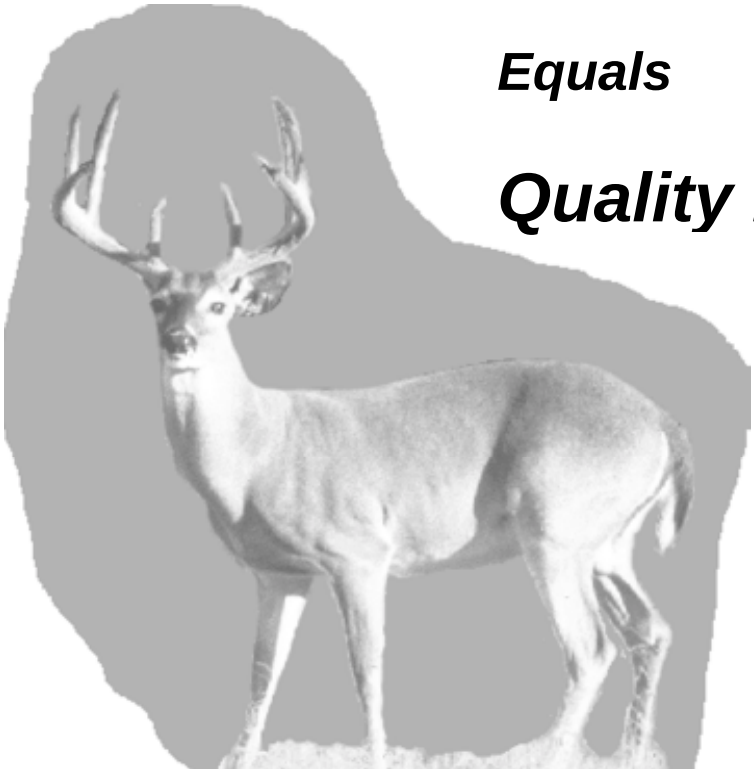
White-tailed Deer Management in the Texas Hill Country

W. E. Armstrong and E. L. Young

Texas Parks and Wildlife

Improved Habitat + Selective Harvest



Equals

Quality Deer

FOREWORD

The recommendations in this publication are based on a combination of white-tailed deer (*Odocoileus virginianus*) research results and management experience gained by Wildlife Division biologists of the Texas Parks and Wildlife Department (TPW) working in the "Hill Country" or Edwards Plateau region of Texas. Studies were conducted under the following Pittman-Robertson (Federal Aid) Projects: W-56-D, Kerr Wildlife Management Area Development; W-62-R, Edwards Plateau Game Management Survey; W-76-R, Kerr Wildlife Management Area Research; W-109-R; Big Game Investigations; W-127-R, White-tailed Deer Investigations.

This is an updated and expanded version of the 1981 publication by George Litton (TPW retired) and the late Donnie Harmel entitled: Deer Management in the Edwards Plateau. Although the white-tailed deer is one of the most studied wildlife species, the intricacies of its behavior and physiology continue to fascinate generations of hunters, wildlife enthusiasts, and biologists. We hope this bulletin will help provide a range of techniques for deer managers in the Edwards Plateau of Texas, but without detracting from the mystique of the white-tailed deer.

We dedicate this brochure to the memory of TPW biologist Donnie E. Harmel, one who never grew weary of studying the white-tailed deer. Donnie loved deer and deer hunting, and believed in the management application of knowledge gained in research. Above all, he wanted to share the things he had learned with others who appreciated deer. His desire was to create enthusiasm for deer and deer management in hunters and landowners. Ultimately, he wanted to benefit the white-tailed deer and all the creatures that share its habitat. We hope this bulletin helps achieve his goal.

Butch Young and Bill Armstrong
September, 2000

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WHITE-TAILED DEER MANAGEMENT IN THE TEXAS HILL COUNTRY

By

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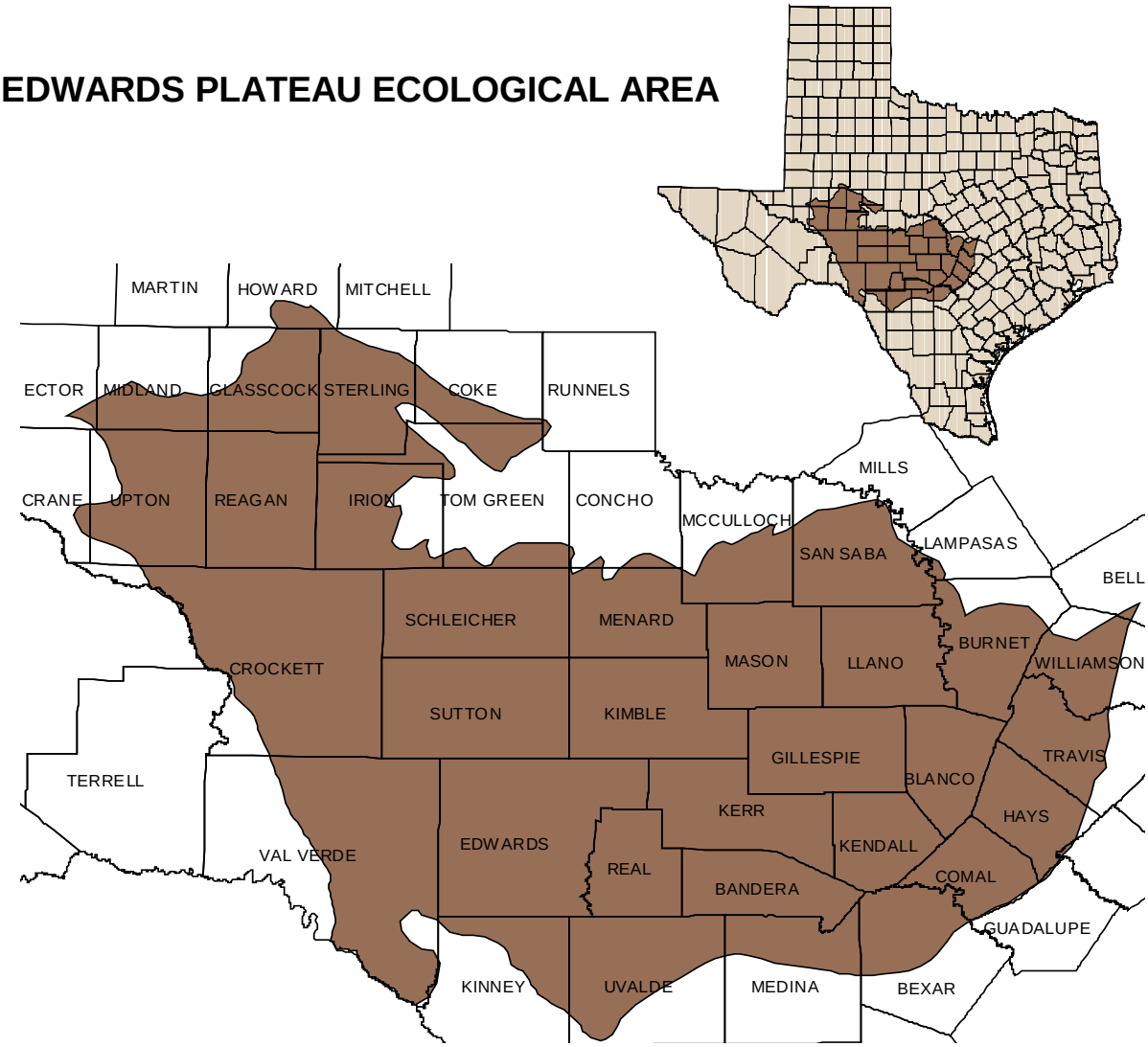
The ecological region called the Edwards Plateau or the “Texas Hill Country” is one of the best-known deer producing areas in the world. It became known to deer biologists after the publication of the classic monograph by Jim Teer, Jack Thomas, and Gene Walker: *Ecology and Management of White-tailed Deer in the Llano Basin of Texas* (Teer et al. 1965). White-tailed deer populations are high with an average density of 65 deer per 1,000 acres (15 acres per deer) for 35 counties in the region. Higher populations occur in many areas, with densities reaching a deer per 3 acres. In 1998, the estimated 1,555,000 white-tailed deer population for the Hill Country constituted over 40 percent of the white-tailed deer found in Texas (Young and Traweek 1999).

Gould (1962) describes the Edwards Plateau as an area comprising about 24,000,000 acres of "Hill Country" in west-central Texas. The granitic Central Mineral Basin, sometimes called the Llano Uplift, centers in Burnet, Llano and Mason Counties. On the east and south, the Balcones Escarpment forms a recognizable boundary to the Edwards Plateau. On the north and west there is a gradual transition into other ecological regions.

The Edwards Plateau is comprised of rocky hills interspersed by rivers and streams.

Although rainfall is low, the land is well watered by springs. The excellent livestock range attracted 19th century Europeans to the area and animal husbandry is still a major industry. Cultivation is largely confined to soils in valley bottoms and rare upland sites where soils are deep. The granitic and limestone soils sustain a diverse mixture of forbs and browse plants. Ranches are often stocked with combinations of cattle, sheep and goats to make full use of the variety of vegetation. Wildlife is an important part of the culture and economics of the region. In addition to native species, the Plateau is well known for herds of exotic game animals that roam the area. Most exotics are found on ranches with high fencing, optimistically called “deer-proof” fences. Many exotics in the Plateau are unconfined and feral herds of free-ranging exotics are common (Traweek and Welch 1992). Commercial hunting of exotic animals is economically important to the region.

EDWARDS PLATEAU ECOLOGICAL AREA



Section I - Deer Management Problems

The most significant management problem facing deer herds in the Hill Country is severe competition for available forage by white-tailed deer, exotic wildlife species, and livestock (cattle, sheep, and goats). Excessive numbers of any of these animals will have detrimental effects upon the others. The importance of maintaining deer at carrying capacity (a population level that prevents damage to the habitat) by removing surplus deer can not be overstated. However, livestock and exotic population numbers also must be maintained within the bounds of the carrying capacity of the range. (All grazing and browsing animals on the range must be considered in order to determine proper stocking rates.) We relied heavily on data from white-tailed deer research conducted on the Kerr Wildlife Management Area in producing this report. The Kerr WMA consists of 5,500 acres under deer proof fence. The area lies west of Hunt, Texas in Kerr County and is representative of many of the habitat types, deer populations, and livestock practices in the Hill Country.

The deer on the left was taken from an overpopulated deer range in poor condition. The deer on the right was taken from a range more properly managed for white-tailed deer. Both bucks are 4.5 years old.

Section II - Basics of Management

Basic deer management can be divided into two broad categories, (a) habitat

management and (b) herd or population management.

A. Habitat Management

understanding food habits, livestock competition, stocking rates, browse lines, rotational grazing, brush control and carrying capacity

A deer's habitat should furnish the basic necessities of life: **nutrition, water, and cover**. The diversity of vegetation on an area is the key to meeting cover and food requirements. Basic cover needs are: 1) *low-growing vegetation* for adequate hiding cover to protect fawns in their first days, 2) *mid-level vegetation* or escape cover to provide protection from predators, and 3) *overstory vegetation* (trees and/or tall shrubs) to protect deer from weather extremes. Low and mid-level vegetation also must provide the nutritional requirements of deer. Deer habitat is provided through a program of vegetation manipulation and care called "range management." Among other things, range management includes balancing wildlife and livestock numbers to fit the food supply, instituting rotational grazing systems, and manipulating vegetation by mechanical means or by use of prescribed fire.

Food Habits: To properly manage for nutrition in a deer herd, it is important to understand just what kinds of plants deer eat**.** There are 3 broad categories of plants found in the Hill Country– forbs, browse, and grass. Texas Parks and Wildlife studies in the Hill Country show that white-tailed deer prefer broadleaf herbaceous plants called "weeds" by some, but are more properly known as "forbs."

Forbs are the preferred foods of deer

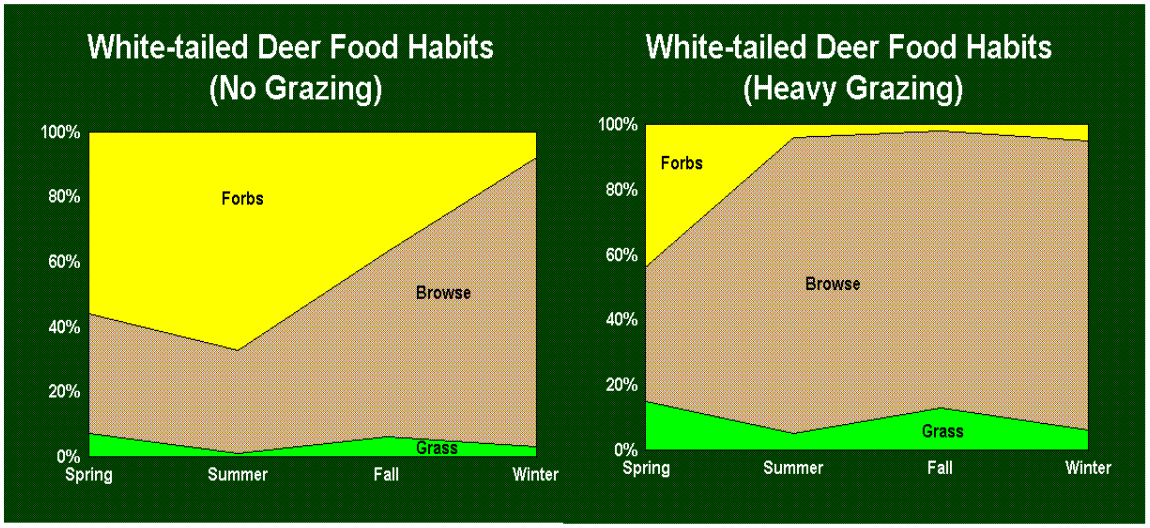
Leaves and twigs of woody plants that we refer to as “browse” are equally important. “Mast”, the fruits, berries, and nuts of trees and shrubs can be of seasonal value. Food preference studies conducted on livestock show that goats, like whitetails, consume a large amount of browse. Sheep, on the other hand, show a definite preference for forbs. However, unlike the white-tailed deer, both sheep and goats can utilize grass when browse and forbs become scarce. Cattle show a definite preference for grass; however, they commonly eat browse plants and forbs, particularly during stress periods (Butts, et al. 1982). To make things even more complicated, most exotic big game animals found in Texas prefer the same browse and forbs as white-tailed deer. White-tailed deer are not physiologically suited to digest mature grasses, and this puts them at a disadvantage to exotic species. As preferred food items become scarce, most exotics shift their diet to grasses. The following charts illustrate the change in forbs, browse, and grass utilization by deer on heavily grazed range as compared to consumption when there is no grazing by livestock.

Browse plants are the staple foods in the Hill Country deer diet

Grasses are not considered to be good deer foods.

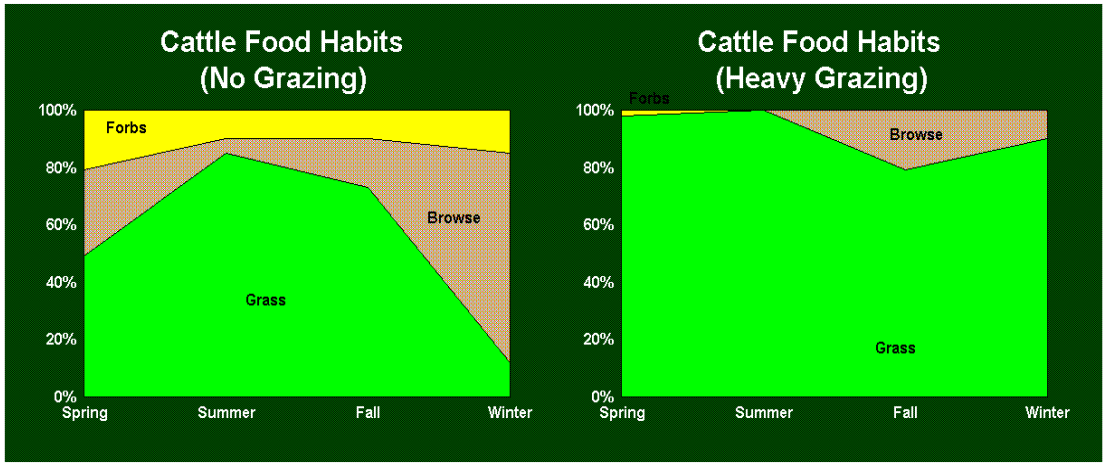
Kerr Wildlife Management Area Food Habits Studies

Deer



White-tailed deer prefer forbs when available. As forbs become unavailable deer shift their diets to browse. Even on overgrazed ranges, less than 15 percent of their diet is grass. They live on basically <u>two kinds</u> of forages: forbs and browse.

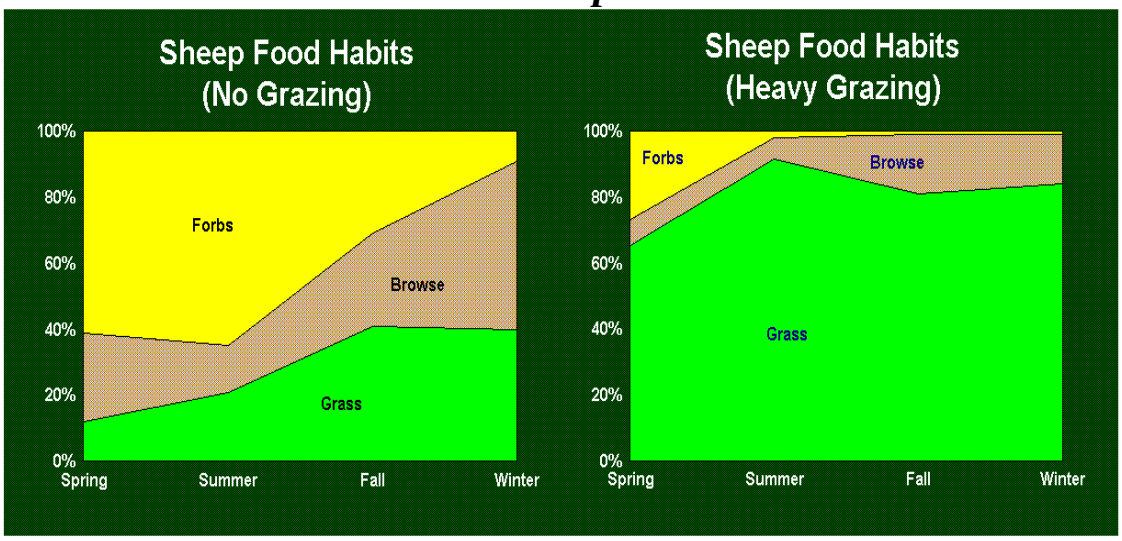
Cattle



Cattle will consume some forbs and browse. However, they eat mostly grass. The consumption of grass results in better forb and browse production. They live on <u>three kinds</u> of forages.

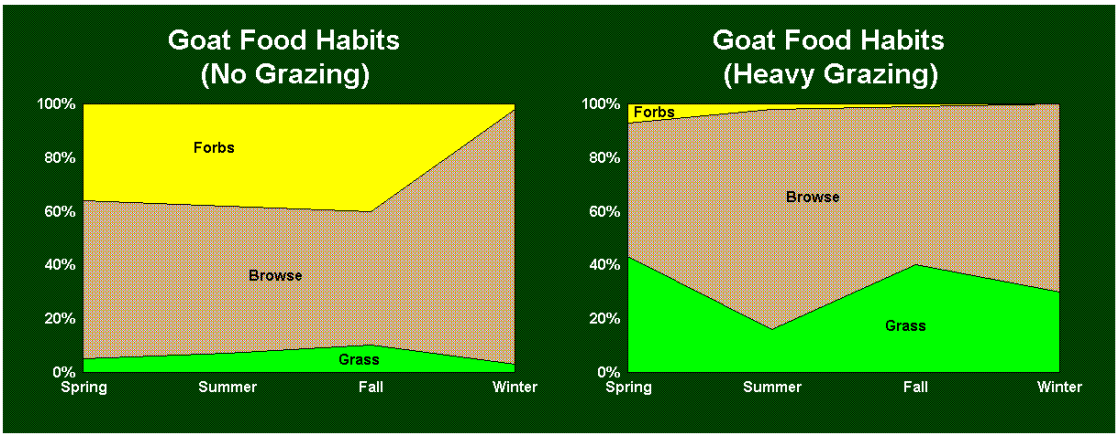
Kerr Wildlife Management Area Food Habits Studies (Continued.)

Sheep



Sheep eat mostly forbs but will readily eat browse and grass. They can live on all <u>three kinds</u> of forages.

Goats



Goats live on <u>three kinds</u> of forages. Goats prefer browse but will readily consume forbs and grass. Up to 40 percent of their diet under heavy grazing was grass.

Browse Lines: We use the term *browse line* when animals have removed all edible vegetation from shrubs and trees as high as they can reach. Browse lines typically become higher and higher as animals eat leaves and twigs that are comfortably within reach, then stretch their necks to get at unbrowsed leaves, and finally rear up on their hind legs to reach higher vegetation. The area with a browse line is commonly described as having a "park-like" appearance. A browse line serves as a visual warning of over-utilization and should not be evident on rangeland considered to be in good condition for white-tailed deer. Trees or shrubs should have leaves and twigs available from the ground up to about 50 inches.

When leaves are missing as high as an animal can reach, it is called a "browse line".

Preferred deer browse in the Edwards Plateau includes Texas oak, post oak, blackjack oak, white shin oak, elm, hackberry, Lacey oak, and Texas kidneywood. Deer eat the leaves and twigs of other browse plants in a pinch. Live oak, greenbriar and evergreen sumac are important winter foods for deer because they stay green during the winter period. Nutritionally poor plants are commonly eaten during stress periods. These include cedar (Ashe and red berry juniper), Texas persimmon, whitebrush, and mesquite. Mast, such as acorns, persimmons, juniper berries, grapes, and mesquite beans are readily taken when they are in season.

The abundance of forbs in the Edwards Plateau depends upon rainfall and season of the year. Primary (or "choice") winter forbs for deer include plantains, spiderwort, eveningprimrose, burclover and Texas filaree. Warm season forbs preferred by whitetails include wild lettuce, lambs-quarters, dayflower, velvet bundleflower, knotweed

leaf-flower, and mat euphorbia.

Although deer are not equipped to digest mature grasses, white-tailed deer consume grass when it is young and succulent. Mature grasses look good, but are rarely eaten by whitetails. The practice of replacing native vegetation with monocultures of non-native grasses such as coastal bermudagrass or klinegrass is detrimental to white-tailed deer and other wildlife. See the plant list at the back of the brochure for a list of preferred Hill Country plants.

Range Management

Stocking Rates: Vegetation diversity is important in deer management. White-tailed deer do best when there is a variety of browse plants available for deer during summer months. Managers should watch deer browse plants for indications of overuse. When half or more of the available leaves have been browsed, use can be called "heavy." Heavy use on nutritionally poor browse species (such as live oak and shin oak) in early summer serves as a warning that there may be too many animals on the range. The numbers of native deer, exotics, and domestic livestock should be examined to determine how many animals should be removed. Surplus deer can be harvested during deer seasons, and livestock or exotics can be sold to reduce the pressure on the native vegetation. Overpopulations of deer, exotics or domestic animals can result in poor antler quality, poor body condition, emaciated deer, disease, and die-offs.

Excessive use on shinoak is a clear warning of over browsing and possible loss of deer.

The Role of Livestock: Good deer management does not necessarily mean removing all livestock from the deer range. The food preferences of deer and cattle mean they can compliment one another in a well-managed operation. A good deer management program is one that is complimented by a well-managed livestock operation. Bison once played an important role in keeping the ecosystem healthy through periodic grazing, then moving on as grasses were depleted. This natural system of rotational grazing created an ideal ecosystem for bison, deer, and other wildlife. Today, cattle are the least competitive with deer for food. A system in which cattle are kept at a **proper stocking rate** to reduce grasses is desirable, and in many instances, necessary for optimum deer management. Dense grasses inhibit the growth of forbs that deer prefer and cattle play an important role in maintaining optimum forb production.

Cattle stocked at proper numbers and used in conjunction with rotational grazing systems can be a very useful tool in deer management.

Rotational Grazing Systems: Rotational grazing systems are organized methods of grazing livestock. Grazing systems are used to control grazing intensity, time of use, duration of use, and length of rest for individual pastures. A well-planned grazing system will provide the flexibility to integrate a host of range management practices (i.e. prescribed fire) into an overall range management program. Livestock are moved from pasture to pasture on a predetermined schedule or grazing criteria. Removal of grasses by cattle stimulates forb growth following grazing. Research has shown that preferred deer foods can be increased through a systematic grazing system. Deer have a preference for pastures that have been deferred.

Rotational grazing systems should allow pastures to be rested (deferred) during a specified time of the year. Some examples of grazing options in order of preference are: a short duration or “time control” system; a high intensity - low frequency system (HILF); a 3 pasture-1 herd system, and the 4 pasture-3 herd rotational grazing system. Each requires different degrees of involvement and fencing. Professionals from the Natural Resources Conservation Service (NRCS), Texas Agricultural Extension Service, and/or Texas Parks and Wildlife can discuss the advantages and disadvantages of each system.

Livestock Fencing: Livestock fencing is vital to establishing deferred rotation systems, but fences can be expensive. Electric fencing can be an economical alternative in controlling livestock movements. Electrified fences are usually less expensive than conventional fences. They can be erected or removed quickly, and may be used in conjunction with existing fences to reduce the size of pastures for deferment purposes.

Noxious Vegetation Control: The manipulation of undesirable or noxious vegetation is an important range management practice in the Hill Country. Cedar (Ashe juniper or red-berry juniper) became a problem in the Hill Country after the arrival of Europeans. Some plant species are tolerant of fire. Others require fire for adequate germination. Cedar is not a fire tolerant plant and regrowth cedar less than 2 feet tall can be readily controlled by prescribed fire. Before European settlement , it was controlled by the frequent wildfires that occurred. Europeans suppressed fire to prevent damage to wooden structures, farmlands, fences, and grazing lands. That eliminated or reduced the role that fire played in maintaining the ecosystem. Formerly restricted to

Juniper when not controlled will dominate a range in just a few years.

steep, rough areas where fire couldn't reach, cedar is rarely eaten by deer or livestock and quickly invades all sites in the absence of fire. Cedar provides nesting material for warblers, and hiding and thermal cover for other species, but little else of benefit to wildlife. The Hill Country of the early 19th Century was comprised of grassy savannah where stands of trees were interspersed with large open areas or prairies that were burned periodically by the settlers or Indians (Roemer 1995). When fire was reduced, dense cedar brakes replaced the spaces between the clumps of trees. The increase of cedar in the Edwards Plateau has meant poor wildlife habitat, reduced carrying capacity, and a lowered water table. It is not a good idea to eradicate cedar from the well-managed ranch, but planned cedar control can be achieved by the following methods:

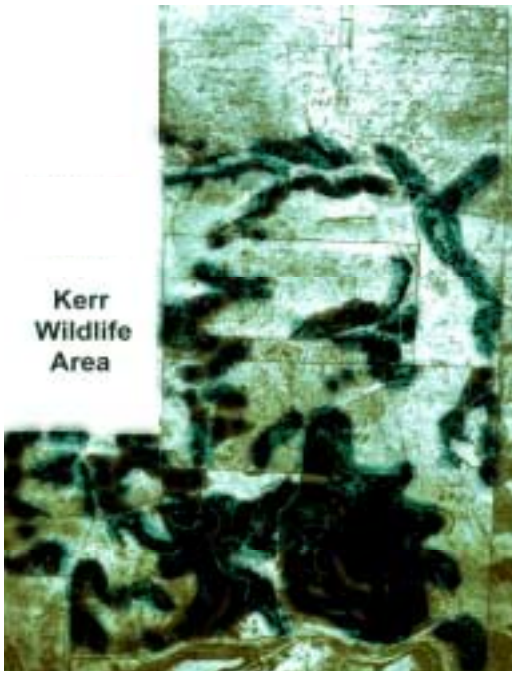
1) Prescribed Burns: We recommend planned burning as a tool for improving habitat for white-tailed deer as well as other species. Controlled burns kill small regrowth cedar trees, but do not harm primary browse and forb species. A burn program that is used properly with a grazing deferment program and deer harvest management will increase preferred deer plants and plant diversity. Burned pastures can be grazed immediately to reduce grasses that compete with forbs, then deferred to allow the pasture to rest. Whitetail and exotic wildlife numbers may have to be reduced prior to burning to allow preferred plants to reestablish following prescribed fire.

Prescribed fire is a useful tool in habitat management

Portions of the property should be left in permanently unburned cover to insure that

plants intolerant of fire are part of the ecosystem diversity. A burning schedule should be maintained to give priority to burning in the winter and early spring before green-up. Even with the best planning, burning “windows of opportunity” always depend on humidity, wind and fuel moisture. The inexperienced manager should ask for assistance and/or advice from agencies such as TPW or the NRCS. While instructional materials are available (White and Hanselka 1991), it is suggested that the novice assist on a burn conducted by an experienced person before attempting the first controlled burn. Controlled fire (prescribed burning) is an advantageous management tool. It reduces regrowth cedar, but rarely harms mature cedar, the home of the endangered golden-cheeked warblers, and encourages the growth of deciduous trees preferred by black-capped vireos. Cedar utilizes a large quantity of subsurface water, and adequate cedar control can result in an increased flow in springs and seeps.

2) Mechanical Control: Undesirable woody species can also be controlled by mechanical means such as use of hydraulic shears, chaining, bulldozing, or hand-cutting. Of these methods, hand-cutting or use of hydraulic shears are preferred because they cause the least soil disturbance. Excessive soil disturbance may lead to erosion in hilly regions. Furthermore, mixing soil horizons reduces productivity.



Strips of Ashe juniper (better known as cedar) should be left at ¼ to ½ mile intervals to act as cover for deer. Kerr WMA is 6,500 acres.

3) Chemical Control: While in many parts of Texas chemical control can be effective, it is impractical for most Hill Country brush species at this writing.

Carrying Capacity:

balancing animal numbers to available vegetation

The concept of carrying capacity is complex and varies annually from ranch to ranch. Carrying capacity can be defined as balancing annual animal numbers to native vegetation. We consider there are two levels of carrying capacity for management purposes: *optimum* and *maximum.*

Young regrowth blackjack oak is an excellent indicator that the deer herd is at or below carrying capacity.

Optimum carrying capacity is reached when deer are receiving a diet that promotes good antler production, body growth, and reproduction. When 50% or more of preferred browse is utilized, optimum carrying capacity is usually exceeded. Physical parameters of deer, including body weights and measurements of antlers can be used as a gauge of optimum carrying capacity. The addition of extra animals would degrade the physical quality of the herd.

Maximum carrying capacity is defined as the point at which the range is saturated with white-tailed deer and/or other animals and additional animals would trigger a die-off. If 50% or more of the available nutritionally poor browse is utilized, maximum carrying capacity is often exceeded. The effects of animal numbers on the habitat should be monitored to insure that overuse does not occur. There are obviously many stages between optimum and maximum carrying capacity.

Effectively Balancing Herds to Habitat

Deer Proof Fences: Some properties in the Hill Country have net wire, deer-proof fences that are 7½ feet high or higher and will restrain deer, exotics, and livestock. Although many were built to restrain exotic big game animals, they enable landowners to closely manage white-tailed deer.

Habitat improvement is difficult if deer cannot be effectively controlled. A high fence prevents the ingress of excess deer from neighboring ranches. However, high fences present unique management problems. Cost of construction depends on topography and location and a high fence will generally cost from $6,000 to $14,000 per mile. "Water gaps," sections of fence that are periodically washed out during rains, must be replaced quickly to restrain deer. For a high fence to be cost effective, most deer managers must intensely market deer hunts. Deer populations grow rapidly, and as forage is depleted and deer cannot escape the confines of the high fence, herd health will suffer and malnutrition will reduce deer numbers. Proper harvest is essential to keep deer within the carrying capacity of the range. A high fence around a small area reduces the esthetic enjoyment of deer for many and raises questions of fair chase in the mind of some deer hunters and the general public. For this reason, the larger the fenced area, the better.

Wildlife Cooperatives: Some movement of deer to and from neighboring ranches occurs in low fenced areas. To effectively manage, deer managers should have control over deer harvest and be able to effectively manage habitat within a deer's home range. In the Edwards Plateau, a deer's home range is about a square mile (640 acres) for most of the year. A minimum management size for low fenced areas would be about a thousand acres to insure management effectiveness.

Deer population control is essential for an *intensive* deer management program to be effective. If the area is smaller than the home range of a whitetail (about a square mile)

this may require cooperative management programs between adjacent landowners. Texas Parks and Wildlife provides assistance to adjoining landowners who want to form cooperatives in which landowners have an agreement to establish a deer management program on the combined acreage. This is a sound approach to managing deer herds on open range. Good management practices will have positive effects on deer populations, even when applied to relatively small places. As total acreage size increases on which sound deer management is being applied, greater improvement in the resident deer herd can be realized.

Supplemental feeding: Supplemental feeding is a two edged sword. Automatic feeders can be used to attract deer to blinds for selective harvest. Supplemental feeding can have positive effects when used as a *nutritive* supplement when native plant nutrition is low, and when animal numbers are balanced to range conditions. However, supplemental feeding should not be used to increase deer populations above native carrying capacity. Maintaining excess deer often negatively impacts preferred deer plants, accelerates range deterioration and promotes disease. Supplemental feeding programs should not be used to increase carrying capacity at the expense of native ranges. The deer manager should always gauge the health of the herd and the range by periodically examining the use of native vegetation by deer. Avoid excessive brush clearing, since desirable native habitat should be preserved for deer and other wildlife

Food Plots: Food plots are not generally recommended for drier regions such as the Edwards Plateau. Most Hill country soils are shallow and highly erodible. Loss of topsoil on these highly erodible areas can cause long term damage to soil structure. Generally, when sufficient moisture exists to grow food plots, sufficient native foods exist; however, when deeper soils are present, food plots can be used to supplement deer diet during winter or summer stress periods. Food plots should not be used to increase carrying capacity at the expense of native ranges. Again, deer managers should gauge the health of the herd and the range by periodically examining deer use of native vegetation.

Post Season Populations: Regardless of the size of the property, sustained annual deer harvest to balance deer numbers to native vegetation should be a primary goal. General post-season deer population goals are shown for the various areas of the Edwards Plateau in the sidebar. These recommendations are based on ranches moderately stocked with cattle and deer. The proper number of deer for your ranch will probably differ, depending on soil productivity, past management history, rainfall, livestock and exotic numbers, and other factors. Texas Parks and Wildlife biologists can recommend a reasonable harvest of both does and bucks based on range conditions, exotic harvest, and livestock stocking rates.

Population Recommendations (Post-season)

Eastern Plateau - 10-15 acres per deer

Central Plateau – 12-16 acres per deer

Western Plateau – 14-20 acres per deer

B. Population Management

antler measurements, body weights, census, genetic selection, harvest strategies, age structure, reproductive success, sex ratios

While habitat management deals primarily with the manipulation of vegetation through many means to improve deer nutrition, *population management* consists of the manipulation of the structure of the deer herd. It consists of manipulating buck to doe ratios, producing numbers of deer of certain ages, selective harvest based on antler characteristics, and a high doe harvest to influence the genetic makeup of the herd.

It all starts with record keeping: It is necessary to maintain data to help you determine the effectiveness of your management strategy. Field records should include deer density, buck to doe ratios, fawn production, and spike-antlered buck occurrence. Harvest records should include age information from all harvested animals, field-dressed weights, antler measurements (number of points, main beam length, antler spread and basal circumference) and incidence of lactation in the female segment of the herd. These data must be grouped and analyzed by sex and age class. The proper method of collecting harvest data may be learned with very little effort. It is crucial to obtain the ages of individual deer harvested on the property. There is a simple means of determining approximate deer ages. The examination of tooth replacement and wear on the six back teeth of the lower jaw is easily learned (Ramsey et al.1993).

Measurements of deer that indicate habitat health:

The average field-dressed body weights of bucks on good range within each age class should equal or exceed the following minimum standards:

Fawns	***35 pounds***
1.5 years	***60 pounds***
2.5 years	***75 pounds***
3.5 years	***85 pounds***
4.5+ years	***105 pounds***

Buck weights: Body weights of deer are a product of both nutrition and genetics. To reach a deer's genetic

potential, it is necessary to ensure adequate nutrition. The average field-dressed weight of a mature male deer (4+year old deer) on poor range in the Hill Country is around 80 pounds. The average weight of mature deer on a healthy range should be in excess of 105 pounds. Bucks on good range should average close to the weights in the sidebar.

Antler size: Antler size and mass is a good indicator of the nutritional status of bucks. Main beam length is one of the best indicators of overall antler size. Average main beam length of mature deer (4.5 years or older) on Edwards Plateau ranges (many in poor condition) is 16 inches (M.Traweek, unpubl. data). Average main beam length on healthy range at the Kerr WMA is 19 inches. While characteristics such as points, general antler conformation and potential antler mass are genetically controlled, adequate nutrition must be available if a buck is to reach his potential.

Incidence of spike antlered deer: Antler mass is a function of nutrition and genetics. The average number of yearling spikes harvested in the Edwards Plateau from 1993 through 1998 ranged from around 37% to 61% of the yearling age class (Young and Traweek 1997, 1999). Spikes can be an indicator of poor nutritional conditions as well as unsatisfactory genetics. If spikes in a random harvest exceed one-third of the yearling males, it may indicate habitat and/or genetic problems.

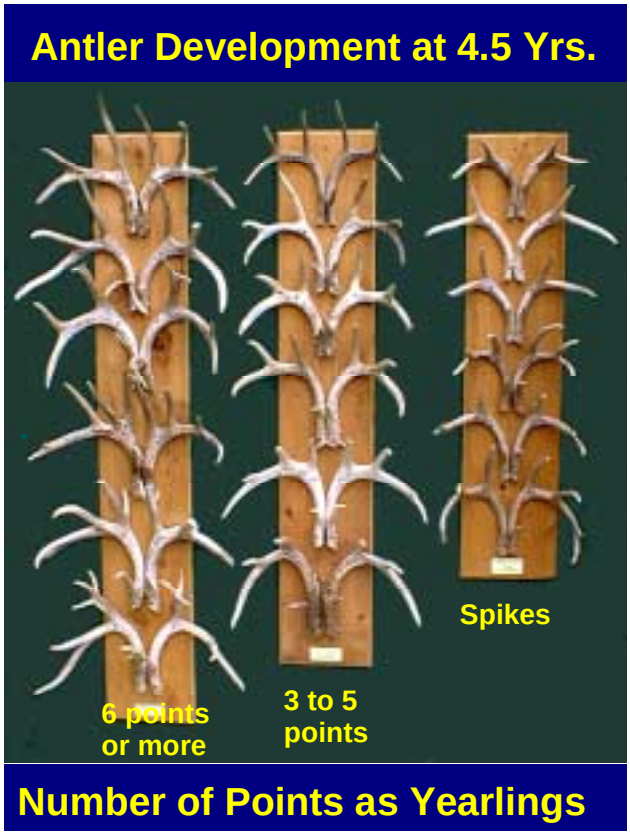
Fawn survival: Bucks show more dramatic weight gains under good nutrition than does. However, does respond to a healthy range by increased fawn production. In normal years, most doe herds on poor nutritional ranges produce between 30-60% fawn crops; whereas, most doe herds on healthy ranges produce between 80-120% fawn crops. At least 80 percent of harvested does in the 2.5-year-old age class should show signs of milk production (lactation) as evidence of fawning.

Available bucks: A good ratio of bucks to does for a herd *with good fawn survival and high fawn crops* would be from 1.2 to 1.5 does per buck. When trophy buck production is the objective, a high percentage of bucks increase the odds that some will

be trophies. See *Age structure* below.

Genetics, nutrition, and selective harvest:

A comparison of studies in Texas, Georgia, Mississippi and Alabama (Strickland et al. 2000) show that yearling antlers are a reliable predictor of future antler development. Within a group of bucks born the same year, the bucks with the smallest antlers as yearlings will usually have the poorest quality antlers at maturity. Age and antler data collected throughout Texas shows that not all yearlings are spikes, but almost all spikes are yearlings (Young and Traweek 1999).



There should be an effort to reduce the incidence of spike bucks through herd reduction, habitat improvement, and selective harvest. Removing spike antlered deer will reduce the number of breeding spikes in the herd. If spikes are selectively removed when range conditions are poor, the incidence of spike bucks should decrease markedly as range conditions improve. Penned deer studies have shown that selection during nutritional stress

Two year old buck on high protein diet. This deer was an offspring of a spike buck and a doe from a spike sire.

lowered the incidence of spikes in subsequent generations (Williams et al. 1999).

Antler characteristics as well as body size are inherited traits (Williams et al. 1994). Leaving the best (branch antlered) yearling bucks in the herd to do the breeding will improve overall antler characteristics of the herd.

Buck to doe ratios: Using selective harvest to adjust sex ratios is an important tool in deer management. It can reduce annual herd increment, increase the average age in the herd, and make more males available for harvest.

Kerr Wildlife Management Area 1994

Herd increment-Large doe populations will normally mean greater fawn production and requires a higher harvest to maintain the population at carrying capacity. Lowering doe numbers helps reduce the necessity to harvest high numbers of deer.

Age structure-Hunters tend to select larger animals (mature deer), leaving the younger deer. Continual removal of older deer to achieve carrying capacity makes it difficult to add age to the herd. If reproduction is high and the sex ratio strongly favors does, there will usually be an over-harvest of bucks. To maintain the distorted ratio at carrying capacity, an effort must be made to remove young deer, especially does and fawns, and protect the older bucks. The bias against killing fawns makes it difficult to achieve harvest. See the sidebar in *Age structure* for an example of the effect of different sex ratios.

Age structure: ***Males:*** Male deer grow a new set of antlers and shed them each year. Antlers become progressively larger each year until deer reach 6 years of age. After about 6 years, annual antler growth decreases. If bucks are allowed to mature, there will be more large antlered deer available for harvest. Harvest of yearling spike bucks also enhances the quality of mature bucks by allowing forked antlered yearlings to make it into the older age classes.

Examples of the effects of buck to doe ratios on age structures of the harvest

Example 1

Carrying capacity = 120 deer
Buck to doe ratio = 1:1
Percent Fawn crop = 100%

Spring Population = 120

Males = 60
Females = 60

Fawns Born = 60
Male Fawns = 30
Female Fawns = 30

Excess Deer = 60
Total males 90
Total females 90

Population after harvest
Males = 60 (90-30)
Females = 60 (90-30)

Harvest is 30 antlered males

Example 2

Carrying Capacity 120 deer
Buck to doe ratio 1:5
Percent Fawn Crop 100%

Spring Population = 120

Males = 20
Females = 100

Fawns Born = 100
Male Fawns = 50
Female Fawns = 50

Excess Deer = 100
Total males 70
Total females 150

Population after harvest
Males = 20 (70-50)
Females = 100 (150-50)

Harvest is all 20 antlered males plus 30 male fawns

If a population of deer at carrying capacity has a 1 to 1 buck to doe ratio and produces a 100% fawn crop, that means that 1/3 of the population is bucks, 1/3 is does, and 1/3 is fawns. To reduce the population to carrying capacity each year 1/3 of the population needs to be removed. If all bucks removed were from the older age classes, the buck segment of the herd would "turn over" every three years. The constant removal of older age class deer makes it difficult to add age to the herd. If some bucks (spikes) were removed from the yearling age class, this would allow for more of the better bucks to advance into the older age classes (See examples 1 & 2 above). Allowing antlerless deer hunting always means some buck fawns will be harvested. Under antlerless harvest, 15 to 25% of the harvest will be buck fawns that are mistaken for does. Therefore, male fawns should be included as part of the recommended harvest of males. Again, the harvest of yearlings and fawns allows middle age males to become older.

Females: Most of the time, even under good range conditions, less than 10% of the yearling does produce fawns, although yearling lactation as high as 60% has been recorded. Most 2 year old does will have a single fawn. Three year old and older does usually have twins. An older doe herd will produce more fawns than a young doe herd.

Section III - Deer Management Techniques

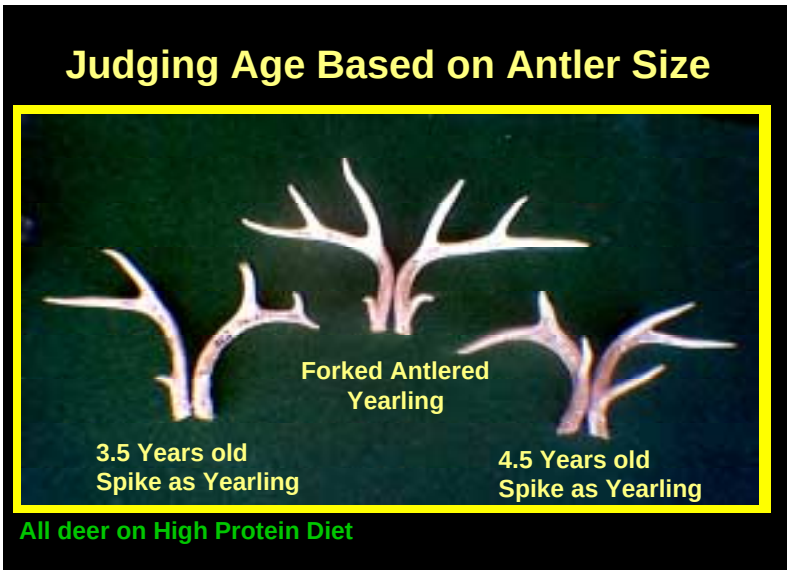
Census: A herd management plan can be developed through annual inventory of the herd and proper record keeping. Various survey techniques such as Hahn walking lines, mobile surveys, spotlight surveys and aerial counts may be used (Shult and Armstrong 1984). Some managers use remote cameras on smaller properties to obtain an estimate of population numbers. Terrain, ranch size, and visibility will dictate the census methods appropriate to the site.

Harvest Strategies:

Using Sex Ratio and Percent of Herd : The use of various harvest strategies should be integrated into an overall management plan to attain the goals of balancing animal numbers to the available food supply (carrying capacity) and at the same time managing for deer herd composition and structure. A number of buck harvest strategies were listed by Technical Guidance Biologist Fielding Harwell for the Edwards Plateau (Harwell 1994). Harvest strategies range from 20% harvest of bucks to 50% harvest of bucks. The 20% harvest allows for more bucks to reach an older age class while the 50% harvest allows for maximum hunting recreation.

Kerr Wildlife Management Area 1998

Base Doe Herd Harvest Strategy: The "base herd" strategy sets a fixed number of does to be maintained over time regardless of the number of bucks. "Base doe harvest" is useful when beginning harvest management programs that encourage selective harvest of spike bucks and other males. This type of harvest selection will often distort buck to doe ratios initially. The number of deer for the base doe herd is calculated from a post-harvest population with a 1 to 1.2 buck to doe ratio. Example: The desired carrying capacity of deer on a 1,000 acre ranch is 1 deer per 10 acres after the harvest. This theoretical population has a 1 to 1.2 buck to doe ratio, or 45 males and 55 females. The base doe herd would then be 55 females. After the base doe herd number is established, bucks are harvested based on antler configuration without regard to sex ratio. Surplus females, bucks which meet harvest criteria, and trophy class males are harvested annually. This is the strategy currently being used on the Kerr Wildlife Management Area.



All three of these antlers are about the same size. One set is from a yearling deer, one from a 3.5 year old deer, and one from a 4.5 year old deer. For quality deer management, a harvest strategy should include the harvest of spike bucks before they are 3.5 or 4.5 years old and become part of the breeding population.

Post-Season Population: In general, the annual deer herd composition (after the harvest) will probably be comprised of 25 to 35 percent bucks, 35 to 45 percent does and 30 to 40 percent fawns. This composition will allow for an appreciable number of adult bucks to be harvested annually, an all-important factor to hunters' satisfaction. These strategies will allow for maximum production without overpopulating the range

during late summer and winter stress periods when drought conditions may prevail.

Crafting A Deer Management Program: Tailor your deer

management program to fit your needs. Each ranch has characteristics that make its deer management plan a unique document. The plan will change over time with the objectives of the manager and the resources available. In addition to specific deer population goals, you must consider many other factors: size of the ranch, topography, soils, vegetation, and water resources. The history of past land use practices and past deer herd management is important. Historical deer harvests, livestock management, and brush manipulation are crucial to understanding the current state of the range and the deer herd.

The first step is to outline your personal objectives for the habitat and the deer herd. Your vision for how you want the range and the herd to look should consider the needs of deer and other wildlife. There must be a good mixture of open areas and brush or trees to provide the "edge" habitat that deer favor. Likewise, maintaining surplus deer will damage vegetation through overuse. The needs of the deer herd and the range must be balanced.

Both deer are 5.5 years old. The deer on the right has no brow tines. Research has shown that mature deer without brow tines were probably spikes as yearlings (McGinty, 1998).

Many ranches depend on whitetail deer hunting as a source of income, just as they do

their livestock or other crops. Providing trophy animals to hunters as a source of income may be a goal, but in the early stages of a management plan you may have to concentrate on producing as many harvestable animals as possible. There will be many deer that are surplus to the habitat and herd management program. It is important to plan the removal of surplus deer even in trophy management programs. Decide whether extra deer will be taken by friends and family, youth hunts, or commercial hunting. Consider whether long term leases fit your style, or whether a “day hunting” scenario suits you better. Selective harvests can be accomplished by guided or unguided hunters, but you need to decide whether guides are necessary to help hunters shoot the right animal.

Section IV - SUMMARY

Many factors must be considered before establishing a plan for your ranch. A summary of the more important considerations follows:

1. Populations of domestic livestock, exotic big game and white-tailed deer must be maintained at levels determined by the available food supply. All animals existing on the range should have adequate food available to prevent nutritional stress.

2. A good deer management program can be conducted in conjunction with a well-managed livestock operation. Cattle can be an asset to a deer management program when proper stocking rates and deferred rotation grazing systems are used.

3. Managing a deer herd requires effectively manipulating a population of deer. This may require a large tract of land under a single ownership. Alternately, a cooperative deer management program can be initiated between landowners working together to manage deer. The least desirable option is confining a herd with a deer-proof fence.

4. Annual deer herd inventory and proper record keeping are essential to implementing a deer management program. Data must be gathered pertaining to deer density, buck-to-doe ratios, percent fawn crop and percentage of spike bucks.

5. Records must be maintained on all harvested animals including age, field-dressed weights, antler measurements and incidence of lactation. This will permit the setting of objectives and the measurement of progress.

6. If management by sex ratio is desired at an early stage, ratios of 1:2.5 or 1:2 are reasonable. Total number of deer should be maintained at or below carrying capacity.

7. The incidence of spike bucks in the yearling age class should decrease markedly as range conditions improve. Spikes should be calculated as part of the buck herd, but spike bucks should not be protected. We recommend removing spikes and protecting the branch-antlered yearlings.

8. Range: plants should be monitored periodically to determine the effects of livestock, exotics and white-tailed deer on native vegetation. See Appendices B and C for a list of important plants.

Appendix A:

An example of a successful white-tailed deer management program-Kerr Wildlife Management Area

The following management plan is one that presently is being used on the state-owned Kerr Wildlife Management Area located in the Edwards Plateau in western Kerr County. We do not expect this plan to exactly fit your particular need. It can be used as a guideline for formulating your own plan.

The long-term management objective for the white-tailed deer population on the Kerr Wildlife Management Area is to produce *quality* white-tailed deer through harvest and native habitat management. Quality of the deer herd is judged by antler characteristics of the bucks, body weights of bucks and does, the reproductive potential of the does, fawn survival, and herd mortality. A concurrent objective is to maintain vegetative diversity to provide habitat for other game and non-game wildlife species.

Background

Status at Time of Purchase:

The Kerr Wildlife Management Area, once part of MO Ranch, became a management and research area of the Texas Game, Fish and Oyster Commission in 1950 and personnel started management in 1954. With the exception of the extreme north end of the Area, the terrain was dominated by mature Ashe juniper. Much of the area was an unproductive cedar brake. Food habits and carrying capacity studies indicated that cedar removal was necessary to produce quality deer habitat. Major mechanical brush removal occurred in the mid 1960's. When purchased, the Area was heavily grazed by cattle, sheep, goats, exotics, and white-tailed deer.

Conditions Prior to Deer Proof Fence: 1954-1967

Managed deer harvest started on the Kerr in 1954 through controlled public hunts with a buck-only regulation. Biologists soon realized that populations had to be reduced to levels at or slightly below carrying capacity. To accomplish this, there was a need to harvest deer of both sexes. Either-sex hunts have been conducted on the Area since 1958.

Studies conducted on the Kerr Area showed that a maximum post-season deer density of 1 deer per 10 acres could be maintained without a major die-off. For optimum population growth and good body conditions, the desired post-season population is 1 deer per 12 acres. This figure was established as the post-season carrying capacity goal. The mechanical removal of extensive stands of mature Ashe juniper from 1964 through 1966 brought about improved habitat for deer and increased deer numbers. Annual hunting failed to adequately control the Area's deer population, even though 300-400 deer were removed annually. Deer moved into the area as range conditions improved because of improved livestock management and cedar control. A deer proof fence was built to halt the ingress of deer from neighboring ranches.

Low fawn crops, major die-offs, poor body weights and inferior antlers (high percentage of spikes in the harvest) were recorded prior to 1968. Deer populations were high and deer food conditions poor. Heavy hunting pressure was applied for four years following the construction of the deer-proof fence. By 1972, hunting brought the deer population below the maximum carrying capacity of one deer per 10 acres.

Kerr Wildlife Management Area 1978

Conditions after construction deer proof fence: 1968-1998

The improvement of range conditions after 1968 could be attributed to several factors. The removal of large stands of Ashe juniper in 1964 and 1966 reduced competition for light and water and encouraged the growth of desirable deer food plants. Sheep and goats were removed from the Area because of direct competition with white-tailed deer for food. These factors, plus a heavy harvest of white-tailed deer to reduce numbers, resulted in more forage for the deer.

Kerr Wildlife Management Area 1992

Either-sex harvest

From 1958 through 1982, deer harvest was either-sex, that is a hunter could harvest one deer, regardless of age, sex or antler chracteristics. The primary management objective was to reduce deer populations to within carrying capacity to allow range recovery. The harvest for the 26 years from 1972 through 1999 was approximately 54 percent males

.

From 1964-1972, a number of management practices were initiated. Sheep and goats were removed from the area. Deferred rotational grazing systems for cattle were started to improve range conditions. Juniper control through burning and cutting was accomplished as well.

Start of Selective Spike Harvest

From 1983 through 1999, special antlerless hunts (an antlerless deer was defined

as any deer with less than 3 points) and/or either-sex hunts were held to encourage the harvest of spike bucks and to control the female segment of the herd. In 1998, special spike-only hunts were added. Either-sex hunts were limited to antlerless deer, spikes, and males whose antlers were wider than their ears. This was initiated in an effort to reduce the harvest of the better antlered yearling bucks.

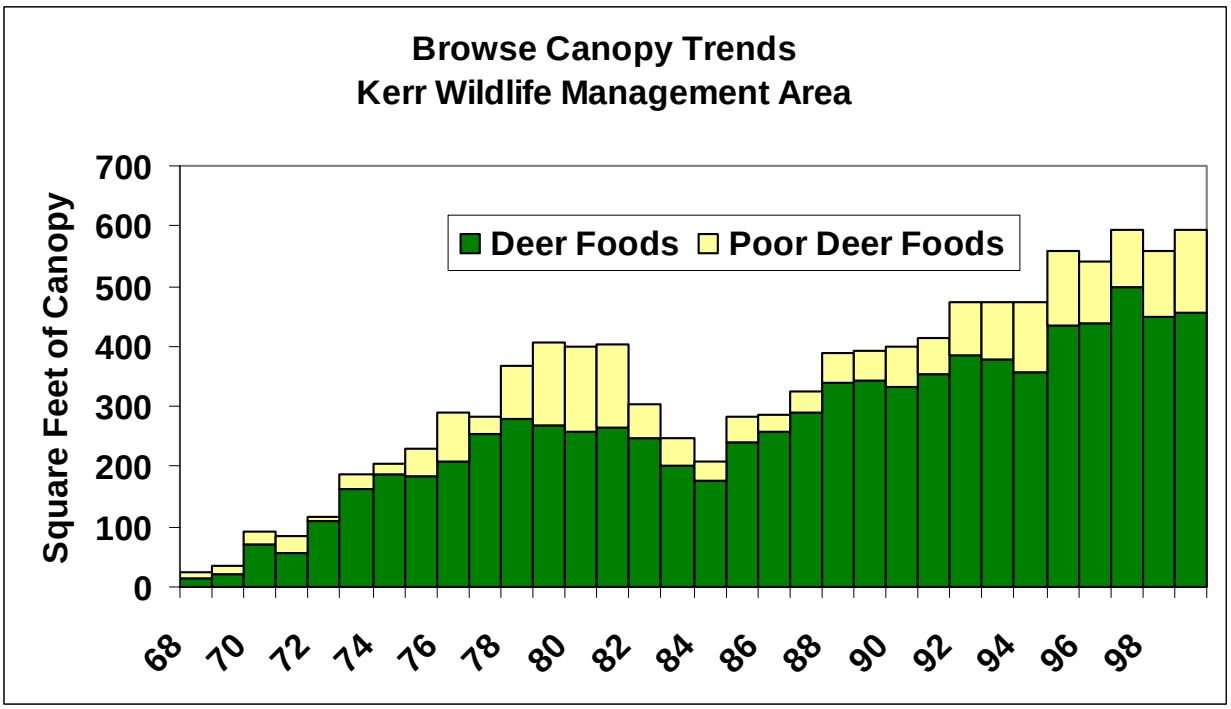
The harvest of spike antlered deer is a recommended harvest strategy

Through a combination of range, livestock, and harvest management, the deer herd on the Kerr Wildlife Management Area has made substantial progress toward improved antler size, body weight, reproduction and age. Herd improvement has been accomplished with native deer on native range without the benefit of supplemental feed, food plots, or introducing deer from an outside source. Trend information is listed below.

Quality yearling deer harvested on either sex hunts in 1986.

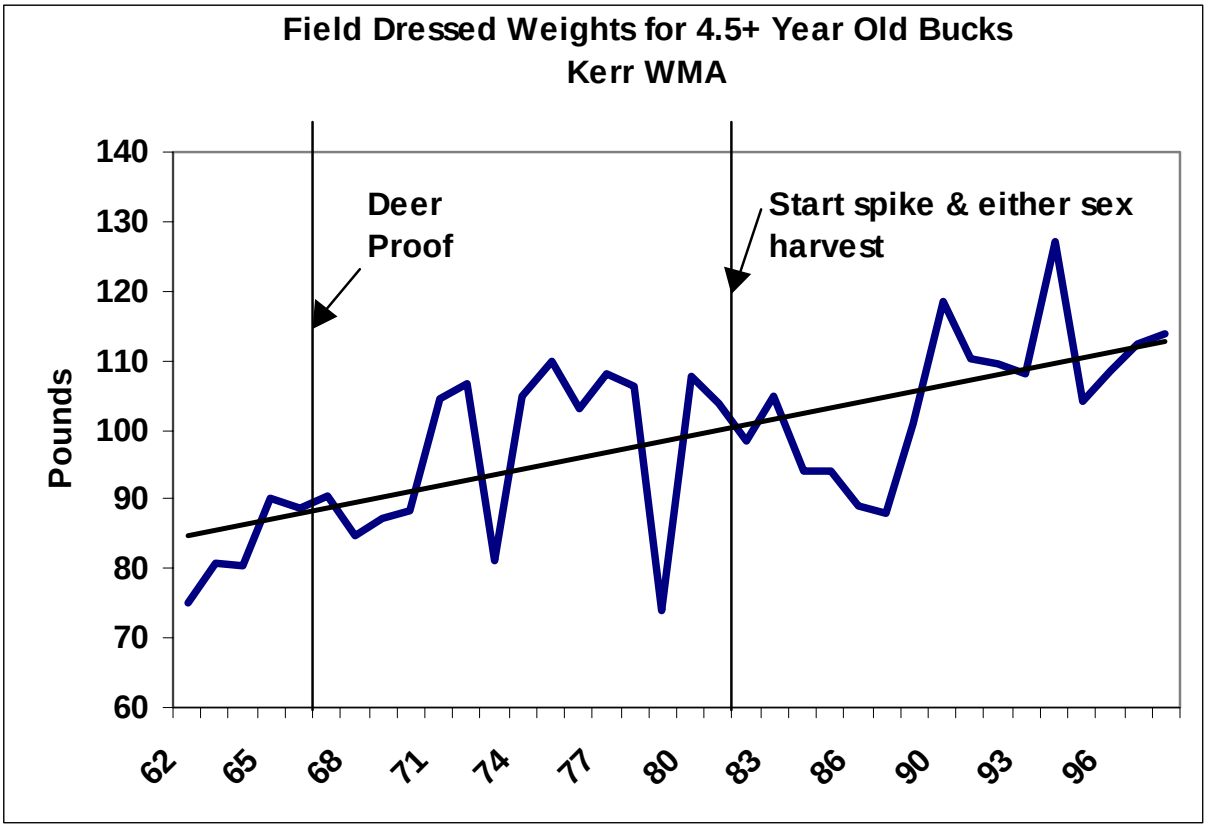
TRENDS

Range Trends – Kerr Wildlife Management Area:



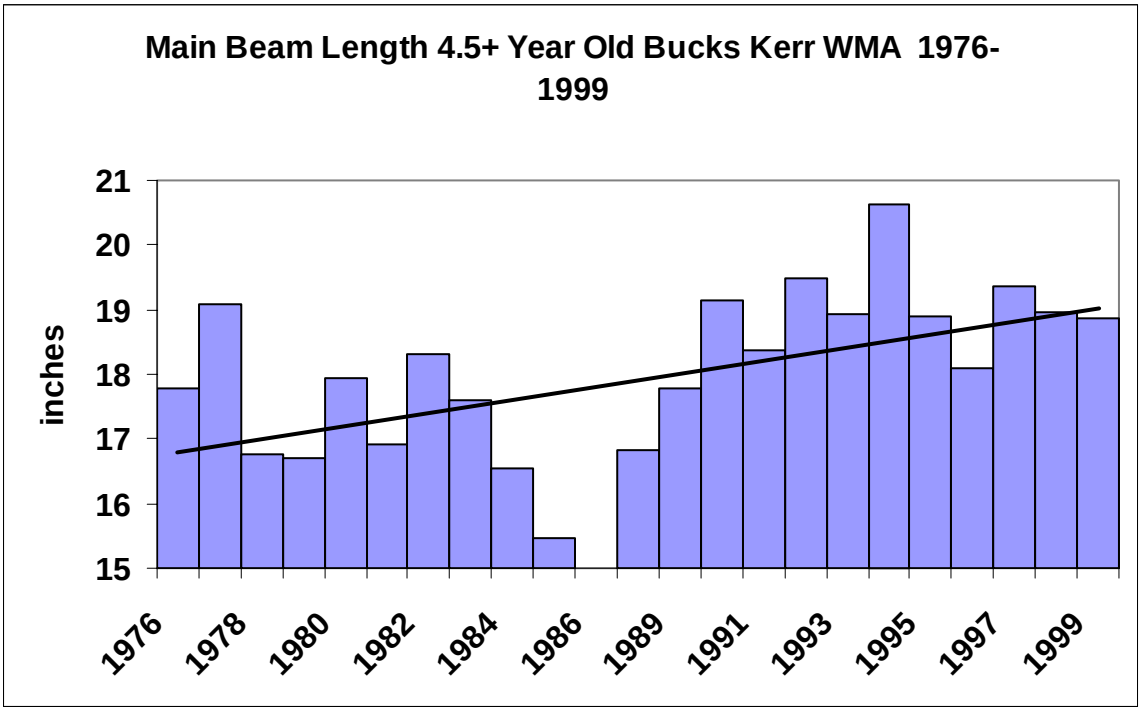
Range Improvement: Browse canopy trends illustrate the overall range improvement on the Wildlife Management Area. Steady improvement in browse availability has been evident since 1968 in spite of differences in rainfall through the years, i.e., a drought in the Eighties coupled with the burning of extensive brush piles initially reduced available browse.

Deer Population Trends – Kerr Wildlife Management Area



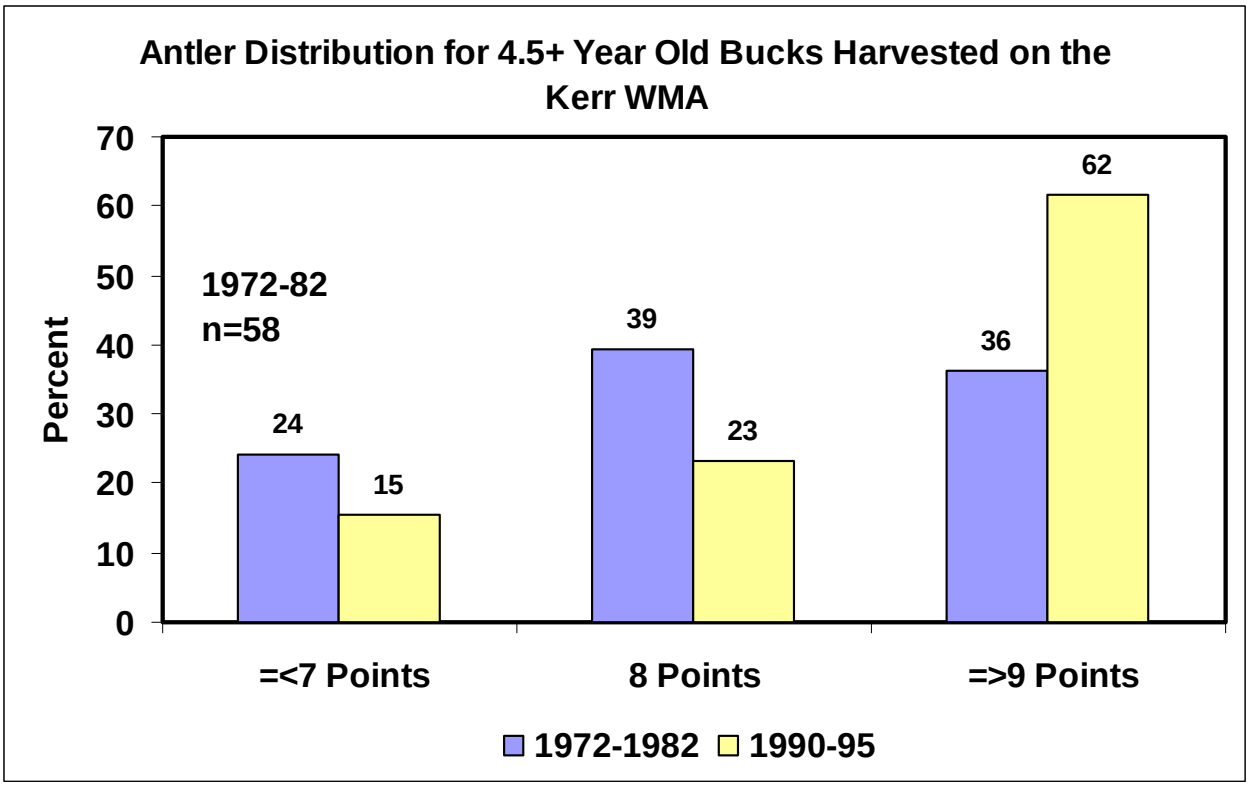
Body Weights: Field dressed weights for male deer in all age classes have improved from the average weight of 79 pounds for 4.5+ year-old buck deer in 1962. Average weights in 1999 were about 118 pounds. The heaviest 4.5+ deer recorded from 1954 through 1999 was 141 pounds (1994).

Deer Population Trends – Kerr Wildlife Management Area (Con't.)



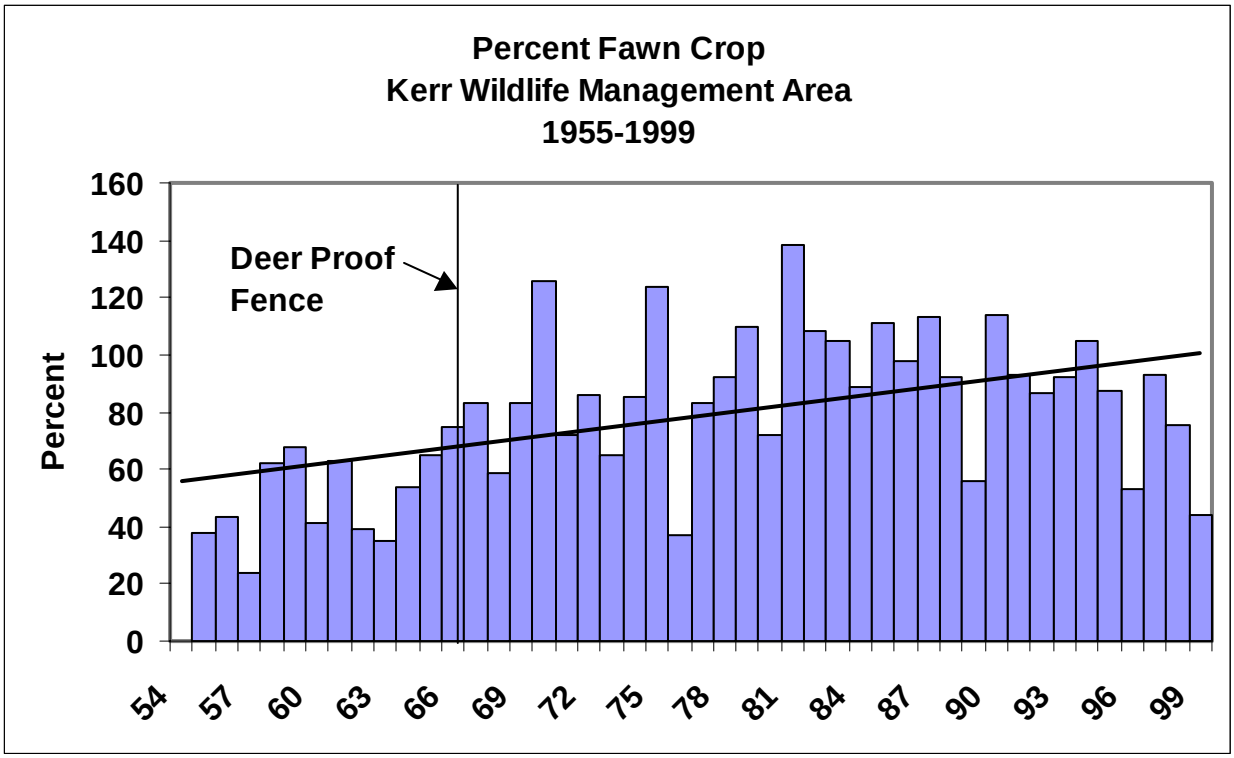
Antler size: Under this harvest strategy, antler quality has improved as illustrated by the trend in main beam lengths. This trend is a result of a combination of increased nutrition through habitat management and genetic selection (removal of spikes). There was only one deer harvested in the 4.5+ age class in 1986 and he was a spike as a yearling..

Deer Population Trends – Kerr Wildlife Management Area (Con't.)



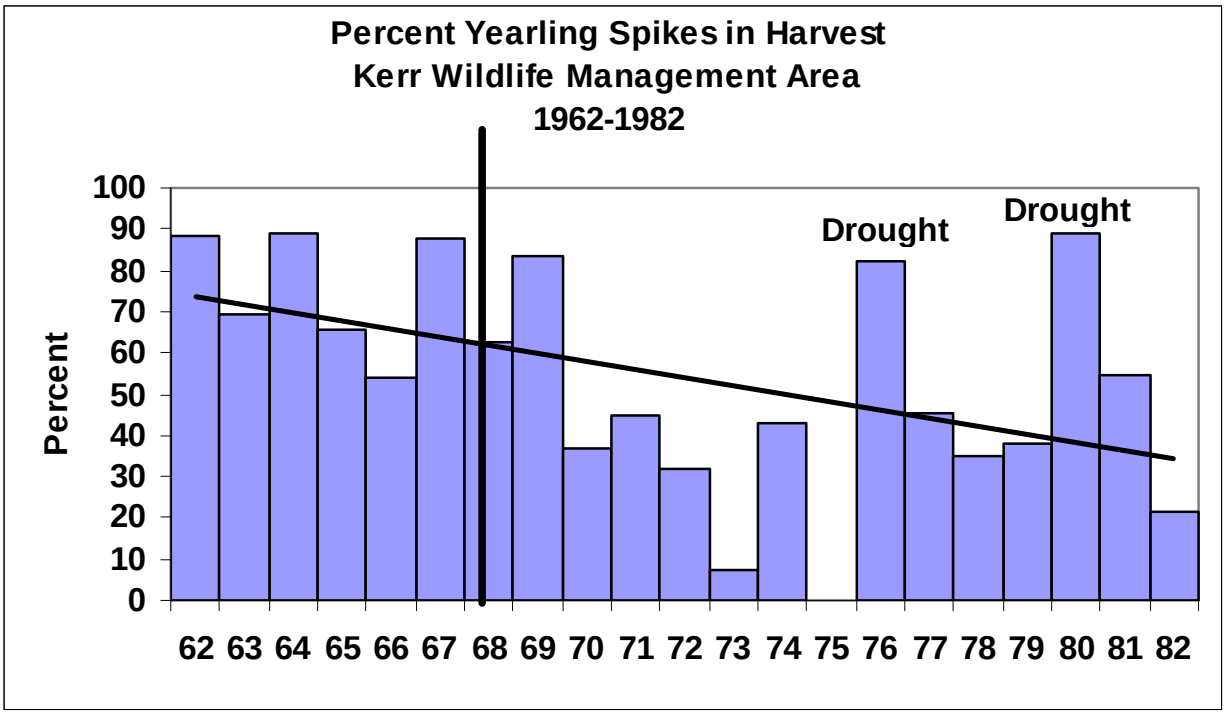
Antler Points: Just as antler size has increased, so has the number of antler points. Again this may be attributed to a combination of increased nutrition through habitat management and genetic selection (removal of spikes).

Deer Population Trends – Kerr Wildlife Management Area (Con't.)



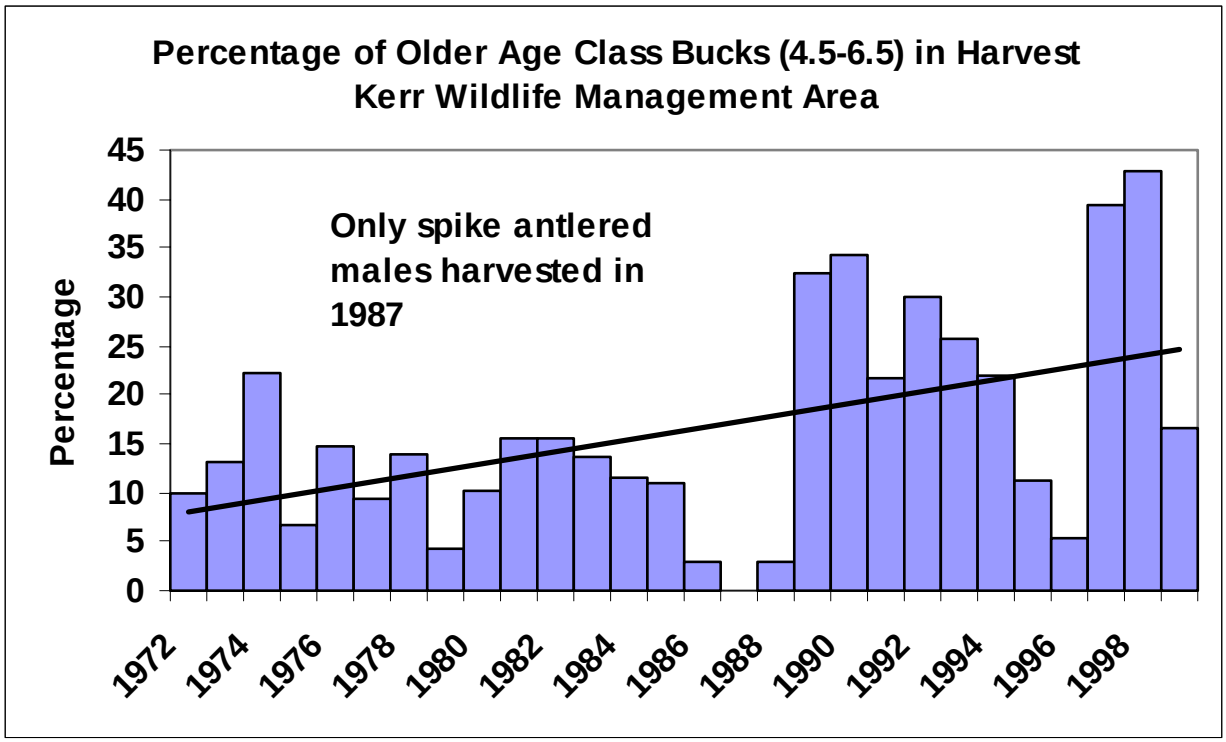
Fawn crops: Improved range conditions have resulted in an increased fawn crop. An average fawn crop of 89.30 percent has been produced since 1968 when the deer population was reduced and controlled. Upward fawning trends corresponded to improving habitat conditions.

Deer Population Trends – Kerr Wildlife Management Area (Con't.)



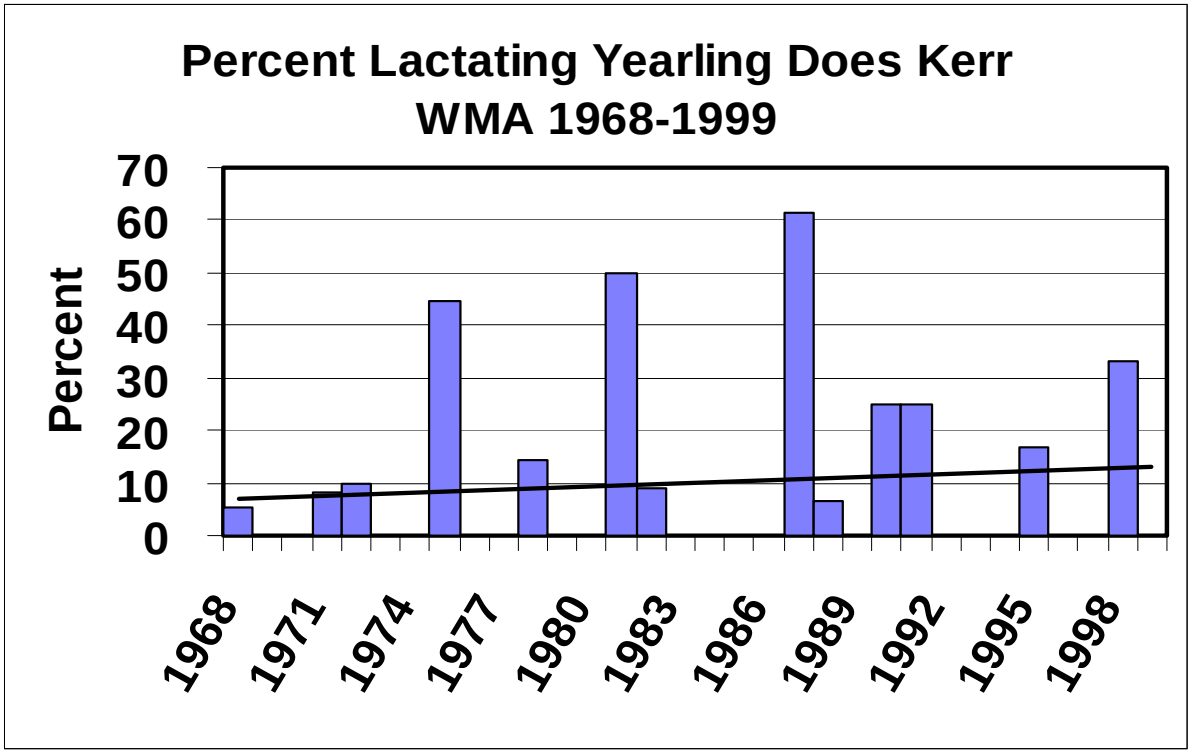
Spike bucks: In some hunts, spikes were the only legal bucks, nevertheless, the incidence of spike bucks in the Kerr Area harvest was reduced under improved range conditions. Within the yearling age class and prior to selective spike harvest starting in 1983, the percentage of spikes in the harvest ranged from zero to 83 percent. Of the 1,131 spikes killed from 1970-1999, only 13 (1.15%) were older than 1.5 years.

Deer Population Trends – Kerr Wildlife Management Area (Con't.)



Age Structure: The combination of spike and antlerless deer harvest has distributed the kill between younger and older age class males. Managing for a more even sex distribution (buck to doe ratio) in the harvest increased the availability of older aged males for harvest**.**

Deer Population Trends – Kerr Wildlife Management Area (Con't.)



Lactation: The number of lactating 1.5 year-old does in the harvest has shown an increasing trend since 1968. Improved habitat conditions allowed does to breed as fawns, give birth, and raise their fawns to weaning. The average percent of lactating does in the 2.5 year-old and older age classes from 1968 through 1988 was 83 percent, an indication of a healthy herd.

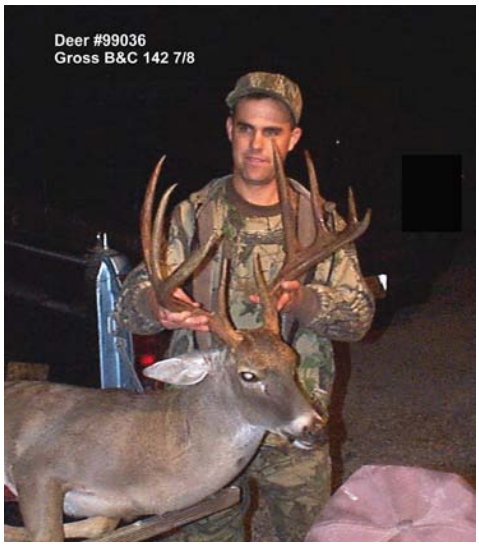
Short Term Fluctuations in Trends: It is apparent from looking at the preceding charts that yearly trends can fluctuate widely while long term trends continue to improve. Deer management is a long-term commitment, requiring perseverance. Short-term fluctuations may be caused by rainfall patterns, mast failures, wildfire, extended drought, disease, and other setbacks.

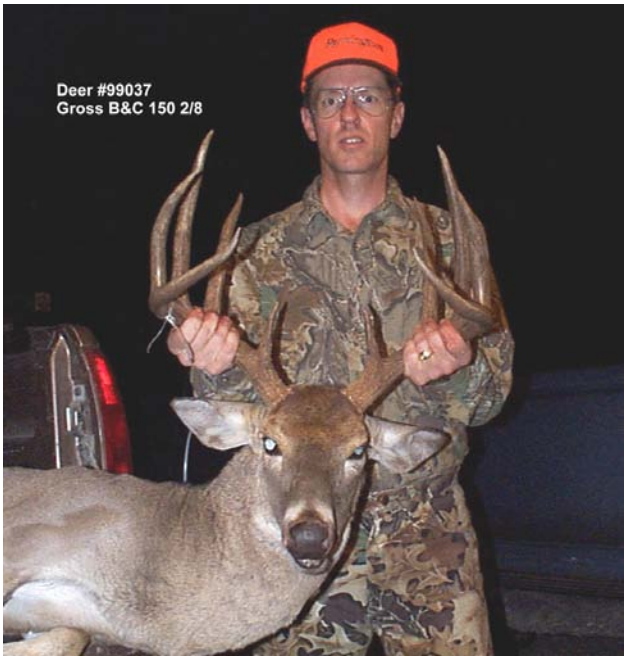
Kerr Wildlife Management Area 1989

Comparison of Average Body Weight and Antlers of 4.5+ Year Old Deer

Characteristic	*Kerr, Real, and Edwards Counties*	*Kerr WMA*
Weight	**88 lbs.**	**110 lbs.**
Points	**8.53 pts.**	**9.83 pts.**
Spread	**13.76 in.**	**15.60 in.**
Circumference	**3.56 in.**	**4.05 in.**
Main Beam	**16.34 in.**	**19.09 in.**

The results of intensive habitat and herd management on the Kerr since 1954 have resulted in improvements to the herd. The above comparison with counties in the Edwards Plateau, including Kerr County, shows that the WMA deer herd is superior in all respects. Management works.





Kerr Wildlife Management Area
1999 Deer

Appendix B

Deer Browse Plants: Forage Preference by White-tailed Deer on the Kerr Wildlife Management Area

Preferred Deer Browse

These browse plants usually show signs of being grazed even with moderate to low deer numbers. Presence of young plants of these species indicate low deer density and deer are probably on a good nutritional level.

Carolina buckthorn var. caroliniana	*Rhamnus caroliniana*
Cedar elm	*Ulmus crassifolia*
Chinaberry	*Melia azedarach*
Cockspur hawthorne	*Crataegus crusgalli*
Downy viburnum	*Viburnum rufidulum*
Littleleaf leadtree	*Leucaena retusa*
Slippery elm	*Ulmus rubra*
Texas kidneywood	*Eysenhardtia texana*
Texas madrone	*Arbutus texana*
Texas mulberry	*Morus microphylla*
Texas oak var. texana	*Quercus shumardii*
Texas sophora	*Sophora affinis*
True mountainmahogany	*Cercocarpus montanus*
White honeysuckle	*Lonicera albiflora* var. *albiflora*
Wright pavonia	*Pavonia lasiopetala*

Good Deer Browse

Moderate to heavy grazing on these plants indicates moderate deer numbers. Numbers of these plants should increase with proper deer numbers.

Blackjack oak	*Quercus marilandica*
Carolina snailseed	*Cocculus carolinus*
Chinkapin oak	*Quercus muehlenbergii*
Common greenbriar	*Smilax rotundifolia*
Escarpment blackcherry	*Prunus serotina* var. *eximia*
Evergreen sumac	*Rhus virens*
Flameleaf sumac	*Rhus copallina*
Fourwing saltbush	*Atriplex canescens*

Heartleaf ampelopsis	*Ampelopsis cordata*
Ivy treebine	*Cissus incisa*
Lacey oak	*Quercus laceyi*
Mountain grape	*Vitis sp.*
Netleaf hackberry	*Celtis reticulata*
Poisonivy	*Rhus toxicodendron* var. *vulgaris*
Possumhaw	*Ilex decidua*
Post oak	*Quercus stellata* var. *stellata*
Roemer acacia	*Acacia roemeriana*
Saw greenbriar	*Smilax bona-nox*
Sevenleaf creeper	*Parthenocissus heptaphylla*
Skunkbush sumac	*Rhus aromatica var. flabelliformis*
Texas colubrina	*Colubrina texensis*
Texas redbud	*Cercis canadensis* var. *texensis*
Virginia creeper	*Parthenocissus quinquefolia*
White shin oak	*Quercus durandii* var. *breviloba*
Woollybucket Bumelia	*Bumelia lanuginosa. var. oblongifolia*

Low Quality Deer Browse

No moderate to heavy grazing of these plants should be observed. Moderate to heavy grazing indicates an overpopulated deer herd. General condition of the deer herd will be poor.

Agarito	*Berberis trifoliolata*
Elbowbush	*Forestiera pubescens* var.*pubescens*
Fragrant mimosa	*Mimosa borealis*
Herculesclub pricklyash	*Zanthoxylum clava-herculis* var. *fruticosum*
Live oak	*Quercus virginiana* var. *virginiana*
Netleaf forestiera	*Forestiera reticulata*
New Mexico forestiera	*Forestiera neomexicana*
Texas black walnut	*Juglans microcarpa*
Texas persimmon	*Diospyros texana*
Western soapberry	*Sapindus drummondii*

Little Utilized Browse

Grazing on these species indicates extremely poor range conditions. Deer will be in poor condition with poor fawn crops, body condition, and antler development.

Ashe juniper	*Juniperus ashei*
Lindheimer's silktassel	*Garrya lindheimeri*
Lotebush	*Condalia obtusifolia*

Mexicanbuckeye	*Ungnadia speciosa*
Texas yucca	*Yuccarupicola*
Whitebrush	*Aloysia lycioides*
Willow baccharis	*Baccharis salicina*
Yucca	*Yucca sp.*

Note: Browse plants are placed in forage preference groups based on deer use of leafy material and not for mast preference. Deer readily eat acorns, persimmon fruits, mesquite beans, and cedar berries. Because of erratic rainfall patterns, mast is not always produced by the various browse species and is not considered a reliable food source for white-tailed deer. However, in many areas of the Edwards Plateau mast and fruit crops can become important food sources at critical times of the year. For instance, mesquite beans in the western plateau may be the primary food source during the winter period.

Kerr Wildlife Management Area 1997

Appendix C

Common Forbs of the Edwards Plateau

Preferred Forbs

Arrowleaf Sida	*Sida rhombifolia*
Blue curls	*Phacelia congesta*
Bur-Clover	*Medicago hispida*
Dayflower	*Commelina erecta*
Engelmann's daisy	*Engelmannia pinnatifida*
Evening Primrose	*Calylophus berlandieri*
Four O'clock	*Allionia spp.*
Indian Mallow	*Abutilon incanum*
Knotweed Leaf-flower	*Phyllanthus polygonoides*
Lambs-quarters	*Chenopodium album*
Mat Euphorbia.	*Euphorbia serpens*
Maximillian sunflower	*Helianthus maximiliani*
Redseed Plantain	*Plantago rhodosperma*
Spiderwort	*Tradescantia spp.*
Texas bluebell	*Eustoma grandiflorum*
Texas filaree	*Erodium texanum*
Trailing Lespedeza	*Lespedeza procumbens*
Velvet Bundleflower.	*Desmanthus velutinus*
Wild Lettuce	*Lactuca spp.*
Winecup	*Callirhoe digitata*
Winecup	*C. involucrata*

Little Utilized Forbs

Basket flower	*Centaurea americana*
Blue flax	*Linum lewsij*
Bluebonnet	*Lupinus texensis*
Butterfly weed	*Asclepias tuberosa*
Clasping-leaf coneflower	*Dracopis amplexicaulis*
Columbine	*Aquilegia canadensis*
Coreopsis	*Coreopsis tinctoria*
Cowpen Daisy	*Verbesina dentata*
Drummond's phlox	*Phlox drummondij*
Eryngo	*Eryngium leavenworthij*
Gayfeather	*Liatris mucronata*
Greenthread	*Thelesperma filifolium*
Horehound	*Marrubium vulgare*
Horsemint	*Monarda citriodora*

Huisache daisy	*Amblyolepis setigera*
Indian blanket	*Gaillardia pulchella*
Indian paintbrush	*Castilleja indivisa*
Lanceleaf coreopsis	*Coreopsis lanceolata*
Lindheimer senna	*Cassia lindheimeriana*
Plains Bitterweed	*Hymenoxys scaposa*
Prairie larkspur	*Delphinium carolinianum*
Purple coneflower	*Echinacea purpurea*
Rain lily	*Cooperia drummondij*
Square-bud primrose	*Calvlophus drummondianus*
Standing cypress	*Loomopsis rubra*
Tahoka daisy	*Machaeranthera tanacetifolia*
Texas bluebell	*Eustoma grandiflorum*
Two-leaved senna	*Cassia roemeriana*
Yarrow	*Achillea millefolium*

Browse line being created by over browsing of deer

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