

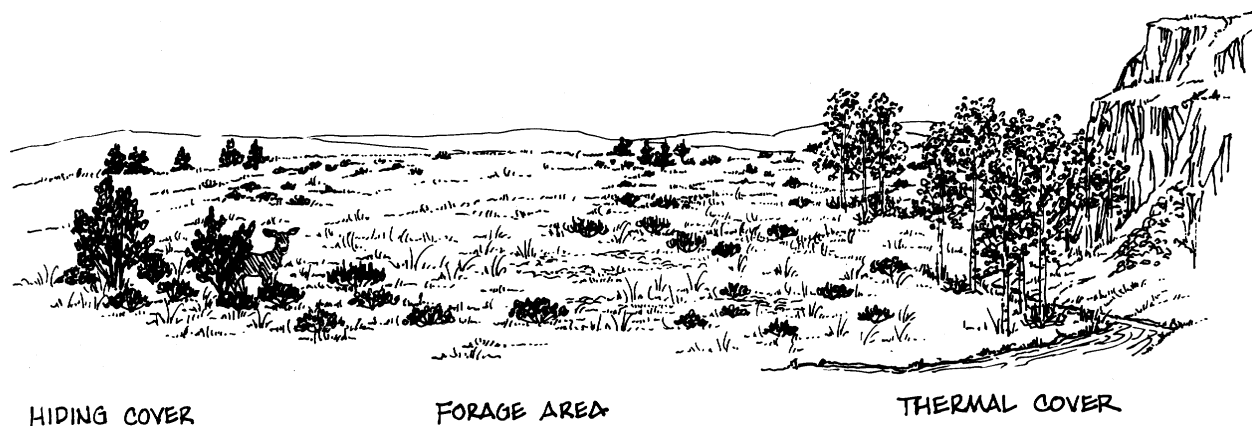


Figure 10. Example of habitat components on Great Basin range illustrating the importance of forage and cover areas in proximity. Source: Leckenby, et al. 1986. Mule deer. Wildlife habitats in managed rangelands- the Great Basin of southeastern Oregon. Gen. Tech. Rep. PNW-139.

V. COMMON FACTORS AFFECTING DEER HABITATS

Habitat Components

Historically, the phrase “quantity and quality” has been used in discussions of deer habitat and factors limiting deer populations. Quantity refers to the amount of habitat available, accounting for those areas that may have become geographically isolated (fragmented) or modified by human activity and are no longer viable deer habitat. Quality describes our understanding of the habitat’s value in meeting life history requirements of deer. The variety of habitats available do not have the same value to deer. The value, or quality of deer habitat is determined either subjectively or is actually measured. Habitat quality is based primarily on how the following three components are distributed (Figure 10) and made available for use by deer:

Forage- Deer food must contain sufficient amounts of protein, carbohydrate, minerals, and trace elements. Nutritious vegetation must be available (normally five feet or less in height) and digestible. Many plant species that are available do not provide forage because deer cannot easily digest them. Typically, young tender shoots and leaves of plants are higher in nutrients and more digestible than old plants. Hence, valuable forages are primarily young shrubs, new shoots of shrubs, and succulent grasses and forbs. Other food items, such as acorns, are seasonally important.

Cover- The quality of deer habitat is influenced by the availability of cover and its proximity to food. Deer require cover for hiding, escape, and for regulating their body temperature. Hiding cover is particularly important from early to midsummer for young fawns; and for all deer in areas subject to predation and/or human disturbance. Escape cover is generally the same as hiding cover, but refers specifically to cover which is near open foraging habitats. Having suitable escape cover in proximity to desirable foraging areas increases the quality of the area as habitat and its likelihood of being used by deer. Thermal cover is used by deer to minimize their energy expenditure and is typically provided by overstory trees and large shrubs. Thermal cover is important to deer inhabiting areas that experience hot summers, cold winters, or both. High quality thermal cover is generally that which provides cool, moist environments during summer

days, and mild temperatures during winter nights. Protection from wind, snow, rain, and sun are also features of desirable thermal cover. Overall, habitat quality is increased when all of these cover elements are in proximity to good feeding areas.

Water- In arid areas of the state, water can be limiting and preclude deer from inhabiting otherwise suitable habitat. Drinking water is particularly important during summer when adult females are nursing fawns and seasonal water sources dry up. Generally, the closer a permanent water source, the greater the likelihood that deer would use a habitat.

Factors Affecting Deer

Numerous factors continually affect deer abundance, condition, and health in California (CDFG, *A Strategic Plan for California Deer*, draft, in prep.). Many of these factors are at work simultaneously, confounding our ability to point to any single reason for a decline or increase in deer numbers. Factors potentially having significant impacts on deer include:

- ✓ Habitat loss and conversion.
- ✓ Habitat condition- acreage of habitat and quality of forage and cover.
- ✓ Timber harvest and reforestation practices- e.g., biomass thinning, hardwood removal, and clear-cutting.
- ✓ Livestock grazing.
- ✓ Wildfire, prescribed fire, and fire suppression.
- ✓ Developments- residential, reservoirs, ski areas, golf courses, and agriculture.
- ✓ Predation by mountain lion, coyote, black bear, and domestic dog.
- ✓ Regulated hunting, including antlerless hunting.
- ✓ Illegal kill.
- ✓ Diseases.
- ✓ Annual or short-term weather patterns, such as severe winters and drought, and long-term climatic change.
- ✓ The size, sex and age structure of deer populations relative to their habitat.
- ✓ Competition with non-native wildlife species.
- ✓ Highway mortality.

The significance of any of the above factors will vary among deer populations and each factor can change in its importance or influence. We do not expect to find solutions to deal with all factors, although each is considered in deer management planning efforts. Priority, or importance, of factors should be based on the potential impacts to deer and the likelihood of a successful solution to any factor that may be causing problems. Our ability to determine cause and effect relationships from any individual, or combination of these factors affecting deer populations can enhance our understanding of each factors importance.

VI. COMMON FACTORS AFFECTING DEER HABITATS ON PUBLIC LANDS

Of those factors manageable on public lands, timber management practices, fire, and livestock grazing were identified as having the most widespread impact on deer habitats. Some of the issues related to these activities were common to several DAUs and should be addressed throughout the state as well as regionally. The following sections describe some of the factors common in much of the state and introduce why the issue is relevant to deer habitat management and ultimately, deer populations. Where applicable, these factors are mentioned in the individual DAU evaluations.

Forests Moving Away from Early Successional Habitats Through the Lack of Fire and Through Fire Suppression

Declining abundance of early successional vegetation communities in forestland was considered to have the greatest effect on long-term deer populations. The primary mechanism to establish those communities is fire, either wildfire or prescribed. In California, society has passively contributed to the aging and declining quality of deer habitats by not institutionalizing prescribed fire or natural fire (let-burn) on a significant scale. For example, of the approximately 32 million wildland acres that the California Department of Forestry and Fire Protection has jurisdiction over, an average 250,000 acres has burned annually since 1953-- only about 1/10 of one percent. A corollary is that we actively move away from diverse ecosystems having adequate representation of the varied successional communities, in part because of fire suppression efforts (Martin and Sapsis 1992). State and Federal programs to integrate fire into wildlands should be increased dramatically.

Evidence there is a positive response by deer to fires includes increased fat reserves, body weight, and productivity several years following fire (Taber and Dasmann 1958). On many forested ranges, enhancement of grass/forb growth and shrubs such as deerbrush (*Ceanothus integerrimus*) and hardwood species is a common and desirable benefit for deer after fire (Grifantini 1991). The 1987 fires on the Klamath (Gallagher and McCullough 1992) and Stanislaus forests are examples of large fires that benefit deer and other early successional wildlife on a landscape perspective. These benefits translate into more deer available for hunters (Figure 11), although the benefit could be short-lived in the absence of either-sex hunting (Longhurst and Connolly 1970), because of the maturing vegetation (as in Figure 9), or because other factors become limiting.

Prescribed fire to benefit deer should occur at times of the year when the greatest likelihood of achieving the desired plant response will be achieved. For example, dry season burns tend to result in better regeneration of shrub species from seed than moist season burns. Fire-adapted shrub species are typically favored when burning occurs at the time of year that plants have adapted to-- usually in the late summer or early fall.

A common use of prescribed fire is as prevention against large wildland fires that endanger structures and valuable timber stands (Biswell 1989, CDF 1995). However, such fires do not necessarily benefit deer or other wildlife because of the timing, as well as the location. Timber stand enhancements that use prescribed fire are another example in which the understory forage and cover may be lost because of a dense overstory canopy.

DFG, USFS, BLM, and the CDFFP have been involved in prescribed fire programs to reduce fuels, enhance forage, and enhance wildlife habitat since the 1950s. DFG's deer herd restoration program provided additional funding to enhance deer range on about 50,000 acres since 1985 in cooperation with the USFS and BLM. Over the years we have learned that the most effective fires are those greater than 400 acres in size; are a component of a larger watershed approach that establishes mosaics of varying successional stages; and are conducted where wildlife value is the priority (compared to fuel reduction or timber stand improvement as priority).

Encroachment by development into privately owned wildlands necessitates greater vigilance and fire suppression on these and nearby lands (public and private) that otherwise could benefit from

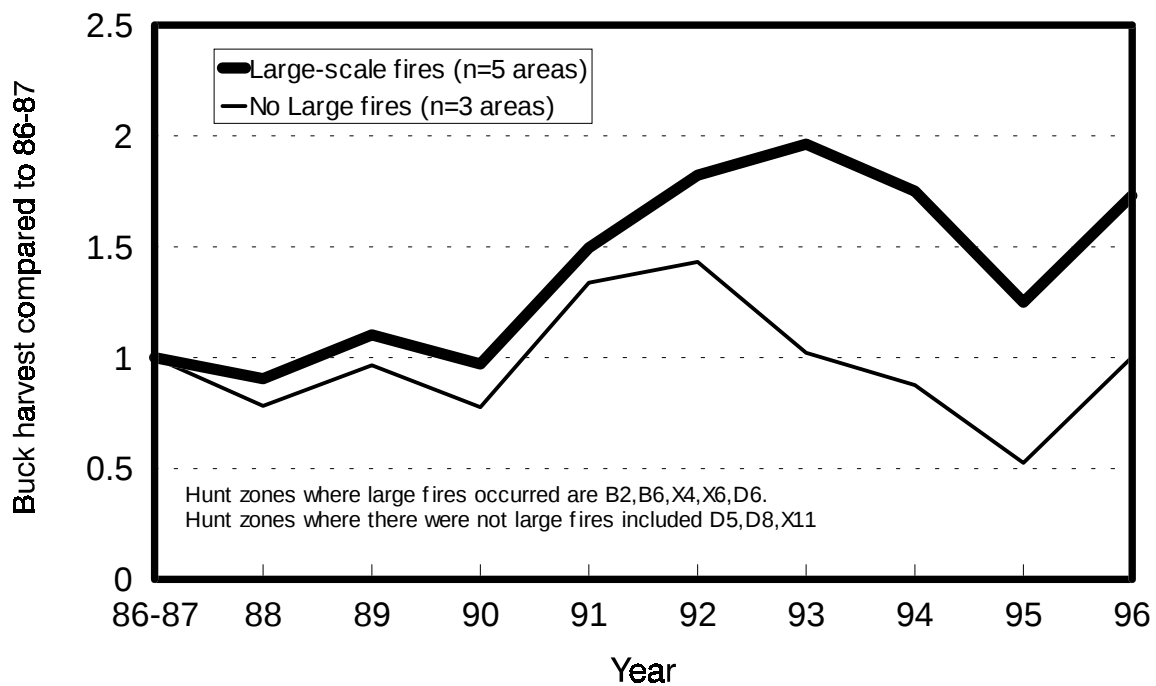


FIGURE 11. Buck deer harvest in years following 1987 fire year on forested deer ranges. Numbers reflect proportional change in deer harvest compared to 1987 values in five areas with, and three areas without, large fires. These zones comprise portions of the DAUs. Fires were each greater than 30,000 acres in size. (Recall the generalized model presented in Figure 9.)

fire. Because of fire suppression efforts on private lands, the ability to interject some diversity in chaparral and forest on public lands by fire is a desirable long-term objective.

Habitat Changes on Rangelands as Influenced by Fire

On shrub winter ranges east of the Sierra Nevada, fire is a different story, with largely negative effects on deer habitat. For a time, recently burned areas provide little or no browse, thermal cover, or hiding cover for wintering deer (Loft and Menke 1990; and see Figure 10). Contributing to the habitat concerns on deer ranges between Susanville and Reno are the large acreages burned in the mid-1980s (Figure 12). Faster and more effective response to suppress summer wildfires in east side shrub winter ranges is desirable. Summer prescribed burning in these communities to reduce juniper or sagebrush and enhance herbaceous production may result in fire so hot that some desirable shrub species may be killed.

Post-fire rehabilitation of burned sites can also affect deer. Establishing diverse stands of native forbs, grasses, and shrubs provide more beneficial habitat than use of one or few exotic plant species. Annual ryegrass on chaparral burned sites, or planting of crested wheatgrass in the Great Basin are examples of non-native rehabilitation efforts that do little to enhance deer habitat. Quick action to rehabilitate burned ranges before invasive species dominate appears to be the most likely means of recovery for burned ranges (Evans and Young 1978).

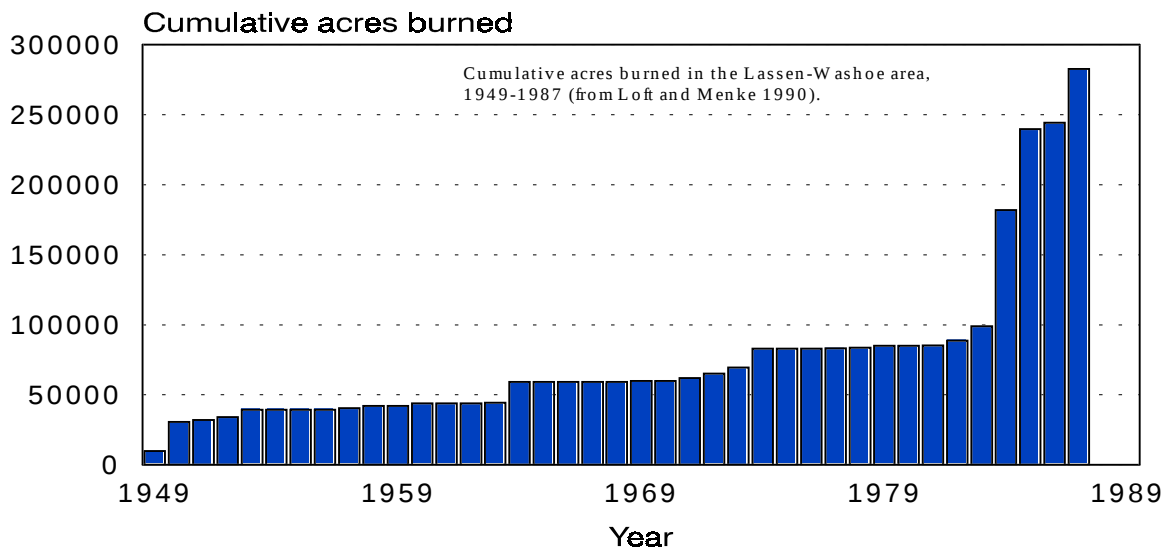


FIGURE 12. Cumulative acreage burned on the Lassen-Washoe deer winter ranges between Reno and Susanville areas (up to 1987). The summer wildfire years of 1984, 1985, and 1987 resulted in portions of the Lassen-Washoe shrub range to be recolonized by plants such as cheatgrass which are of low value to deer as food/cover; and are ephemeral (unreliable) in occurrence.

Forests Moving Away From Early Successional Habitats Through Timber Management Practices and Reforestation Efforts

Historically, logging and post-fire rehabilitation typically involved clear-cutting an area, piling/burning slash debris, and reforesting the cleared area with seedling trees. There are both positive and negative consequences for wildlife, depending on species, to clear-cutting, as well as consequences to soils and watercourses (Tuchmann et al. 1996). Over the years, clear-cutting, except in small patches, has gone out of favor on public lands because the potential negative impacts often exceed the positive. However, early successional vegetation in clear-cut areas was a positive response that benefitted deer in many cases.

Current timber management practices appear to suppress the diversity of habitats and early successional stages (Photo 1a, 1b). For example, renewed and intensive efforts to improve tree growth and health through whole-tree (biomass) thinning and herbicide spraying results in a meager understory of forage and cover for deer and other early successional dependent wildlife. Salvage-logging following fire can alter the successional process and reduce the abundance of desirable browse species (Grifantini 1991).

Forest thinning and Whole-tree removal (biomass thinning)

Thinning is used to help restore tree stands to a more healthy condition by removing undesirable trees. It “increases merchantable yields on trees by distributing growth to a lesser number of larger stems, similar to thinning a row of carrots” (USDA Forest Service 1996a). While this can improve health of the tree stand, it decreases some of the components (and successional stages) of a diverse forest system. Manipulated second-growth forest stands typically have minimal understory vegetation in them (see Figure 9 and Photo 1a).

Kucera and Barrett (1995) assessed the effects of thinning on wildlife habitat in Northern California. This activity is conducted on several forests in Northern California (Plumas, Lassen, Shasta-Trinity, and Modoc for example). The Lassen National Forest reportedly has thinned more than 7,000 acres per year; approximately 60,000 acres are thinned annually statewide. However, the majority of thinning occurs on private lands between Redding and Susanville.

Thinning results in an immediate decrease in thermal and hiding cover, and may result in a decline in forage. Wildlife that benefit from post-fire shrubfields or dense understory, such as deer, may not benefit in the short term. The authors concluded that the structural consequences of biomass harvest as currently practiced are not consistent with good deer habitat, and livestock grazing tends to compound the problem.

The long-term effects of whole-tree thinning on wildlife and wildlife habitat are not well-understood, but research indicates they appear to be negative for at least 10 years; that development of a shrub layer following treatments is rare; and that the use of this practice on private timberlands increases the concern about conducting the practice on public lands where there are multiple use mandates.

Herbicide treatments

Herbicide sprays are frequently used following fire in conifer forests to kill the reestablishing herbaceous and woody shrub vegetation prior to transplanting conifer seedlings on such sites (Photo 2a). This practice typically modifies normal successional trends and has been common on private timberlands (examples can be seen west of Burney on Hwy 299 and east of Placerville on Hwy 50) and has been reinstituted in the past few years on public lands administered by the Forest Service (e.g., Stanislaus and El Dorado forests). Aerial application of herbicides can eliminate large tracts of herbaceous and shrub vegetation as suitable deer habitat.

A recent study of post-fire herbicide spraying by DiTomaso et al. (1997) indicated very low shrub cover (1, 7, and 11 percent cover) in three sprayed areas after 2, 8, and 12 years following fire, respectively, compared to 75, 44, and 103 percent cover in the same respective areas not treated with herbicide. Herbicides clearly reduced shrubs, and the potential application of such treatments over large tracts of land is a concern from a forage perspective. Conversely, allowing post-fire areas to become dominated by shrub species (typically deerbrush) in excess of 60 percent cover is not desirable from a deer habitat perspective either (Photo 2b).

A management strategy that would maintain a diverse mix of herbaceous, shrub, and conifer species for forage and cover consistent with typical successional processes (e.g., grass/forb to shrub to tree) would be more desirable to support the diverse wildlife species that occur in forest communities (Thomas et al. 1979) than a mix that rapidly is dominated by herbaceous and conifer cover. This would be especially true in systems such as the west slope of the Sierra Nevada where shrub species are such an integral component.

Livestock Grazing Impacts on Important Habitats and Natural Communities

Discussion of livestock impacts on deer (or other large native herbivores) in California frequently recognizes that deer populations were at their highest at about the same time that livestock

numbers were at their highest. However, this was during the period that we were still “flying high” with an abundance of early successional habitats throughout forested ranges in the state and we now have fewer of both species on forests/rangelands, with overuse still occurring on some ranges.

Historically, the competitive effects of livestock on deer were likely overshadowed by the tremendous level of habitat disturbance that took place between 1849 and the early 1900’s. There was likely enough early successional habitat available on forested ranges that livestock and deer did not significantly compete. Since that time, the acreage and quality of deer habitat has declined to the extent that cattle and deer may now be competing for resources on summer ranges in mutually preferred meadow-riparian and aspen habitats (Loft and Menke 1988); on winter and spring-fall ranges characterized by declining hardwood resources and shrinking forest openings (west side of Sierra and Coast Ranges; Bronson 1992); and on winter range shrub communities (east and west side of Sierra Crest, Coast Ranges; e.g., Longhurst et al. 1977).

The decreasing role of fire and logging as mechanisms for creating early successional habitat in forested ranges indirectly results in greater potential for competition between deer and cattle on remaining ranges. Grazing by cattle in the spring and summer on west slope deer winter ranges may have a negative impact on browse availability the following winter. Cattle may also directly compete with deer for mast crops during fall and winter (Leach and Hiehle 1957). Barrett (1982) reported that cattle excluded deer from preferred oak-woodland habitat and suggested negative social interactions were detrimental to deer.

On east side shrub/grass ranges, the continuous growing season-long grazing that had been the usual practice was largely replaced in the 1970s by grazing systems that allow for periods of rest from livestock. While these systems have benefitted upland perennial grass species in some areas, they largely ignored effects on riparian-wetland areas and on browse species. More attention is being paid to reducing livestock use on key browse species such as bitterbrush and to implementing grazing practices that will enhance riparian-wetland vegetation. These efforts need to be continued and expanded. Grazing can have positive impacts for deer habitat in some cases. Consumption of grass that competes with desirable forbs and shrubs is an example. Urness (1990) indicates that these positive impacts have largely been fortuitous rather than prescriptive. Greater effort to establish grazing prescriptions to benefit wildlife habitat would likely enhance public lands and help meet the goals of the three agencies.

The following sections summarize some of the key habitats important to deer around the state and how livestock grazing can affect them:

Aspen- In natural settings, aspen habitat supports a wide variety of wildlife species because of the presence of a productive overstory and understory providing food and cover. Livestock also highly prefer these summer habitats in California, congregate in them, and can degrade the stand. Hanley and Page (1982) illustrate this impact: “lush vegetation of perennial forbs... was not present in the livestock-grazed aspen stands...” and that there was “absence of successful aspen reproduction due to consumption of the root sprouts by livestock.” In the absence of livestock, aspen was the most highly preferred habitat by mule deer in the Sierra Nevada (Loft and Menke 1988). Many aspen stands are declining in California (Photo 3a), however no comprehensive assessment of this habitat has been conducted in the state. One forest, the Stanislaus, has

identified aspen as a species/ecosystem component of interest to “conserve biological diversity” in the Research Natural Area program (USDA 1996b).

The decline in aspen is largely attributable to season-long livestock grazing and preference for these desirable stands (Pillsbury 1994, Dale 1996). Even after understory forage is consumed, livestock congregate in aspen stands for shade as this habitat is usually associated with water sources and meadow-riparian habitat (Loft and Menke 1988). The result is repeated browsing and trampling of the new shoots (suckers) that would form new trees in openings in the aspen clone. This impact precludes survival of the suckers to establish trees and is why many aspen stands in managed forests are characterized by few, large trees of similar age with many dead and down logs scattered about to delineate the original stand (Photo 3b). Lack of fire can also play an important role as it can stimulate vigorous sprouting. Aspen habitat has a short-term forage value for livestock in summer, but summer-long value as resting cover. In the absence of livestock, this habitat provides abundant understory and ground cover for wildlife summer-long (Photo series 3c). In addition to livestock, wild horses/burros can also impact aspen stands on east side ranges.

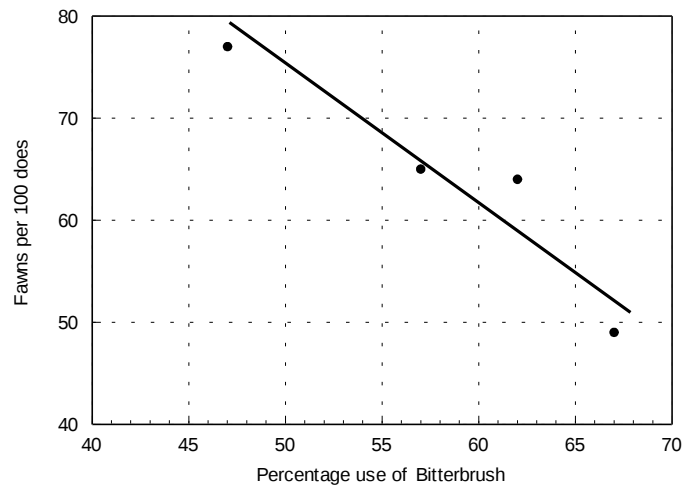
Mountain meadows and montane riparian zones- Livestock highly prefer these summer habitats in California and congregate in them summer-long because of the availability of high quality forage in proximity to water. Distributing livestock to prevent excessive utilization is one of the most difficult challenges to grazing management (Photo 4a, 4b). These habitats are highly preferred by deer and other wildlife. These and associated aspen habitats are often regarded as key fawning areas and population centers, critical for female deer trying to nurture young fawns at this most nutritionally demanding time of the year (Hanley and McKendrick 1985). Overuse of herbaceous and shrub vegetation through the summer reduces hiding and escape cover, and leaves little in terms of quality forage in September-October as deer attempt to build reserves for the winter period. Negative effects of livestock on mountain meadow vegetation cover and diversity have been documented from the coastal mountains of Southern California (Bowyer and Bleich 1984), to the Sierra Nevada (Loft and Menke 1988, Kie et al. 1991), and to the Klamath Mountains near the Oregon border (Van Sickle 1994).

Inadequate monitoring and lack of implementation of management change are important issues in management of meadow-riparian habitats. The habitats comprise a relatively small amount of geographic area while serving a critical role in providing areas of high quality forage, cover, and water in proximity. Case studies indicate livestock exclusion for a period of time can result in recovery. Placing recovery as a first priority, then bringing in modified and well-managed (monitored) grazing systems would benefit these habitats.

Great Basin and Desert ranges- riparian, springs, seeps, and meadows: These small “oases” in the desert make surrounding uplands inhabitable by deer and other wildlife for up to several miles distance. Water, succulent herbaceous forage, and cover are typically available at these small isolated spots if they have not been degraded (Photo 5a). These areas are often heavily used by livestock and wild horses/burros resulting in utilization levels being exceeded (Photo 5b). Many of the more productive and larger riparian-wetland areas in this category are privately owned, thereby increasing the importance of managing sites on public lands for multiple uses. Incentive programs for private holdings for maintaining habitat quality would also be beneficial.

FIGURE 13. Relationship between bitterbrush use (by livestock and deer) and deer fawns produced in the following year (from Dasmann and Blaisdell 1954).

The authors concluded that fawn survival would decline moderately if utilization exceeded 25 percent, and steeply if it exceeded 34 percent. Alleviating browsing pressure from livestock is one opportunity to help retain browse for deer.



Grazing impacts at these typically small sites can be a determining factor for when livestock should be moved on many ranges. In productive (e.g., wet) years, an abundance of upland vegetation nearby may be lightly grazed because of livestock behavior, while nearby riparian-wetlands may be severely grazed. In dry years, the riparian-wetlands become even more heavily used by all herbivores. However, whether in drought or wet year, inadequate monitoring and management of livestock use on riparian-wetland areas can contribute to degradation of the habitat for deer populations. Setting allowable use levels conservatively enough to allow for the needed improvement of these sites can have long-term benefits.

An increasing, and year-round, wild horse population in northeastern California further impacts available resources. As feral animals are present year-round, the potential for competition and displacement can occur at stressful times for deer populations such as summer (when adult female deer are lactating) and winter (maintenance survival conditions).

Great Basin shrub/grass communities (big sagebrush, antelope bitterbrush, curlleaf mountain mahogany): These habitats are considered the traditional deer habitats on the east side. Deer historically have relied on bitterbrush for feed during the fall and early winter, and on sagebrush for the bulk of the winter (Leach 1956). Mahogany stands when available also provide valuable forage and cover.

Livestock browsing of these key species, particularly bitterbrush, during the growing season can reduce potential flowering and consequent seed production, as well as reduce leader availability for deer. Also, previous high deer populations substantially contributed to declining shrub range conditions on the east side. A strong correlation between percent utilization of bitterbrush and the following season's fawn survival has been demonstrated (Figure 13; Dasmann and Blaisdell 1954). For some areas, establishing more conservative browse limits for livestock use could be an important step in attempting to maintain valuable shrub stands. Early intensive grazing to reduce grass competition with bitterbrush is one possibility for using livestock to benefit deer habitat. This strategy should be evaluated and increased if it can be demonstrated to be effective. The lush growth of herbaceous grasses and forbs are important to deer in spring and summer (Figure 14, [color figure on page 50]). Lactating does have their highest energy demands in summer and need high quality forage to nourish their growing fawn(s). The effects of livestock and wild horse/burro grazing of lush vegetation and on plant species composition can be negative.

Conversely, these larger, more general diet herbivores can remove some of the older, rank plant material and stimulate new growth desired by deer.

Other activities of concern related to livestock grazing, or more specifically range management activities, are grass seedings and prescribed fire to increase grass production for livestock; and in some cases, fencing. These activities can be at the expense of deer habitat (Longhurst et al. 1977).

Hardwoods and associated west slope shrub communities: Oak mast (acorns) and oak browse are staple food item for deer on west slope Sierra Nevada and in the Coast Range areas. Long grazing seasons (fall to spring) on winter range reduces forage available to deer (Bronson 1992). The effects are increased in years when herbaceous forage is scarce and cattle reduce oak mast biomass that could otherwise be available for deer. Kie and Boroski (1995) reported that competition with cattle on west slope winter ranges resulted in larger home range sizes for deer and recommended grazing not be permitted before mid-January. Spring grazing can also have an impact on browse species that deer would rely on in the following fall and winter (e.g., buckbrush, *Ceanothus cuneatus*).

Recognizing the Role That Private Lands Have in Affecting Deer Range

Many private lands are, and will remain, wildland. Additional efforts by the three agencies should be encouraged to provide assistance and incentive to private landowners to maintain high quality deer habitat, or enhance habitats through manipulation. The Enhancement and Management of Fish and Wildlife and their Habitat on Private Lands (PLM) program is an example of providing an economic incentive to maintaining deer habitat. For many ranches there is an important link to public land management because they have grazing permits on federal land that help keep the entire ranching operation viable. Greater incentive to maintain private holdings as wildland should be encouraged by all three agencies.

Susanville, Bishop, Reno, Santa Rosa, Auburn, Paso Robles, or the San Diego area all are examples of California's intrusion with houses, subdivisions, or other permanent development on California's wildlands. As it affects deer, much of the development occurs on winter range areas on either side of the Sierra Nevada or year-round range in the coastal mountains. As California proceeds with development on private lands, the remaining public lands administered by the BLM and USFS are becoming increasingly important as sustaining habitats for deer and other wildlife. It is becoming more important that these public lands be able to support the diverse habitats and successional processes that wildlife depend on.

The necessity to suppress fire on public lands at the urban-wildland interface, as well as attempts to reduce fuels through prescribed fire, indicates that these lands may not be managed for their potential value as deer habitat. The same applies to private forestlands managed for timber production. Maintaining or enhancing deer habitat is not usually a high priority because it can increase the cost of doing business. Greater effort to develop and prescribe cost-effective methods to accomplish timber objectives while deriving an enhanced benefit to habitat conditions are needed.