emerald Bay Rd., Ste. 1
South Lake Tahoe, CA
96150
(530) 573-2600

Lassen National Forest

Forest Supervisor
55 S. Sacramento St.
Susanville, CA 96130
(530) 257-2151

Almanor Ranger District
P.O. Box 767
Chester, CA 96020
(530) 258-2141

Hat Creek Ranger District
P.O. Box 220
Fall River Mills, CA 96028
(530) 336-5521

Eagle Lake Ranger District
477-050 Eagle Lake Rd.
Susanville, CA 96130
(530) 257-4188

Los Padres National Forest

Forest Supervisor
6144 Calle Real
Goleta, CA 93117
(805) 683-6711

Monterey Ranger District
406 South Mildred
King City, CA 93930
(408) 385-5434

Ojai Ranger District
1190 East Ojai Ave.
Ojai, CA 93023
(805) 646-4348

Mount Pinos Ranger District
34580 Lockwood Valley Rd.
Frazier Park, CA 93225
(805) 245-3731

Santa Barbara Ranger District
3505 Paradise Rd.
Santa Barbara, CA 93105
(805) 967-3481

Santa Lucia Ranger District
1616 North Carlotti Dr.
Santa Maria, CA 93454
(805) 925-9538

Mendocino National Forest

Forest Supervisor
825 N. Humboldt Ave.
Willows, CA 95988
(530) 934-3316

Corning Ranger District
22000 Corning Rd., P.O.
Box 1019
Corning, CA 96021
(530) 824-5196

Stonyford Ranger District
5171 Stonyford-Elk Creek Rd.
P.O. Box 160
Stonyford, CA 95979
(530) 963-3128

Covelo Ranger District
78150 Covelo Rd.
Covelo, CA 95428
(707) 983-6118

Upper Lake Ranger District
10025 Elk Mountain Rd.,
P.O. Box 96
Upper Lake, CA 5485
(707) 275-2361

Modoc National Forest

Forest Supervisor
800 W. 12th St.
Alturas, CA 96101
(530) 233-5811

Big Valley Ranger District
P.O. Box 159
Adin, CA 96006
(530) 299-3210

Devils Garden Ranger
District
800 W. 12th St.
Alturas, CA 96101
(530) 233-5811

Doublehead Ranger
District
P.O. Box 369
Tulelake, CA 96134
(530) 667-2246

Warner Mountain Ranger
District
P.O. Box 220
Cedarville, CA 96104
(530) 279-6116

Plumas National Forest

Forest Supervisor
159 Lawrence St., P.O. Box
11500
Quincy, CA 95971
(530) 283-2050

Beckwourth Ranger
District
P.O. Box 7
Blairsden, CA 96103
(530) 836-2575

Feather River Ranger
District
875 Mitchell Ave.
Oroville, CA 95965
(530) 534-6500

Mt. Hough Ranger District
39696 Hwy 70
Quincy, CA 95971
(530) 283-0555

Regional Office, Region 5

Regional Forester
1323 Club Drive
Vallejo, CA 94592
(707) 562-8737

San Bernardino National Forest

Forest Supervisor
1824 South Commercenter Circle
San Bernardino, CA 92408
(909) 383-5588

Arrowhead Ranger District
28104 Hwy 18, P.O. Box 7
Skyforest, CA 92385
(909) 337-2444

Big Bear Ranger District
P.O. Box 290
Fawnskin, CA 92333
(909) 866-3437

Cajon Ranger District
1209 Lytle Creek Rd.
Lytle Creek, CA 92358
(909) 887-2576

San Gorgonio Ranger District
34701 Mill Creek Rd.
Mentone, CA 92359
(909) 794-1123

San Jacinto Ranger District
P.O. Box 518
Idyllwild, CA 92549
(909) 659-2117

Sequoia National Forest

Forest Supervisor
900 West Grand Ave.
Porterville, CA 93257
(209) 784-1500

Cannell Meadow Ranger District
P.O. Box 9
Kernville, CA 93238
(760) 376-3781

Greenhorn Ranger District
P.O. Box 3810
Lake Isabella, CA 93240
(760) 379-5646

Tule River Ranger District
32588 Hwy 190
Springville, CA 93267
(209) 539-2607

Hot Springs Ranger District
Route 4, Box 546
Hot Springs, CA 93207
(805) 548-6503

Hume Lake Ranger District
35860 East Kings Canyon Rd.
Dunlap, CA 93621
(209) 338-2251

Shasta-Trinity National Forest

Forest Supervisor
2400 Washington Ave.
Redding, CA 96001
(530) 246-5222

Big Bar Ranger District
Star Route 1, Box 10
Big Bar, CA 96010
(530) 623-6106

Hayfork Ranger District
P.O. Box 159
Hayfork, CA 96041
(530) 628-5227

McCloud Ranger District
P.O. Box 1620
McCloud, CA 96057
(530) 964-2184

Mount Shasta Ranger District
204 West Alma
Mt. Shasta, CA 96067
(530) 926-4511

Shasta Lake Ranger District
14225 Holiday Rd.
Redding, CA 96003
(530) 275-1587

Weaverville Ranger District
P.O. Box 1190
Weaverville, CA 96093
(530) 623-2121

Sierra National Forest

Forest Supervisor
1600 Tollhouse Rd.
Clovis, CA 93612
(209) 297-0706

Kings River Ranger District
34849 Maxon Rd.
Sanger, CA 93657
(209) 855-8321

Mariposa-Minarets Ranger District
57003 Road 225, P.O. Box 10
North Fork, CA 93643
(209) 877-2218

Pineridge Ranger District
P.O. Box 559
Prather, CA 93651
(209) 855-5360

Six Rivers National Forest

Forest Supervisor
1330 Bayshore Way
Eureka, CA 95501
(707) 442-1721

Smith River National Recreation Area
P.O. Box 228
Gasquet, CA 95543
(707) 457-3131

Lower Trinity Ranger District
P.O. Box 68
Willow Creek , CA 95573
(530) 629-2118

Mad River Ranger District
Star Route Box 300
Bridgeville, CA 95526
(707) 574-6233

Orleans Ranger District
P.O. Box 410
Orleans, CA 95556
(530) 627-3291

Stanislaus National Forest

Forest Supervisor
19777 Greenley Rd.
Sonora, CA 95370
(209) 532-3671

Calaveras Ranger District
P.O. Box 500 Hwy 4
Hathaway Pines, CA 95233
(209) 795-1381

Groveland Ranger District
24545 Old Hwy 120
Groveland, CA 95321
(209) 962-7825

Miwuk Ranger District
P.O. Box 100, 24695 Hwy 108
Miwuk Village, CA 95346
(209) 586-3234

Summit Ranger District
No. 1 Pinecrest Lake Rd.
Pinecrest, CA 95364
(209) 965-3434

Tahoe National Forest

Forest Supervisor
Hwy 49 and Coyote Street
Nevada City, CA 95959
(530) 265-4531

Downieville Ranger District
15924 Hwy 49
Camptonville, CA 95922
(530) 288-3231

Foresthill Ranger District
22830 Foresthill Rd.
Foresthill, CA 95631
(530) 367-2224

Nevada City Ranger District
631 Coyote St.
Nevada City , CA 95959
(530) 265-4531

Sierraville Ranger District
P.O. Box 95
Sierraville, CA 96126
(530) 994-3401

Truckee Ranger District
10342 Hwy 89 North
Truckee, CA 96161
(530) 587-3558

Appendix II.

Addresses of Bureau of Land Management offices in California

California State Office
2135 Butano Drive
Sacramento, CA 95825
(916) 978-4400

Alturas Field Office
708 West 12th St.
Alturas, CA 96101
(530) 233-4666

Arcata Field Office
1695 Heindon Rd.
Arcata, CA 95521
(707) 825-2300

Bakersfield Field Station
3801 Pegasus Ave.
Bakersfield, CA 93308
(805) 391-6000

Barstow Field Office
2601 Barstow Rd.
Barstow, CA 92311
(760) 252-6000

Bishop Field Office
785 N. Main St. Suite E
Bishop, CA 93514
(760) 872-4881

California Desert District
6221 Box Springs Rd.
Riverside, CA 92507
(909) 697-5200

Clear Lake Field Office
2550 N. State St.
Ukiah, CA 95482
(707) 468-4000

Eagle Lake Field Station
2950 Riverside Dr.
Susanville, CA 96130
(530) 257-0456

El Centro Field Office
1661 S. Fourth St.
El Centro, CA 92243
(760) 337-4400

Folsom Field Office
63 Natoma St.
Folsom, CA 95630
(916) 985-4474

Hollister Field Office
20 Hamilton Court
Hollister, CA 95023
(408) 630-5000

Needles Field Office
101 West Spikes Rd.
Needles , CA 92363
(760) 326-7000

Palm Springs/ South Coast Field Office
690 West Garnet Ave.
N. Palm Springs, CA 92258
(760) 251-4800

Redding Field Office
355 Hemsted Dr.
Redding , CA 96002
(530) 224-2100

Ridgecrest Field Office
300 South Richmond Rd.
Ridgecrest, CA 93555
(760) 384-5400

Surprise Field Office
602 Cressler St.
Cedarville, CA 96104
(530) 279-6101

Appendix III.

Addresses of California Department of Forestry and Fire Protection (CDF) and California Department of Fish and Game (CDFG) offices.

CDF Offices

Headquarters
1416 Ninth St.
Sacramento, CA 95814
(916) 653-5121

Coast-Cascade Region
135 Ridgeway Ave.
Santa Rosa, CA 95401
(707) 576-2275

Sierra-South Region
1234 E. Shaw Ave.
Fresno, CA 93710
(209) 222-3714

CDFG Offices

Headquarters
1416 Ninth St.
Sacramento, CA 95814
(916) 653-7664

Wildlife Programs Branch
1416 Ninth St. Rm 1270
Sacramento, CA 95814
(916) 653-7203

Northwest
619 Second St.
Eureka, CA 95501
(707) 445-6493

Northern California-North Coast
601 Locust St.
Redding, CA 96001
(530) 225-2300

Sacramento Valley-Central Sierra
1701 Nimbus Rd.
Rancho Cordova, CA 95670
(916) 358-2900

Central Coast
7329 Siverado Trail
Yountville, CA 94558
(707) 944-5500

San Joaquin Valley-Southern Sierra
1234 E. Shaw Ave.
Fresno, CA 93710
(209) 243-4005

Central Coast
20 Lower Ragsdale Dr.
#100
Monterey, CA 93940
(408) 649-2870

Eastern Sierra Nevada
407 W. Line St. Rm. 8
Bishop, CA 93515
(760) 872-1171

South Coast
4949 View Ridge Ave.
San Diego, CA 92123
(619) 467-4201

San Francisco Bay Area
411 Burgess Dr.
Menlo Park, CA 94025
(415) 688-6340

Long Beach Area
330 Golden Shore, Suite 50
Long Beach, CA 90802
(562) 590-5132

Appendix IV.

List of Plant and Animal Scientific Names

Trees

Alder	*Alnus spp.*
Aspen	*Populus spp.*
Chinquapin	*Castanopsis spp.*
Cottonwood	*Populus spp.*
Douglas-Fir	*Pseudotsuga menziesii*
Fir, Red	*Abies magnifica*
Fir, White	*Abies concolor*
Joshua Tree	*Yucca brevifolia*
Juniper	*Juniperus spp.*
Oak, Blue	*Quercus douglasii*
Oak, California Black	*Quercus kelloggii*
Oak, Canyon Live	*Quercus chrysolepis*
Oak, California Scrub	*Quercus dumosa*
Oak, Interior Live	*Quercus wislizenii*
Oak, Oregon White	*Quercus garryana*
Oak, Valley White	*Quercus lobata*
Pine, Lodgepole	*Pinus contorta*
Pine, Ponderosa	*Pinus ponderosa*
Pine, Yellow	*Pinus ponderosa*
Pinyon	*Pinus edulis*
Redwood	*Sequoia sempervirens*
Willow	*Salix spp.*

Shrubs

Bitterbrush	*Purshia spp.*
Buckbrush	*Ceanothus cuneatus*
Cactus	*Opuntia spp.*
Ceanothus, Blue blossom	*Ceanothus thyrsiflorus*
Chamise	*Adenostoma fasciculatum*
Cherry, Bitter	*Prunus emarginata*
Cherry, Hollyleaf	*Prunus ilicifolia*
Cherry, Wild	*Prunus spp.*
Clover, Bear	*Chamaebatia foliosa*
Creosote	*Larrea tridentata*
Deerbrush	*Ceanothus integerrimus*
Manzanita	*Arctostaphylos spp.*
Mountain Mahogany	*Cercocarpus montanus*
Mountain Mahogany, Birchleaf	*Cercocarpus betuloides*
Oak, Scrub	*Quercus dumosa*
Redberry	*Rhamnus crocea*
Rhododendron	*Rhododendron macrophyllum*
Rose, Wild	*Rosa californica*
Sage, Coastal	*Artemisia californica*
Sagebrush	*Artemisia spp.*
Sagebrush, Big	*Artemisia tridentata*
Snowberry	*Symphoricarpos spp.*
Tobaccobrush	*Ceanothus velutinus*
Whitethorn, Mountain	*Ceanothus cordulatus*

Grasses/Forbs

Cheatgrass	*Bromus tectorum*
Clover	*Trifolium spp.*
Filaree	*Erodium spp.*
Lotus	*Lotus spp.*
Lupine	*Lupinus spp.*
Oats, Wild	*Avena fatua*

Mammals

Burro	*Equus asinus*
Caribou	*Caribou spp.*
Cattle	*Bos spp.*
Deer, Mule	*Odocoileus hemionus*
Deer, Axis	*Cervus axis*
Deer, Burro Mule	*Odocoileus hemionus eremicus*
Deer, California Mule	*Odocoileus hemionus californicus*
Deer, Columbian Black-tailed	*Odocoileus hemionus columbianus*
Deer, Fallow	*Cervus dama*
Deer, Inyo Mule	*Odocoileus hemionus inyoensis*
Deer, Rocky Mountain Mule	*Odocoileus hemionus hemionus*
Deer, Southern Mule	*Odocoileus hemionus fuliginatus*
Deer, White-tailed	*Odocoileus virginianus*
Donkey	*Equus spp.*
Elk	*Cervus elaphus*
Horse	*Equus spp.*
Moose	*Alces alces*
Mule	*Equus spp.*

Fish

Steelhead	*Salmo gairdnerii*