Competition and Conflicts

Livestock Competition: Pronghorn and livestock have co-existed to various degrees on western rangelands for over 450 years (Wagner 1978, Leftwich and Simpson 1978, Yoakum and O'Gara 1990, Yoakum et al. 1996). Cattle, sheep, and horses, are the animals of principal concern, because they are the primary domestic animals on rangelands occupied by pronghorn today. Goats, however, were serious competitors with pronghorn in the past, and may remain so in parts of Texas and Mexico (Buechner 1950).

The chronology of livestock and pronghorn numbers was well documented by Wagner (1978). He graphically portrayed this relationship, illustrating the degree of forage consumed by both, emphasizing that pronghorn today consume less than 1% of the vegetation on western rangelands.

All livestock use probably has some effect on pronghorn, the degree depending upon ecological factors in different habitats. These will be discussed first, then those factors warranting management considerations will be covered for cattle, horses, and sheep.

Livestock in General: Rangelands can be rapidly or slowly altered by livestock (Wagner 1978, Kindschy et al. 1982, Wald and Alberswerth 1989, Yoakum et al. 1996). These changes can affect both the quality and abundance of preferred forage needed to sustain thrifty pronghorn herds (Ellis 1970, Howard et al. 1990). Decreasing vegetative cover brought about by livestock grazing was reported by Autenrieth (1982) to be a serious factor affecting fawn survival. Heavy use of forage by livestock during a severe drought forced pronghorn to turn to poisonous plants, resulting in direct mortality and poor reproductive performance (Hailey 1979). Grazing also inhibits fire, favors the proliferation of woody and shrubby vegetation, and otherwise alters pronghorn cover (Humphrey 1950).

McNay and O'Gara (1982) reported displacement of parturient does by livestock. Does used traditional fawning areas when livestock were not present, but moved to adjacent sites when livestock were allowed on fawning areas. Such competition for space resulted in does moving to sites with less desirable vegetative height. Management guides to alleviate this problem include excluding or delaying the turning-out of livestock in traditional fawning areas until after the pronghorn's parturition period.

At times, and in certain locations, livestock and pronghorn have a commensal relationship (Yoakum et al.1996). Although case histories are rare, livestock grazing on rangelands with an abundance of grasses can cause increased production of forbs and shrubs preferred by pronghorn. Then too, pronghorn consume many plants known to be noxious or poisonous to livestock such as larkspur (*Delphinium* sp.), death camas (*Zygadenus* spp.), locoweed (*Astragalus* spp.), and halogeton (*Halogeton* spp.) (Buechner 1950, Yoakum and O'Gara 1990). Predator control programs intended to benefit livestock may also benefit pronghorn, and Connolly (1978) lists numerous cases of predator control increasing pronghorn populations. Nonetheless, livestock can at times

be reservoirs of diseases and parasites that deleteriously affect pronghorns (Yoakum 2004d).

Careful assessment needs to be used in identifying the assets and liabilities of livestock compatibility or competition on rangelands occupied by pronghorn. Here is a topic that warrants greater research conducted and reported for field conditions on sites in grasslands, shrubsteppes and deserts.

Cattle: Aggressive behavior between cattle and pronghorn appears to be minimal (Roebuck 1982, Pyrah 1987). However, forage competition can not be an issue depending on the vegetation composition and production. For rangelands with abundant native grasses, forbs and shrubs in an ecological healthy condition, interspecific competition can be minimal. This is because cattle are primarily grazer of grasses, whereas pronghorn predominantly forage on forbs and shrubs (Yoakum 2004c). It can not be stressed too strongly that these compatible relationships may occur on rangelands with abundant, healthy native vegetation. However, for monoculture grasslands or rangelands with low quantities or diversity of forbs and shrubs, there can be serious competition for preferred forage classes (Yoakum 2004c). Hoover et al. (1959) reported that the 10,000 pronghorn in Colorado at that time would not eat as much grass as would 200 head of cattle. Apparently, there is a low dietary overlap between cattle and pronghorn; a survey of 10 studies revealed ratings of less than 30% overlap in 9 cases (Yoakum and O'Gara 1990). One study found serious competition for grasses and forbs on Great Basin rangelands during spring and early summer, resulting in low fawn survival rates compared to Plains grassland (Ellis 1970). These are generalized tabulations over many different habitats, but are consistent in depicting the low rate of dietary overlap. Hence, on a year-round basis, competition is relatively low because of the consumption of different forage classes by the two species.

Figure 32. When rangelands are in healthy ecological conditions with an abundance of grasses, forbs, and shrubs, dual foraging by pronghorn and livestock can be compatible. Here, pronghorn and cattle can be seen foraging together in a short grass prairie community in central Arizona. Photo by George Andrejko.

Domestic Sheep: Investigators are not always in agreement concerning the social compatibility of pronghorn and domestic sheep. Authors finding problems of competition included: Einarsen (1948), Buechner (1950), Campbell (1970), Freeman (1971), and Pyrah (1987). However, Severson (1966) observed no apparent stress on either species as a result of the other's presence. Forage competition, due primarily to both animals consuming large quantities of forbs and shrubs was found in 6 food habit studies evaluated by Yoakum and O'Gara (1990). Sheep trailing through pronghorn fawning areas can also be a problem, and should be prohibited from 15 days before to 15 days after the peak of fawning activity.

Two other sheep foraging programs on rangelands can be deleterious to pronghorn: (1) sheep are carriers of parasites and diseases common to pronghorn, and (2) sheepmen encourage the construction of fences not favorable to pronghorn movements.

Horses (domestic and feral): Domestic and feral horses occupy a number of rangelands with pronghorn; however, only two studies have investigated interspecific competition between the two species (Meeker 1979, Berger 1986). Both noted little aggression between species, but horses were dominant at all times. Dietary overlap was minor on rangelands with an abundance of grass according to Yoakum and O'Gara (1990).

Other Ungulates: Bison and elk occur on pronghorn habitats in Arizona, on Yellowstone National Park, on the National Bison Range, and elsewhere. Excessive numbers of any ungulate can result in forage competition with pronghorn, and large numbers of elk may be responsible for some of the decline in pronghorn populations in Yellowstone N.P. (Boccadori and Garrot 2002) and on Anderson Mesa in northern Arizona (Brown et al. 2004).

Vegetation Manipulation: Pronghorn thrive on rangelands in a sub-climax vegetative condition. Such conditions were created historically by wildfires and, where precipitation was sufficient, seasonal grazing by herbivores such as bison and elk. On western rangelands today, most vegetation manipulation efforts are for livestock needs. These projects can be beneficial or detrimental to pronghorn. To benefit pronghorn, vegetation manipulation must increase the number of nutritious forbs and shrubs, and provide habitat diversity. Low diversity grasslands, and shrubsteppes of natural or artificial origin, can be improved by adding species that provide food or cover, whichever is most limiting (Yoakum 2000c).

Shrub control and artificial seedlings that develop monocultures have limited value for pronghorn (Yoakum 1980, Kindschy et al. 1982, Pyrah 1987), especially when accomplished in large blocks of 5,000-15,000 acres (2,000-6,000 ha). Large habitat projects require pronghorn to travel long distances for preferred shrubs during plant succession.

Shrub Control: Areas dominated by shrubs and shrubby trees are not desirable habitat because shrubs compete for moisture and nutrients with forbs, and thick or high vegetation prevents pronghorn from seeing and escaping enemies. Shrub and/or tree control may or may not enhance pronghorn habitat depending on local conditions and how the treatment is implemented. Controlling woody vegetation has not improved pronghorn habitat in Texas (C. Winkler, pers. comm.). However, numerous reports have documented that shrub control (mostly junipers and sagebrush) can increase the carrying capacity for pronghorn in the Great Basin region (Kindschy et al. 1982, Aoude and Danvir 2002, Yoakum 2000c). An ongoing study in Wyoming indicates that plants grow more vigorously on previously "controlled" areas than on "uncontrolled" areas (H. Harju, pers. comm.). This can be good or bad for pronghorn as areas of tall dominant shrubs (more than 50% canopy cover) make for marginal or low-density pronghorn habitat. This is especially true where shrubs are 30 inches (76 cm) or higher (Willis et al. 1988, Ockenfels et al.1994); such areas should be treated to decrease shrub quantity and height. Limiting the size of projects to less than 1,000 acre (400 ha) blocks is recommended, and each project should ideally maintain 5-20% shrub canopy cover. In general, shrub/tree control should attempt to mimic natural conditions, i.e., conditions maintained by periodic fires.

Wintering and spring fawning areas should be included in shrub control projects only when shrubs are decadent or so dense as to increase predation rates. Shrub control projects should not attempt to eradicate preferred shrubs that provide nutritious forage during fall and winter. Shrubs are of utmost importance where snowfall exceeds 12 inches (30 cm) because they often protrude out of the snow and are available for forage.

Shrub control frequently is accomplished by mechanical practices such as plowing and chaining. Plowing with large plows can remove 90-95% of the shrubs (Vallentine 1989), but often kills forbs that are highly preferred by pronghorn. Chaining is accomplished by pulling a heavy anchor chain between 2 large tractors. This practice does not kill as many shrubs and is less damaging to grasses and forbs. However in the south, it may promote rather than inhibit the production of mesquite, junipers, and other small trees and shrubs (R. Miller, pers.com.).

Chemical spraying is another shrub control technique. The spray (usually 2-4-D) controls shrubs without harming native grasses and can be targeted to specific species of plants (Vallentine 1989). However, this chemical has been shown to have deleterious effects on forbs when applied at inappropriate seasons. To avoid killing forbs, spraying should not be conducted during the late spring and summer.

Fires (wild and prescribed) are one of the surest disturbance agents for restoring and maintaining grasslands (Saver 1950), and burning grasslands is the oldest known practice used by man to manipulate vegetation (Vallentine 1989). Although accidental burns can be more deleterious than beneficial to rangeland resources, prescribed burning can be a beneficial and economical habitat improvement technique. Prescribed burning involves systematic planning so fires are set when weather and vegetation are in a

condition to mimic natural conditions and maximize benefits. Timing is important as, when properly accomplished, prescribed burns can decrease shrubs and not seriously harm grasses and forbs (Beardahl and Sylvester 1974). Investigators have reported immediate stimulation of plant growth after burning, resulting in greater forbs production and forage yields (Deming 1963, Courtney 1989, Yoakum 2000c).

Valentine (1989) provided a thorough discussion on objectives, techniques, and results of burning shrublands. Pechanec et al. (1954) recommended burning sagebrush only where this species is dense and forms more than half the plant cover. Other recommendations included burning only when fire-resistant perennial grasses and forbs form more than 20% of the plant cover, or where the area will be seeded after burning, and where the economic and biological needs of all uses (livestock forage, big game habitat, watershed values, etc.) have been adequately considered. He also recommended burning sagebrush during late summer or early fall at least 10 days after the perennial grasses have ripened and dried, and the seeds have been scattered.

Artificial Seeding: When proper planning has shown vegetation plantings to be desirable for pronghorn, Plummer et al. (1968) recommended seeding a mixture of 10-30 species of grasses, forbs, and shrubs. Seeding with a monoculture frequently results in low densities and fewer varieties of forbs. Many manipulated rangelands have been planted to exotic perennial graminoids seldom consumed by pronghorn, such as crested wheatgrass (*Agropyron* sp.). When feeding on grasses, pronghorn prefer finer textured native species such as Sandberg's bluegrass (*Poa sanbergii*).

Although seeding with mixtures of native grasses and forbs is more costly, the result is a greater diversity of species, somewhat comparable to many rangelands in a natural condition. Also, native seed mixtures are in conformity with Federal laws (such as the National Environmental Protection Act of 1969, the Federal Land Policy and Management Act of 1976, and the Surface Mining Act of 1977) that mandate public lands be managed for their natural vegetation, including sagebrush (*Artemisia* spp.).

Ten principles for large-scale restorations of rangelands used by wildlife in Utah were developed by (Plummer et al. 1968). These procedures have wide application on similar sites throughout the West, although some modifications may be necessary to meet ecological conditions in the Southwest and in other local environments.

1. Changes in plant cover by the proposed measures must be desirable. Often lighter grazing by livestock, so that desirable species can grow, may be all that is required.

2. Terrain and soil types must be suited to the changes selected. The soil and terrain should be carefully considered to determine where appropriate treatment would produce the most forage for wildlife.

3. Precipitation must be adequate to ensure establishment and survival of seeded plants. The amount of precipitation, along with the occurrence of indicator plants, is the most important guide to what species may be seeded successfully.

4. Vegetative competition must be low enough to ensure that desired species can be established. Anchor chaining is a highly versatile, effective, economical, and a widely applicable method for eliminating unwanted competition from trees and shrubs.

5. Only species and strains of plants adapted to an area should be planted. Seeded species must be able to establish and maintain themselves. There should be a mixture of grasses, forbs, and shrubs.

6. Mixtures, rather than single species, should be planted. Seeding mixtures is advantageous when the major purpose of restoration is for the improvement of diversity needed by wildlife.

7. Sufficient seed of acceptable purity and viability should be planted to assure a stand. The amount per acre depends on seed purity, size, viability, and whether seeds are drilled or broadcasted.

8. Seeds must be covered sufficiently. Planting deeper than 0.5 inch (13 mm) is seldom desirable; likewise, leaving seed exposed is unsatisfactory.

9. Planting should be done in the season of optimum conditions for establishment. Whenever climate permits, seeding in winter (December-February) is best. Transplanting of nursery stock seedlings is most successful when completed while the ground is still wet from spring moisture.

10. The planted area must be adequately protected. Young plants and seedlings should not be grazed or trampled by livestock or big game.

When properly accomplished, artificial seeding has been proven to be beneficial to pronghorn. An evaluation of an 11-year, large-scale restoration project near Vale, Oregon showed herd increases of nearly 100% near areas seeded mainly with dryland alfalfa compared to adjacent untreated lands where populations increased 30% (Kindschy et al. 1982). Pioneering pronghorn herds in California, Oregon, and Nevada moved to manipulated rangelands having the pronghorn's habitat requirements of a variety of grasses, forbs, and shrubs (Yoakum 2004e).

Wildlife managers on the Desert Land and Livestock Ranch in northeast Utah and adjacent lands in Wyoming, reported on vegetation restoration program with an objective of increasing forbs for pronghorn and livestock (Aoude and Danvir 2002). Various methods of brush control were accomplished and some sites were seeded to herbaceous plant. The authors concluded that vegetation restoration projects increased pronghorn fawn production and carrying capacity compared to non-treated adjacent sites. Results of

this study suggested that treating sites as small as 2 percent of the rangeland annually contributed to increased pronghorn herd numbers.

Grazing Systems: Livestock grazing systems are designed to maintain or improve forage conditions. There are a number of different systems, i.e., deferred grazing, year-round grazing, flash grazing, rest-rotation, holistic or short-duration grazing, etc. (Stoddart and Smith 1955, Heady and Child 1994, Holechek et al. 1997). Livestock managers frequently try or change grazing systems.

When forage is being allocated, plant species preferred by pronghorn should be reserved as forage for pronghorn. These include grasses, forbs, and shrubs identified by food habit studies in the same or a similar ecosystem. Consideration should be given to ensuring that key forbs and shrubs are not grazed beyond their sustainable tolerance. The forage reserved should also accommodate a reasonable number of pronghorn. Reasonable numbers should be based on management objectives of wildlife and land management agencies (Yoakum and O'Gara 1990).

When grazing systems are designed around "key plant species," forbs and shrubs should be included as key species. Grazing systems that simulate serial vegetation conditions closely resembling ecological potential are most favorable to pronghorn. Grazing systems that restrict, alter, limit, or deleteriously affect any of the habitat requirements of pronghorn should include mitigating and alternative procedures for enhancing pronghorn habitat. For example, any grazing system should require that livestock be restricted from fawning areas during the fawning season.

Animal Equivalents: The allocation of forage for livestock and pronghorn is a complex procedure. Various methods of calculating exchange ratios (animal equivalents) have been used, but none has been completely satisfactory (see e.g., Buechner 1950, Hoover et al. 1959, Severson et al. 1968, Taylor 1972, Kniesel 1988, Yoakum et al. 1996).

The most common system for calculating animal unit months (AUMs) of forage consumed by livestock and pronghorn is the ratio of metabolic weights (Heady and Child 1994). Based on this system, six pronghorn were considered equivalent to one AUM. In Idaho, Anderson and Denton (1980) used a system of comparing quantities of forage consumed per day, resulting in 14.8 pronghorn being the equivalent of one AUM. But when dietary overlap ratios were considered, Anderson and Denton (1980) recalculated their equivalents and determined that it took 59.2 pronghorn to equal one AUM.

Kniesel (1988) reviewed past procedures and practices for using equivalent ratios. He stressed the tremendous variation in ratios of pronghorn per cow used by management agencies (e.g., 105:1 in Colorado; 59:1 in Idaho; 39:1 in Texas; 7-14:1 in Oregon; and 5:1 in Montana). Kniesel attributed the wide variation to different methodologies and information used. Some investigators primarily used weight differentiations, while others included such considerations as dietary overlap and rangeland condition. He concluded that assessing AUM equivalents for pronghorn and livestock would remain a problem as

long as there was little agreement between state and federal management agencies when it came to standardized animal equivalents for forage use on multiple-use ranges.