TEXAS PARKS & WILDLIFE

APPENDIX GG

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Supplemental Feeding of Deer in West Texas

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Prolonged periods of limited precipitation or "droughts" are the normal conditions in West Texas. Periods of generous rainfall and abundant forage growth occur but are the rare exception. Drought results in numerous impacts on deer and other wildlife. The two primary effects of drought on a deer herd include a reduction in fawning cover (affecting fawn survival) and a reduction in forage quantity and quality (impacting herd nutrition, reproduction, and survival). Many land managers in West Texas attempt to benefit deer on their ranch by providing supplemental feed.

Most deer managers providing supplemental feed are attempting to accomplish one of the following goals: 1) to improve nutrition and buck antler quality or 2) to increase deer numbers (or maintain deer numbers during drought). Some managers attempt to achieve both goals simultaneously which, as evidence has demonstrated, are goals that tend to conflict with one another (Verme and Ullrey 1984, Lewis 1990, Pekins and Tarr 1997, Brown 2001).

Types of Feeding Programs

The types of feeding programs for deer are almost as numerous as the ranches that provide feed. Some managers provide supplemental feed only during stress periods such as dry summers, dry winters (especially during the post-rut period), and during prolonged drought. Managers attempting to increase antler development may feed year-round or focus feeding efforts during the antler-growth months. Managers attempting to increase deer numbers may feed year-round or focus feeding efforts on reproduction (fawning season and just before conception).

Nutritional supplementation should not be confused with "baiting" (attracting deer to sites to increase harvest or temporarily concentrating deer for other purposes). Baiting is usually conducted with spin-cast feeders which periodically supply negligible amounts of corn or other feed. Nutritional supplementation, whether year-round or seasonal, normally involves free-choice feeders or feeding stations that allow the deer herd continuous access to feed with an emphasis on supplying nutrients that are lacking.

White-tailed deer readily take most kinds of supplemental forage. Mule deer are slightly more hesitant to accept artificial feeds, but mule deer in West Texas will take numerous forms of feed. Types of feed being used in West Texas include (but are not limited to) whole cottonseed, corn, peas, protein blocks, protein pellets, alfalfa pellets, alfalfa hay, peanut hay, cattle cubes, sheep and goat cubes, and waste candy products (peanut base). Supplemental-feeding programs may include mineral salt or blocks.

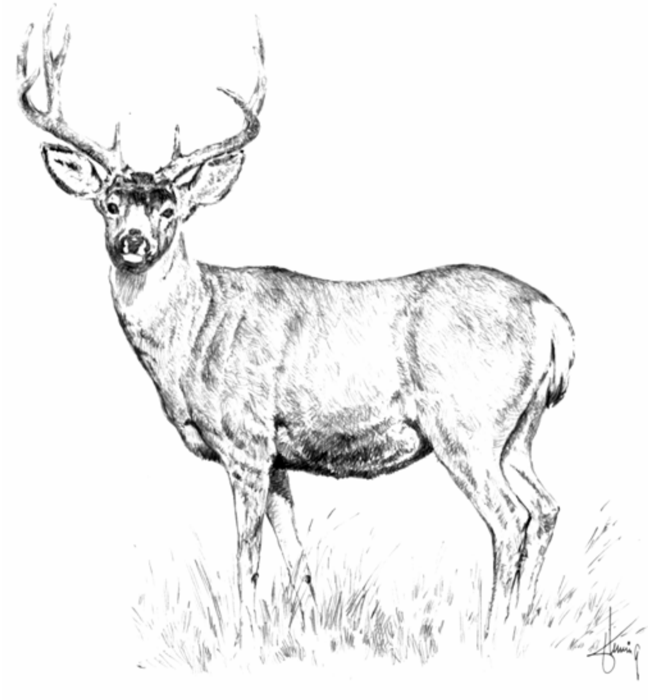
Potential Benefits of Supplemental Feed

Improved Nutrition

Numerous feeding programs have demonstrated that when conducted properly, supplemental feeding can improve the nutritional plane of the deer herd. Improved nutrition occurs when an adequate amount of the proper supplement (varies by season and location) is consumed by the deer herd in addition to a quality diet of native forage. Furthermore, nutritional improvement generally occurs *only* when deer numbers are controlled (i.e., the herd does not exceed the carrying capacity of the land). When deer numbers are allowed to increase in response to the supplemental feed, they can damage the habitat and eventually experience a declining nutritional plane (Lewis 1990, Schmitz 1990, Murden and Risenhoover 1996, Doenier et al. 1997, McCullough 1997). Habitat damage can also occur when a feeding program is used to maintain high deer numbers during drought.

Increased Antler Growth

Feeding programs can improve antler development if the bucks consume adequate amounts of the proper kind of feed at the right time and, most importantly, if the deer herd does not exceed the carrying capacity of the land. The percent of individual deer actually consuming feed can vary, and nutritional effects may be inconsistent by location (Verme and Ullrey 1984, Schmitz 1990, Doenier et al. 1997, Bartoskewitz et al. 2003). Bartoskewitz et al. (2003) found that the proportion of bucks that used feeders on three South Texas ranches ranged from 23% to 48% in summer and 29-56% in winter. Of the bucks that actually consumed supplemental feed, body weights increased by 12-23%, but the effect on antler growth was inconsistent. The improvement in antler growth was 14% on one ranch and there was no significant effect on the other two ranches. Feeding programs are rarely successful in improving deer nutrition and antler growth if excessive deer numbers cause a decline



in the quantity or overall composition of the native forage.

Increase in Deer Numbers

Supplemental feed can result in increased deer numbers if the proper kind of feed is provided at the right time and a substantial proportion of does are consuming the feed. Supplemented herds experience population increases partially because of increased yearling and adult survival but primarily because of increased fawn crops (improved nutrition increases doe conception rates and fawn survival). In low-fence situations deer may be attracted from surrounding properties, particularly during the initial years of a feeding program and during prolonged drought. However, an important consideration regarding feeding programs is whether or not increasing deer numbers is the best goal for the long-term health of the vegetation, the deer herd, and other wildlife species.

Improved Post-rut Buck Survival

Another goal associated with many supplemental feeding programs is to increase survival of bucks following the stress of the rut. During the breeding season, bucks may lose up to 20% of their body weight (Brown 1996). Many bucks have difficulty recovering, especially during dry winters and springs. Annual nonharvest mortality rates for white-tailed bucks have been reported in excess of 20%

(Kie and White 1985, Nelson and Mech 1986, DeYoung 1989), with a substantial proportion of that occurring post-rut. In West Texas, Brunjes et al. (2005) reported average mortality rates of 20% for white-tailed bucks and 24% for mule deer bucks (included legal harvest), with most mortalities occurring during the rut and post-rut months. It seems logical that supplemental feeds high in protein and energy would improve body condition of physically stressed bucks and increase survival until forage conditions improve. Certainly, the perception of many deer managers is that late winter/early spring feeding programs are effective in reducing buck mortality. The ability of supplemental feed to improve buck condition in winter may be hindered by a biological phenomenon—the tendency for deer (not just bucks) to reduce their forage intake during winter (French et al. 1955, Ozoga and Verme 1970, Holter et al. 1977) Reduced forage intake is associated with lower metabolic rates in winter that allow deer and other ruminants to survive under marginal forage conditions. In late winter their metabolism begins to increase in response to the lengthening period of daylight and results in increasing energy demands. Even when supplemental feed is available, buck condition may not improve substantially until hormone levels change and stimulate increased forage intake.

Potential Problems with Feeding Programs

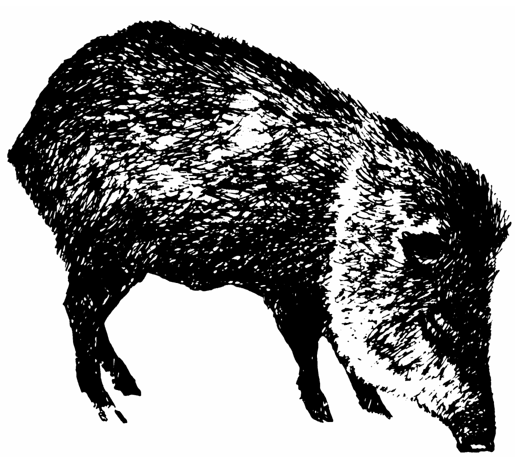
Wildlife Movements and Distribution

The use of feeders and feeding stations has been documented as altering natural wildlife movements (Baker and Hobbs 1985, Williamson 2000, Brown 2001). Every wildlife species has specific habitat requirements and home ranges that shift seasonally in response to their needs. Although forage is only one of these habitat requirements, artificial feed can prevent deer herds and other wildlife from making natural movements which are dictated by habitat differences. Seasonal home range shifts and other natural movements by certain wildlife species have occurred for centuries because the movements directly benefit their health and survival. Altering natural movements with concentrations of feed may be causing problems that are not readily apparent. For example, feeding stations may prevent turkey flocks from moving to high quality winter roost sites, resulting in higher losses to predators. Similarly, feeders may prevent mule deer does from distributing naturally across the land and selecting the best fawning sites. Selecting inferior fawning areas near feeders may increase predation losses. Murden and Risenhoover (1996) suggested that supplementation is disruptive to normal behavioral processes affecting the distribution of free-ranging deer on the landscape, and that these processes may be important in reducing the likelihood of deer overutilizing the more palatable, rare forage species. Under free-ranging conditions, animals normally disperse from habitats where forage resources have been depleted (Arnold and Dudzinski 1967). Supplementation tends to disrupt this natural process, allowing animals to remain in heavily utilized areas.

Disease Transmission

Supplemental feeding has been widely implicated as a causative factor that increases the occurrence of infectious and non-infectious wildlife diseases. Animals are attracted to artificial sources of feed in greater concentrations than normally occurs under natural conditions (Williams et al. 1993, Fischer et al. 1997). As animal density increases, competition for food also increases resulting in more frequent contact among individuals (Baker and Hobbs 1985, Schmitt et al. 1997). If one or more animals are harboring an infectious organism or prion, its transmission to uninfected individuals is facilitated by the increased frequency of contact among animals congregating at the feeding site (Miller et al. 1998). Frequent contact among individuals can also increase internal and external parasite loading. Although the parasites rarely kill the host animal, the physical condition of the deer (or other animal) may deteriorate to the point of increased susceptibility to predation or disease. It has also been suggested that stress from crowding weakens the immune system in some animals, increasing the likelihood of disease (Smith and Roffe 1994, Smith 2001). Depending on the nature of the disease and the feeding location, disease can be transmitted within or between species (Schmitt et al. 1997, Smith 2001), between wildlife and domestic animals (Thorne and Herriges 1992), or even between wildlife and humans (Rupprecht et al. 1995). Supplemental feeding has been suspected of contributing to the spread of tuberculosis and bluetongue in deer, chronic wasting disease in deer and elk, and brucellosis in elk and bison (Davis 1996, Williamson 2000). Moving feeders and feeding stations periodically may reduce the risk of disease spread, but nothing can be done to prevent the unnatural concentration of animals that occurs in a feeding program.

Non-infectious illnesses can also occur when wild species are provided feeds that are incompatible with their digestive function (Wobeser and Runge 1975), feeds of poor nutritional quality (Ohio Wildlife Center 2000), or spoiled feeds that become toxic (Perkins 1991, Davis 1996, Breed 2002). For deer and other ruminants to effectively digest new forages and absorb nutrients, "microbial adaptation" in the rumen is essential which requires a gradual shift in the diet. Sudden and dramatic diet shifts seldom occur under natural conditions, but feeding programs that are initiated and/or discontinued abruptly can result in malnutrition and digestive illnesses despite an abundance of forage. This is why emergency winter feeding of deer in northern regions often fails to prevent death, despite high quality forage in the digestive tract (Nagy et al. 1967).



Non-target Species

The potential effects of providing artificial feed to wildlife usually extend well beyond the targeted species, especially if feed is provided over a prolonged period. Supplemental feed not only attracts deer but also non-target species (i.e., javelinas, feral hogs, aoudads, other exotics), including large predators as well as smaller predators (i.e., skunks, raccoons, foxes) that can impact ground-nesting birds. Mountain lions, bobcats, and coyotes quickly learn to take advantage of deer concentrations near feeders and feeding stations, which can negate the intended goals of some feeding programs. In deer feeding programs that concentrate non-target species such as turkeys and quail, managers may be unintentionally increasing predation or the risk of disease for these and other bird species. Cooper and Ginnett (2000) found that feeders attracted nest predators and decreased survivorship of simulated ground nests within 400 yards of feeders. Furthermore, if plant materials are provided for artificial feed, there is increased likelihood of invasion by exotic plant species (Kosowan and Yungwirth 1999, Spurrier and Drees 2000).

The Wrong Supplement

Many supplemental feeding programs are conducted without a basic knowledge of the seasonal nutrient requirements of deer. If the supplement provided does not focus on the nutrients that are limiting on a ranch during a specific season, the program may be largely ineffective. Ironically, habituation by deer (or other species) to the "wrong" kind of supplemental feed can lead to nutritional deficiencies. For any animal, nutritional requirements vary by age, sex, and season. Deer and other wildlife species are constantly shifting their consumption of native forages to match their changing nutrient needs with corresponding changes in availability of forage types in the habitat. When large amounts of supplemental feed are consumed, a deer's nutritional intake will be limited, to some degree, by the nutrients in the feed, which is usually less diverse and less complete than the combination of nutrients that can be obtained through native vegetation. For example, cottonseed is high in crude protein and energy (fats), but it contains few of the essential macro- and micro-minerals required by deer for physiological growth and development (including antler growth). If a comprehensive mineral mix is not provided in addition to cottonseed, the resulting deer diet may be mineral-deficient.

Impacts on Native Forage

One of the most serious and least recognized problems associated with supplemental feeding is the overuse of forage plants, particularly preferred woody plants and perennial forbs. The most common result of feeding programs is a substantial increase in deer numbers to the point of overpopulation. White-tailed and mule deer are both very capable of reproducing beyond the carrying capacity of the habitat. Under natural conditions in West Texas, predators and periodic drought normally prevent deer herds from increasing beyond the land's carrying capacity. Intensive feeding programs usually result in increased reproduction and recruitment that exceeds mortality, ultimately producing herd growth that can exceed the carrying capacity within a few years. Additionally, feeding programs can attract deer from surrounding properties, at least during the initial years of the program and especially during prolonged drought. Excessive deer numbers resulting from one or both sources will result in overbrowsing of forage plants, especially the high quality forage plants (Murden and Risenhoover 1996). Because of severe and persistent droughts in West Texas, mortality of shrubs or portions of shrubs is a natural occurrence. However, mortality increases substantially for preferred shrubs and perennial forbs that are heavily browsed by excessive deer numbers. More importantly, preferred plants are not replaced through reproduction because seedlings are highly palatable and unable to survive browsing by excess animal numbers.

Even when deer numbers are kept within the carrying capacity of the land, overbrowsing tends to occur near feeding locations because of deer concentrations (Doenier et al. 1997, Williamson 2000, Ginnett et al. 2001). Doenier et al. (1997) found that winter supplementation in Minnesota increased browsing pressure within 900 yards of feeders, which resulted in loss of desirable forage species and increases in less desirable plant species. Ginnett et al. (2001) found browsing pressure to be 7 times as heavy near feeders compared to non-fed areas.

One of the greatest myths about supplemental feeding is that deer will consume supplemental feed instead of native vegetation. Numerous studies have documented heavy utilization of native forage despite the unlimited availability of high quality feed rations (Verme and Ullrey 1984, Schmitz 1990, Murden and Risenhoover 1996, Doenier et al. 1997, Bartoskewitz et al. 2003). Murden and Risenhoover (1996) documented an 8% increase in dry-matter intake by supplemented deer compared to a non-supplemented herd. Furthermore, when provided a high-quality supplement, deer increased their use of rare, preferred forages and consumed proportionately less of the common forage species. This type of foraging pattern would have an obvious detrimental effect on the plant species composition if it occurred over an extended period.

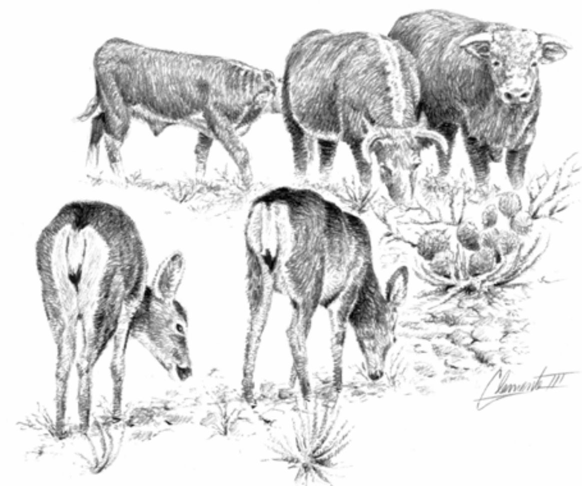
Economics of Feeding

The high cost associated with supplemental feeding programs is another potential disadvantage. Regardless of the benefits (more deer, larger antlers, etc.), it is difficult if not impossible to recover the costs associated with an intensive feeding program (feed, feeders, storage, distribution) through increased lease fees or additional paying hunters. Numerous feeding operations have been examined in various regions of the state and none have proven feasible when based strictly on economics. It is certainly true that many landowners consider this fact about feeding programs an important barrier to their implementation. However, some "financially flexible" landowners are not concerned about whether the practice is economical, provided it helps them to accomplish certain deer management goals. Therefore, the problem of economic feasibility is not reason enough to prevent some managers from implementing a feeding program.

Why is Carrying Capacity Important?

No concept is more important for ranchers and deer managers to understand than *carrying capacity.* Carrying capacity applies to animals, plants, and people. One of the more common definitions for carrying capacity as it applies to animals, is "the number of animals that a habitat can support without causing habitat deterioration." The carrying capacity for a deer herd does not remain at a constant level in any region of Texas, but it is especially a moving target in the Trans Pecos where habitat conditions fluctuate dramatically. In fact, oscillations in animal numbers are not only natural but necessary in West Texas to prevent herds from exceeding the carrying capacity and causing long-term damage to the habitat.

The most important phrase associated with the definition of carrying capacity is **"without causing habitat deterioration."** Of the four habitat components (food, water, cover, space), large grazers and browsers have the ability to impact the forage resource more than any other. Plants can be grazed and browsed to a certain extent without impacting the photosynthetic process (green leaves harnessing sunlight) that replenishes the root system and maintains plant health. When grazing/browsing animals exceed the carrying capacity, plant parts are consumed faster than they can be replaced. Overuse reduces photosynthesis and the health of the root system and overall plant. Continued overuse often results in plant mortality. Unhealthy plants are especially susceptible to mortality during extended drought, a frequent occurrence in the Trans Pecos. More importantly, excessive grazing/browsing severely reduces seed production and seedling establishment. Seedlings tend to be highly palatable and are unable to survive repetitive bites.



When grazers/browsers exceed the carrying capacity, forage overuse results in two general processes of habitat deterioration—a shift in the plant species composition and soil exposure and loss. The first process (shifting plant composition) occurs because highly preferred plants are consumed more heavily than less desirable plants. Excessive browsing results in mortality of desirable mature plants and prevents reproduction (reduced seed production and increased mortality of seedlings). The most preferred plants gradually represent a declining component of the plant community. Less preferred woody plants (creosote, tarbush, mesquite, catclaw, javelinabush), forbs (broomweed), and grasses (threeawn, burrograss, fluffgrass) receive less grazing and browsing pressure, and are able to survive and reproduce unhindered. They gradually increase their representation in the plant community, effectively reducing the carrying capacity for livestock, deer, and other wildlife.

The second process resulting from excessive grazing/browsing is soil exposure and erosion. When perennial grasses and forbs are continually overused, the root systems deteriorate in health, and plant mortality occurs (especially during prolonged drought). When grasses and forbs die, topsoil is exposed to the elements. Highly valuable soil is lost to wind erosion and sheet/rill erosion during rainfall events. Soil exposure also results in crusting or "capping" of the soil surface, which interferes with seed germination and infiltration of rainfall. Additionally, soil temperatures on bare ground can become so high that it can prevent seed germination. As bare soil increases, there is less vegetation to intercept precipitation and funnel it down into the soil profile. Instead, most of the precipitation runs across the surface (sheet erosion) until it reaches a gulley (rill erosion), then a draw and so on. Within hours (sometimes minutes), the vast majority of the precipitation has left the overgrazed rangeland in the form of runoff. Ultimately, there is less moisture available for plant growth and seed germination. More importantly, denuded rangelands result in less infiltration into the soil profile and reduced percolation into the underground waterways and aquifers. This is a primary cause for the reduced and/or halted flow of many springs and creeks in West Texas.

Considerations for a Feeding Program

For managers deciding whether or not a feeding program is appropriate for their ranch, consideration of the following factors is critical to the decision-making process:

- Develop very specific goals for the deer herd. The goals must be realistic and should be measurable (able to identify progress toward goals).
- Practical deer management goals cannot be developed without detailed information about the deer herd (population and nutritional indices) and thorough knowledge about the local limitations of the land.
- Annual deer surveys are important to understand trends in deer numbers and herd composition. Just as important is understanding the biases associated with each survey technique (Richardson 2002).
- Knowledge of annual fawn crops is essential, as well as understanding the true local influences on fawn survival (nutrition, fawning cover, predators, etc.).
- Understanding the current nutritional plane of the deer herd, the nutritional trend, and factors influencing nutrition among years. This can be determined by annual collection of harvest records by age class to include body condition, field-dressed weights, antler measurements, and lactation rates (if does are harvested).
- Knowledge of diversity and condition of deer forage plants, as well as reasons for low abundance, declining condition, etc. This is one of the most important and yet most often ignored steps in the process of assessing whether or not a feeding program is appropriate for a given ranch.
- Livestock cannot be managed independently of the deer herd because they both consume many of the same plants, especially as forage conditions deteriorate (and can have other impacts such as reduced fawning cover). If there are too many animals on the ranch, reducing animal numbers will provide far greater long-term benefits to the soil, plants, and wildlife than maintaining high animal numbers and providing supplemental feed.
- If a feeding program increases deer numbers beyond the carrying capacity of the ranch, do you have the ability to reduce deer numbers? More importantly, are you *willing* to reduce deer numbers?

Using the above process to understand the local deer herd and the limitations operating on the herd will often indicate that deer numbers are in balance with the habitat, and that improvements in habitat quality (fawning cover, water, forage abundance and diversity) will produce an increase in deer numbers and quality. For managers that choose to initiate a supplemental feeding program, implementation of one or both of the following strategies will help to avoid the trap that most managers fall into with their feeding operations (little or no improvement in quality because of excessive deer numbers):

1) Contact a local TPWD biologist to help monitor deer numbers and forage conditions. When preferred plants begin to receive forage use in excess of 50% of the current year's growth, the herd is nearing carrying capacity of the

habitat. When the deer herd is increasing and consistently producing high fawn crops (60-90%), a substantial doe harvest will be necessary to prevent overpopulation and habitat deterioration. A supplemented deer herd with high fawn survival will require an annual harvest of 20-25% of the doe segment to prevent further increases in deer numbers. For managers that wait too long (deer have already exceeded the carrying capacity), a harvest in excess of 30% of the doe segment will be required to reduce deer numbers.

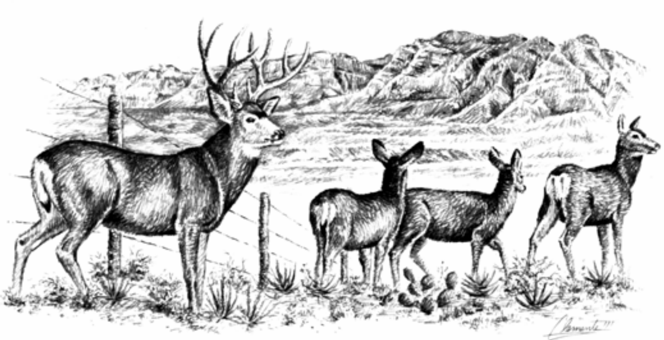
2) If improving antler quality is the goal, restrict feeding efforts to the antler growing months to avoid producing excessive deer numbers. Antler growth (size) is influenced most by nutritional intake just prior to antler drop and during the first 2/3's of the antler development process. The last 1/3 of antler growth is primarily a period of mineral deposition (Muir et al. 1987). Feeding during late summer (fawning) and late fall/early winter (conception) will substantially increase conception rates and fawn survival, ultimately resulting in a population increase. A situation of increasing deer numbers generally conflicts with the goal of improving antler quality. The most common barrier in feeding programs to improving deer nutrition is excessive deer numbers.

An Ecologically and Economically Sound Management Strategy

The best long-term strategy for maintaining a healthy deer population with good body condition, adequate fawn survival, and quality antler development while avoiding habitat deterioration involves the following practices:

- Maintain animal numbers (wildlife and livestock) at or below the carrying capacity of the land (can fluctuate dramatically among years). This requires knowledge of preferred forage species, and annual monitoring of forage use and deer herd nutritional indices (weights, antlers, etc.).
- Maintain abundant fawning cover through appropriate animal numbers and proper grazing management.
- For mule deer, periodic brush management may improve habitat quality (e.g., to control encroachment of mesquite, juniper, tarbush, creosotebush, etc.). No method of brush management is more natural and beneficial to plants and animals than periodic fire.
- Maintain well-distributed and wildlife-friendly water sources. Overflows and seeps that produce green vegetation are particularly valuable during drought.
- Maximize the benefits of precipitation by preventing runoff. By far, the best means of preventing runoff is to maintain good ground cover. Perennial, warm-season grasses (blue grama, bluestems, sideoats grama, tobosagrass, etc.) are more efficient than any other vegetation category in capturing rainfall and allowing infiltration into the soil horizon.

The Trans-Pecos region is unique, with frequent drought and dramatic fluctuations in forage conditions and carrying capacity for grazers and browsers. The limitations associated with West Texas require a patient and flexible manager. Managers who lack these traits are often more successful in areas with greater, more consistent rainfall. In West Texas, the best strategy for the long-term, well being of the deer herd, the habitat, and other wildlife species is to allow the number of grazers/browsers to fluctuate with changing weather and forage conditions. Managers may argue that hunting lease income will be reduced if deer numbers are allowed to decline. However, a thorough cost/benefit analysis of a feeding program will generally discount that argument, and certainly, long-term damage to the habitat (by maintaining excessive animal numbers during drought) will reduce



potential income from deer and livestock in the future.

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