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SOUTH TEXAS RANGELANDS

Brush Management Effects on Deer Habitat

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Much of the rangeland in South Texas is covered by dense stands of low-growing, thorny shrubs which may limit livestock production because of reduced herbaceous forage. Large acreages of brushy rangeland have undergone treatment to check woody plant encroachment and increase forage production for domestic livestock. In the past, most range improvement efforts in South Texas were directed at clearing pastures of brush through mechanical methods, followed by conversion to tame pasture. Only in the past 10 to 15 years have the habitat requirements of wildlife species been considered in brush management programs.

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Habitat Requirements

White-tailed deer are often considered browsers because they consume woody vegetation. In reality, deer prefer forbs (weeds) more than browse but are compelled to consume woody species when herbaceous (non-woody) forage is unavailable or declines in quality. Although forbs are preferred, deer also will eat a broad variety of browse and grass species. Because of this adaptability, it is difficult to single out one habitat type that is greatly superior to others.

Good deer habitat contains a diversity of woody plants (brush), forbs and grasses. A variety of food plants allow deer to select high quality forages throughout the year. The greatest forage supply for deer occurs in the early to intermediate stages of succession before the trees out-compete herbaceous plants for sunlight, water and minerals. This is the reason that brush management (appropriately conducted) tends to increase the availability of deer forage. Fire, herbicides, roller chopping, shredding, etc. temporarily "set back" succession and allow herbaceous forage plants to grow.

Cover is also a vital component of deer habitat. In South Texas,

brush provides excellent cover for escape and for protection against weather extremes. An important aspect of this cover is its structure (height, density and canopy). Brush species with a moderate to dense canopy are important in South Texas as a source of shade. Escape or screening cover does not need to be extremely dense but should be at least 4 feet in height. Probably more important than the extent of the cover is the degree to which it is interspersed with feeding areas. For example, habitat with brush mottes and feeding areas scattered throughout would be far more valuable to deer than habitat with a single large feeding area adjacent to a large tract of brush. This rather simple but important principle should be considered by managers implementing brush management practices with wildlife as a priority.

The reason the interspersion of food and cover is so important to deer can be explained by the "edge effect." *Edge* is the area where two or more vegetation types meet and integrate. The significance of edge is that this region often provides a greater diversity of food plants and cover types (escape, shade, etc.) to meet deer habitat requirements. Therefore, the most beneficial brush management patterns are those that create the most edge among treated and untreated areas. Brush management patterns that leave small blocks of brush in a checkerboard design (Fig. 1) have been used effectively in several deer management programs. However, a strip pattern (Fig. 2) of brush treatment is more common because long, thin strips provide more edge than block patterns. Mosaic brush treatment patterns, which follow contours of the land and certain vegetation or soil types, provide the greatest amount of edge and appear to be the most beneficial to deer. However, these treatments are more expensive and difficult to plan and accomplish.

Deer rarely travel across broad expanses of open area without access to cover. Therefore, a treated area should be no more than twice the distance a deer will move from cover. Research in South Texas has shown that deer will seldom venture more than 200 to 250 yards from cover, so treated strip widths should be no greater than 1/4 mile. It was observed that deer used treated strips more often during daylight hours when strips were only 200 to 250 yards wide.

Brush strips left for cover should be at least wide enough to allow a deer to disappear from visibility when an observer is standing at the edge of the cover strip. Brush density and height are unique to each ranch, but this threshold visibility distance ranges between 30 to 50 yards over much of South Texas. Note that this is the minimum amount of brush that should remain untreated to satisfy the screening requirement of the cover strip. It may be necessary to leave more untreated brush in order to maintain the diversity that is so essential to good deer habitat. This is particularity important with chronic impact treatments such as root-plowing or chaining that physically remove the treated brush plants.

The quantity of brush that can be removed will vary among ranches, depending upon brush characteristics. However, most successful deer management programs maintain 40 to 60 percent of the ranch in brush. Remember that once brush is treated, its composition, structure and density are altered for a long period of time. Clearly define the objectives and consider all options before implementing a brush management program.

Brush Management Practices

Brush management methods that presently have the most applicability in South Texas include

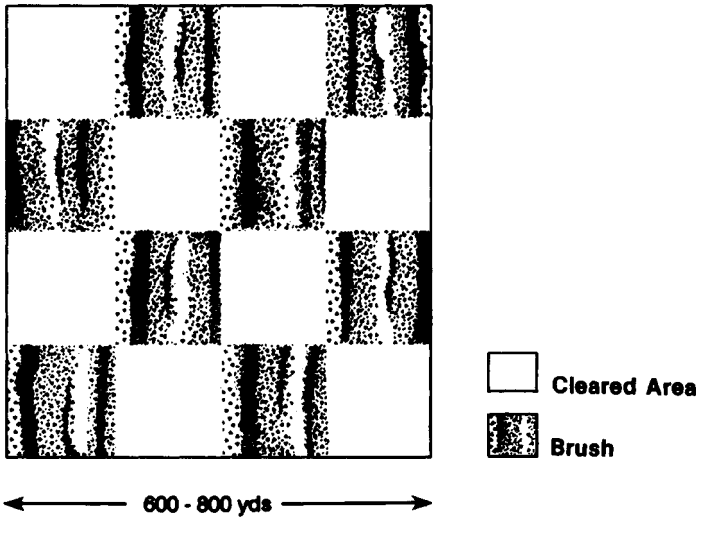


Figure 1. Brush management in an alternating block design with clearings that are 150-200 yards wide.

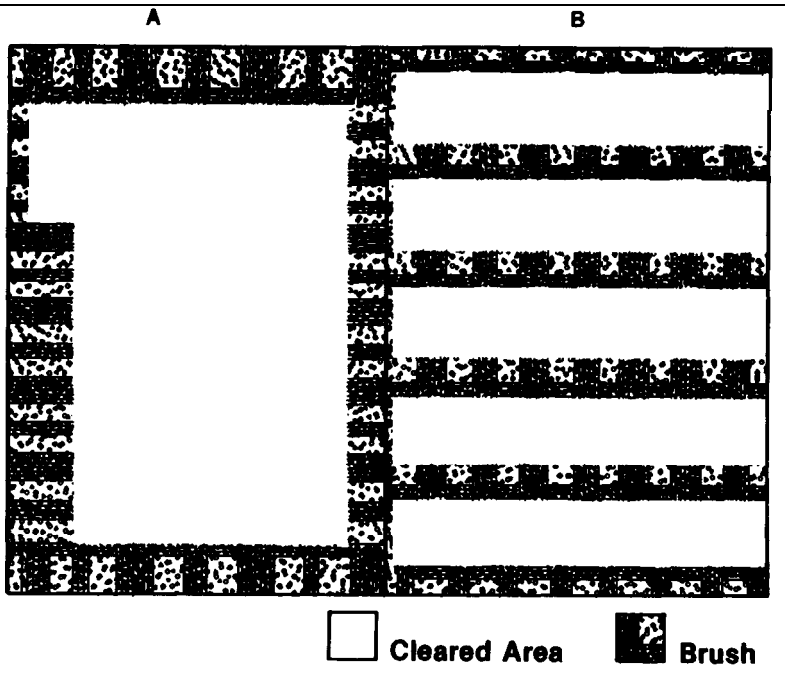


Figure 2. Brush management in a large block pattern (A) and strip pattern (B). Although approximately the same proportion of brush was cleared in A and B, the strip pattern results in better deer habitat.

mechanical and chemical techniques and prescribed burning. Each method has its strengths and weaknesses and should be considered in relation to management objectives.

Mechanical Brush Management

Mechanical brush management methods can be classified into two categories, those designed to simply remove the aerial parts of the plants and those designed to remove the entire plant. *Shredding* and *roller chopping* are the primary methods for simple top removal. The effects of these practices are relatively short-lived since most brush species possess tremendous regrowth potential. However, these temporary effects can improve the accessibility and nutrient content of deer forage.

With shredding and roller chopping of mixed brush, a 50 percent canopy recovery has been observed only one year after treatment. However, all brush plants in treated areas are accessible to deer at least during the first year after treatment, and usually longer. Brush plants on untreated areas may be largely unavailable due to the height and dense growth patterns of the mottes. Top removal not only increases the availability of browse species by reducing the plant height, but also increases browse palatability by allowing more tender regrowth to sprout. Deer readily feed on so-called unpalatable plants when the thorny stems are replaced by new, leafy shoots.

Not only is regrowth more palatable to deer than mature woody plants, but the nutritional quality of the immature growth is usually higher. Immature growth stimulated by top removal tends to be higher in crude protein content and more digestible than mature leaves or stems. Research has shown an eight-fold increase in the value of brush for forage (browse utilization x frequency of use x plant density) after shredding, and a six-fold increase after roller chopping. While roller chopping may be less effective than shredding for improving the forage value of browse, it has the additional advantage of increasing forb production through soil disturbance.

Although shredding and chopping may temporarily improve forage values, continued top removal of brush may result in thickets of root-sprouters such as mesquite and twisted acacia on the treated areas. Mesquite mast is considered important to deer during the summer and twisted acacia may be used by deer, but these species usually are undesirable in dense stands. Because most brush species are prolific sprouters, the effectiveness of shredding and roller chopping treatments generally does not last more than five years. The greatest forage values of browse species are associated with the first year following top removal treatment.

Grubbing, root-plowing and chaining are the primary methods of physical plant removal in South Texas. Little attention has been focused on the effects of *grubbing* on deer forage since it is an extremely selective method. The most efficient control by grubbing usually occurs on sites where woody plants are widely spaced and large enough to be seen by the equipment operator. Elimination of a browse species decreases the diversity of available forage and limits diet selectivity. Cod-season grasses may become established in pits left by grubbing, but grasses are relatively unimportant for deer nutrition.

Most studies on *root-plowing* have reported that the practice is devastating to white-tailed deer habitat because it destroys cover and plant diversity, unless brush strips or blocks are left untreated. However, because brush species generally constitute a significant portion of the deer diet in South

Texas, root-plowing also has a detrimental effect on the year-round availability of forage. Although root-plowing may essentially eliminate browse and reduce cover, the soil disturbance generally stimulates forb production. Therefore, newly root-plowed areas offer a good source of seasonal (spring and fall) feed for deer. However, the root-plowed areas will be used by deer only if cover is available nearby and there are alternate food sources to sustain the deer herd when forbs are not present.

Under proper environmental conditions, *chaining* is an effective method of knocking down, uprooting, and thinning moderate to dense stands of large woody species. Like root-plowing, chaining large expanses of brushland can be detrimental to deer numbers, as well as deer nutrition, by reducing or eliminating available cover and browse species. The effects of chaining are generally not as severe as root-plowing since the smaller, more limber brush plants are seldom up-rooted and the larger shrubs that are broken off at the base often resprout with nutritious, palatable shoots. In addition, the low to moderate soil disturbance (depending on treatment) will increase forb production most years.

Chaining may also result in extremely dense stands of pricklypear. A stacker rake must be used (prior to plowing and after chaining) to avoid this problem. Pricklypear is an important food plant for deer, especially during the summer and winter. However, it is most desirable when interspersed with a diversity of other forage species rather than growing in dense stands.

Chaining treatments reduce the density of most species, but differential reaction among species causes post-treatment communities to differ considerably in composition. The relative importance (density, frequency, size) of mesquite changes little after chaining. Although each additional chaining treatment decreases the density, frequency and size of mesquite, it remains an important part of the woody plant community. Lime pricklyash tends to be more susceptible to chaining, and its relative importance decreases with additional treatments. Spiny hackberry (granjeno), a high quality browse, increases in importance with additional chaining treatments.

Prescribed Burning

Fire in South Texas brush communities significantly reduces woody cover during the first year after the burn. However, generally less than 15 percent of the woody plants are actually killed. Although fire does not kill many brush species, prescribed burning can reduce brush cover, alter brush composition and structure, and increase herbaceous cover. A major constraint to effective prescribed burning in South Texas is the amount and distribution of fine fuel required to carry the fire. A brush control treatment before burning may be required to produce adequate amounts and distribution of fine fuel. Therefore, prescribed burning often is used in combination with other brush management practices and as a maintenance measure. Fire has proved to be more effective on areas where large brush mottes were first knocked down by mechanical means. The reduction of brush cover by chopping or shredding two to three years before the fire allows grass and forbs to grow, which provide fuel for a fire throughout the mottes. In addition, the chopped portions of old brush tops provide additional fuel for the burn. A rest-rotation system of grazing also is necessary to promote adequate amounts of fine fuel.

Because brush species resprout from buds located on the stem base and below the soil surface on roots or on rhizomes, the effect of fire on these plants is similar to that of any method of top removal. In other words, prescribed burning reduces brush cover, especially following mechanical or herbicide treatments, and increases the forage value (availability, palatability, nutrient content) of brush. Increased browse availability and quality can benefit white-tailed deer, provided that other habitat components are adequate to allow utilization of the browse. Huisache plants that are burned tend to have higher levels of crude protein and phosphorus than unburned plants during the first six months after burning. The greatest differences in nutrient levels between burned and unburned plants occur during the first month of growth. The greatest utilization by deer and other browsers occurs during the first two months following the burn. Burned huisache plants tend to produce five to six times the number of "browsable" twigs as unburned plants. Maintenance of huisache plants in a low-growing bushy state can be achieved by burning at two-to three-year intervals. Live oak thickets respond in a similar fashion.

A mosaic of brush cover patterns usually will result from burning in South Texas because of fuel load discontinuities associated with arid conditions and moderate to heavy grazing. This variability associated with "brush country" burns is often desirable for creating high quality deer habitat since it results in a vegetation "mosaic." Deer tend to benefit most from small, hot burns within brush dominated habitats. This pattern increases forbs and valuable

browse regrowth while maintaining security cover. Prescribed burning may even restore broadleaved plants to a range where repeated herbicide use has greatly reduced the forb population. White-tailed deer make heavy use of burned areas in South Texas, especially in early spring when succulent forb growth is available.

Herbicide Brush Management

Broadcast herbicide applications can have negative effects on deer habitat, but if applied properly they can improve the quality and availability of food plants and improve the overall habitat. Treating relatively large acreages with herbicides may temporarily reduce white-tailed deer numbers. Although the standing remains of defoliated brush offer screening cover for deer, herbicides can reduce the diversity of browse species and the abundance of shade cover. In addition, broadcast herbicide applications reduce the diversity and abundance of forbs. Deer numbers may return to normal by the third growing season after broad-scale brush spraying. Generally, deer use grasses only in small amounts in the spring and fall; however, they may consume more grasses in areas sprayed with a herbicide due to a lack of browse and forbs. In such cases, deer may suffer nutritionally since they have a low digestive capacity for grasses.

Research in the northern Rio Grande Plain showed that a substantial portion of the deer population evacuated a pasture where 80 percent of the brush was strip-treated with herbicides. However, when the forbs recovered and browse regrowth developed, deer returned in greater than normal numbers. A study in the coastal brushland found that spraying 80 percent of mature brush in alternating strips did not change deer numbers. The treated and untreated strips were 200 yards and 30 yards wide, respectively. The unsprayed strips apparently furnished adequate forbs which were important deer food items in this area. Spraying 100 percent of an adjacent pasture resulted in a 40 percent reduction in deer numbers. After two years, deer numbers approached pre-treatment levels.

Brush management in drainage habitats should be carefully considered since these sites (such as mesquite drainages) are considered the most important type of habitat for deer in South Texas. The structural features of these sites are preferred by deer for midday loafing and bedding. In addition, these moist, fertile bottomland sites have great potential for producing nutritious deer forage. Indiscriminate broadcasting of herbicides on these sites would be detrimental to deer numbers and/or nutrition. Brush treatment to thin dense stands or create small clearings would be more appropriate. Research in South Texas has shown that spraying 70 percent of a mesquite bottomland was not detrimental to white-tailed deer. Any reduction in cover screen may have been mitigated by a general increase in quality, quantity and availability of browse. The three- to ten-fold increase in grass production may have improved conditions for deer by reducing cattle use of forbs and browse.

Broadcast application of soil-applied herbicides at a rate of two pounds per acre or more increased forage production and botanical composition within two years in the northern and central Rio Grande Plain and in the Coastal Prairie. Although aerial application of these herbicides at two pounds per acre effectively controlled whitebrush, rates as low as one pound per acre were detrimental to forb production and diversity. Rates that were high enough to partially control mesquite (4 lbs/acre) nearly eliminated forb production for two years following application.

One of the most beneficial herbicide applications for deer is the variable rate pattern (VRP), in which different rates of herbicide are aerially applied in strips at right angles to each other. This pattern creates numerous small blocks of vegetation treated with different herbicide rates ranging from none to heavy and results in a diversity of vegetation responses (Fig. 3). This type of pattern provides deer with a good selection of food plants at various successional stages, while leaving scattered blocks of mature brush for cover.

Conclusions and Management Implications

The effects of brush management on white-tailed deer habitat cannot be determined simply in terms of the amounts, kinds and nutrient content of forage species present. Cover (for shelter and screening) is a dominant factor influencing the use of potential feeding areas by deer. A tremendous diversity of nutritious forbs on a large root-plowed and raked area is of little value to deer unless there is screening cover nearby. Conversely, a vast thicket of dense whitebrush cover is of little value to deer if forbs and browse species are unavailable. Diversity and interspersion of cover and forage species are essential components of deer habitat.

Indiscriminate brush treatment can reduce the availability of prime loafing or bedding sites of deer, as well as decrease the availability of critical forages. However, carefully selected brush management

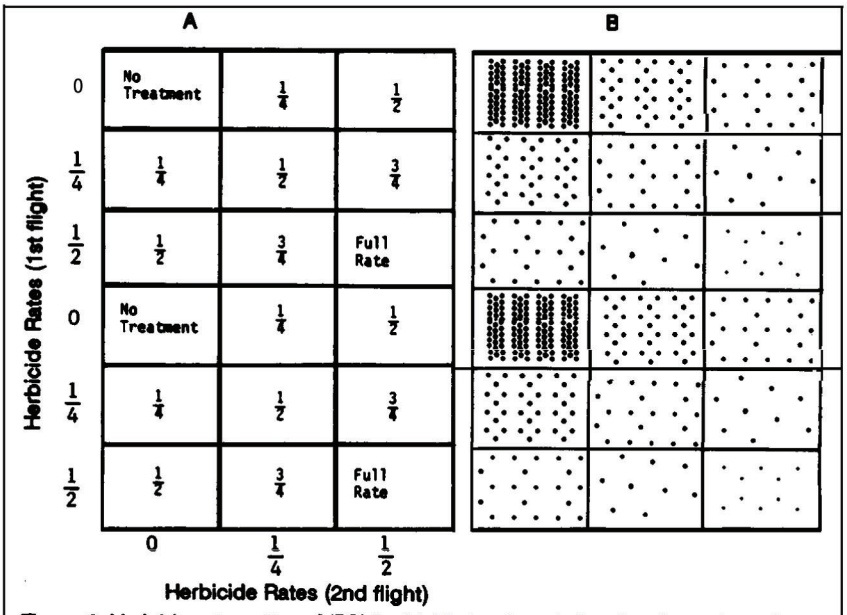
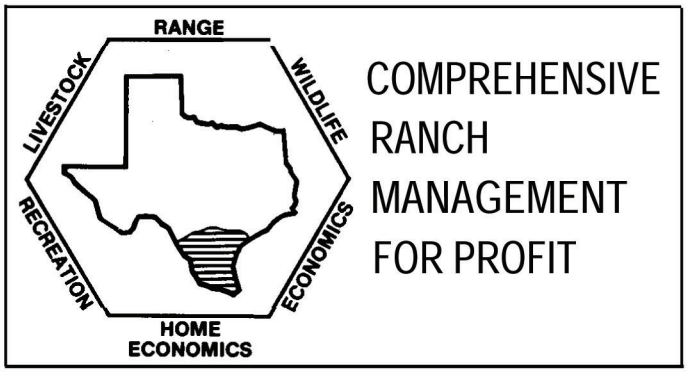


Figure 3. Variable rate pattern (VRP) herbicide treatment showing the variety of cumulative rates for the two perpendicular flights (A) and the simulated vegetation responses (B).

practices and treatment sites can improve deer habitat and increase the quality and availability of forage, especially in areas where dense brush limits herbaceous production. Mechanical treatments such as root-plowing or chaining may disturb deer habitat by suddenly removing cover screen and shade. However, mechanical strip or mosaic clearing appears to be a feasible brush management approach when deer habitat is a concern. The responses from herbicide treatments are more subtle and gradual than broad-scale mechanical treatment. It is extremely important to know before treatment what the plant and animal responses should be and what effect the treatment will have on other ranch resources. Strip spraying and aerial VRP are the most effective herbicide applications for deer management. Prescribed burning also is a feasible approach to brush management that is highly compatible with requirements for high quality deer habitat. Burning is particularly valuable when used as a follow-up treatment or maintenance measure.

To determine the most appropriate brush management practice for a specific area, it is necessary to understand the response to the treatment as influenced by soil moisture, soil type, climate and types of brush. Also, it may be important to consider how range conditions could make the response on one ranch differ from the response on a neighboring ranch. How fast will a range in good condition respond compared to an overgrazed range? How will animal diets differ on ranges in different conditions and what effect will the treatment have on their diets? Once these questions are considered and understood, it is possible to select an appropriate treatment to accomplish a specific management objective.

Regardless of which brush management practice (or combination) is selected, the treatments that will benefit deer most are the ones that stimulate an increase in forb production during the growing season, while maintaining a diversity of browse and cacti for forage when forbs are not available. In addition, any treatment that stimulates the sprouting of browse species will benefit deer nutrition through increased quality and availability of browse. And finally, where possible, numbers and kinds of herbivores may have to be manipulated to reduce competition for the available, high quality forage species.



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