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Bobwhite Quail Management In South Texas

C. Wayne Hanselka and Fred S. Guthery*

"If it rains, we'll have a lot of quail. If it don't, we won't."

This reflects the experience and observations of quail managers in South Texas. As with any generality, however, numerous exceptions exist. Rainfall is only one of many factors that influences quail. Effective rainfall accounts for about 40 percent of the change in bobwhite abundance from year to year on a long-term basis. This means the *manager's influence can be half again more powerful than rainfall!*

Well-managed quail pastures carry about the same number of birds as poorly managed pastures during the "good" years following drought. However, the managed pastures have twice as many quail during a period of years with normal rainfall. Proper management returns six or seven times as many quail as does no management during drought. Abundance returns to normal or high levels after the drought breaks at least one or two years faster on managed areas. Management pays dividends if key principles are followed despite the strong influence of rainfall.

* Extension Range Specialist, Texas Agricultural Extension Service, Corpus Christ, Texas, and Research Scientist, Caesar Kleberg Wildlife Research Institute, Kingsville, Texas.

This bulletin summarizes the key principles of bobwhite management. It discusses basic biology and habitat requirements, decision management based on land use options and active management of quail.

Four All-Star Principles

Adaptation, habitability, succession and interspersions: these four principles are the essence of quail management. Anyone who understands and applies these principles does 95 percent of what he or she can do for bobwhites.

1. Adaptation

Bobwhites have adaptations that define their place in nature. Let's take a bird from harvest to frying pan and note its adaptations.

As we approach a dog pointing a covey, we rarely see birds before they flush. That is because they have evolved color patterns which render them largely invisible to predators. Also, they remain motionless, as if frozen.

The bird is lightweight, averaging almost 6 ounces in South Texas. Its body is about 10 percent fat. This weight and fat load are perfect for the life the bird leads and the climate it encounters.

The hunter may find the bird full of seeds. The elastic tissue of the crop can store relatively large volumes of seeds. Thus, quail can eat rapidly and return to coverts, where they are out of sight of predators.

Lastly, white meat is found on the breast and dark meat on the legs. This means the major flight muscles (breast) are poorly supplied with blood vessels, whereas the legs have a rich supply. Bobwhites are, therefore, built for walking, not flying.

The adaptations of bobwhites are fixed and cannot be changed. They must be considered for management purposes by asking the right questions. If I were six inches tall, could I walk around in this cover? Could I find seeds on the soil surface? Would available brush protect me from aerial and ground predators? Are required cover types close together so I can meet my needs with little travel? Does the habitat permit the straight, low flight to which I am restricted? Answering yes to these questions indicates the habitat fits the adaptations of bobwhites.

2. Habitability

This second principle is so obvious it is often overlooked: maximum numbers of bobwhites occur only where 100 percent of an area is

habitable. In other words, bobwhites must be able to use *every square inch* of the countryside for maximum possible populations.

Bobwhites require two types of habitat. One type provides resources, like food and nesting cover. The second type, woody cover, provides refuge from hot temperatures, cold winds and predators. Resource and refuge habitat must be well mixed for 100 percent habitability. As a rule of thumb, areas become unusable if their distance from refuge habitat exceeds 200 yards.

3. Succession

The third principle is perhaps the most powerful. Bobwhites are said to be a *successional species* because their abundance depends on the *successional status* of plants. Plant succession is the orderly change in plant communities after soil or vegetation has been disturbed, such as

by discing. As time passes, one type of plant community *succeeds* another.

To understand plant succession better, visualize an abandoned farm field. Plant pioneers, mostly annual forbs (broad-leafed weeds), invade the field in the first couple of years. This represents a *lower successional* condition. As time passes, perennial forbs and grasses replace the pioneer plants and a *mid-successional* condition exists. Finally, taller perennial grasses, like little bluestem, dominate the site, resulting in a *higher successional* condition. As ground cover undergoes succession, woody plants may become established. Mesquite, a pioneer, creates an environment favorable for granjeno, pricklypear and other woody plants.

The concept of "range condition" is based on the percentage of higher successional species in a plant community. The classes are poor (0 to 25 percent), fair (26 to 50 percent),

good (51 to 75 percent) and excellent (76 to 100 percent). These descriptions are more accurate for cattle than quail. Sometimes, rangeland in poor condition might be excellent for bobwhites and vice versa.

Bobwhites are early successional (or lower range condition class) species and are *adapted* to plant communities dominated by lower successional grasses and forbs (Figure 1). Therefore, their numbers maximize only under lower successional patterns.

4. Interspersion

Quality bobwhite habitat resembles a patchwork quilt with an interspersion of plant species (grass, forbs and brush). Short and tall grasses should be present, along with small and large shrubs and trees, as well as forbs and bare ground. In short, a mixture of herbaceous and woody plants in a semi-prairie or savannah situation is necessary.

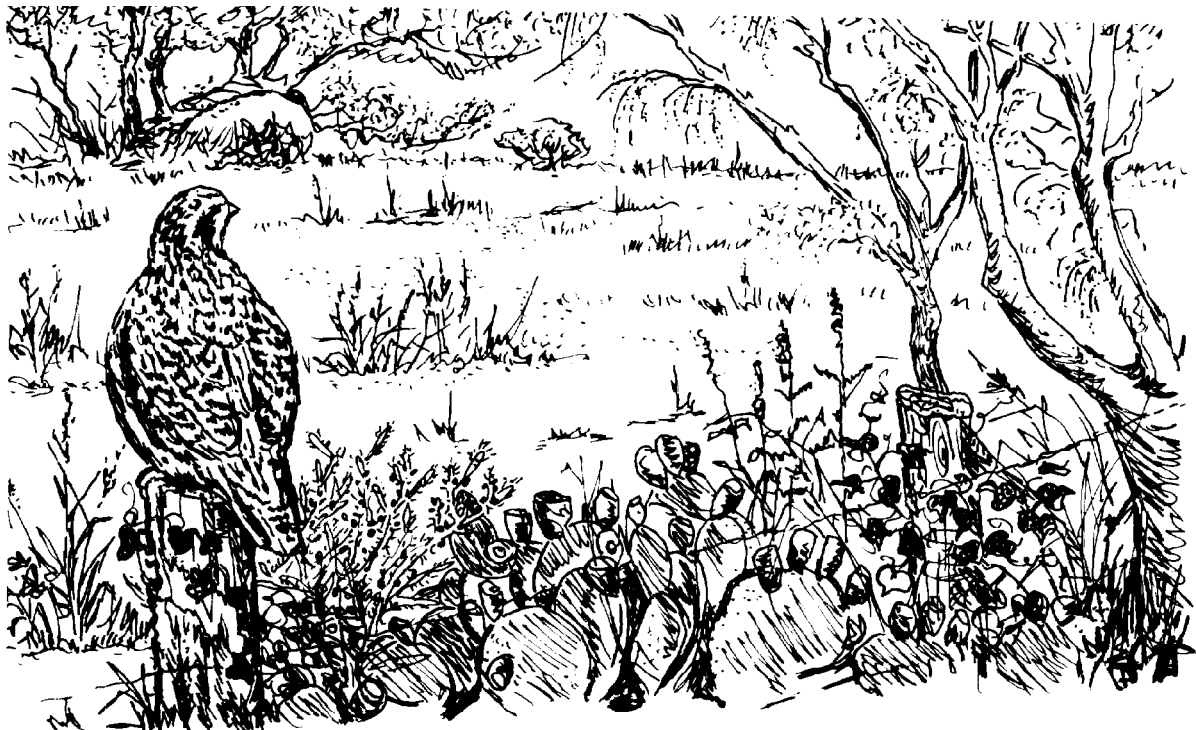


Figure 1. Bobwhites require lower successional habitats of mixtures of low and tall plants: grasses and forbs, shrubs and bare ground.

Habitat Requirements

Food, water, cover and space are general habitat requirements for wildlife, and bobwhites are no exception. Early successional plant communities supply the most important bobwhite foods.

Forbs are more common in early than in late successional plant communities. Prime foods include the seeds of pioneer forbs and grasses like croton, spurges, annual sunflower and Texas panicgrass. Each of these plants produces large seeds with high levels of usable energy.

Larger seeds are crucial to bobwhites because they minimize the time required to obtain energy, and thereby minimize exposure to predation while foraging. Furthermore, too few hours of daylight exist for bobwhites to meet energy needs with smaller seeds alone. For example, a bobwhite would have to eat 28,000 switchgrass seeds each day to survive (Table 1). If it fed three hours in the morning and three more in the afternoon, it would have to eat

more than a seed a second. With common sunflower seeds, it would have to eat a seed every 20 seconds in a 6-hour period.

A second important food source provided by early successional plant communities are insects and other invertebrates. Populations of these animals vary with the abundance of forbs. A cricket equals about 25 to 30 sorghum (milo) seeds in food value to bobwhites. Insects also provide the high levels of protein required by laying hens and growing chicks, and can be important sources of water.

Bobwhites are adapted to rangeland that lacks free water but can obtain water from three sources. The water produced when foods are metabolized, called metabolic water, supplies 30 to 50 percent of daily water needs. The second source is preformed, or bound, water, which is the water available from foods. Primary sources of preformed water are greens (succulent plant parts), which run 70 to 90 percent water, and invertebrates, which average about 60 percent water. The third source is free water in ponds,

streams and dew. Although bobwhites cannot survive solely on metabolic water, they do well on metabolic plus preformed water.

Depending on air temperature, bobwhites use two types of refuge cover between morning and evening feeding periods. They seek taller brush plants, such as granjeno, with thick canopies on hot days. Coverts with this structure provide dense shade that helps the birds remain cool. During days with mild or cool temperatures, coveys often rest under or near low brush, such as lotebush. Canopy density is not a major factor in covert selection on cooler days.

Ideal feeding cover has substantial amounts of bare ground from which the birds pick seeds. Feeding cover should consist mainly of forbs because of the seeds these plants provide and the invertebrates they support.

Table 1. The value of different seeds for bobwhites. Larger seeds with higher amounts of usable energy are best because they permit the birds to rapidly satisfy food requirements.

Seed	Number per pound	Usable energy (calories/ounce)	Seeds needed each day*
Corn	1,200	109	41
Soybean	3,000	109	103
Wheat	15,000	87	648
Grain sorghum	19,000	107	666
Common sunflower	32,000	103	1,160
Black locust	24,000	72	1,257
Hemp	27,500	71	1,448
Partridge pea	65,300	68	3,605
Western ragweed	115,000	110	3,923
Smooth sumac	68,600	42	6,152
German millet	220,000	98	8,396
Korean Lespedeza	225,000	89	9,490
Thistle	288,000	77	14,057
Smartweed	260,000	65	14,952
Common lespedeza	310,000	62	18,639
Switchgrass	389,000	53	27,693
Kleingrass	497,000	57	32,870

*Number of seeds required to give 60 calories of usable energy, about enough for one nonbreeding bobwhite for one day.

Bobwhites roost at nonbrushy points with short, sparse vegetation. Although bobwhites nest in a variety of situations, tall perennial grasses at least 1 foot in diameter and 8 to 12 inches tall provide the best cover.

The last habitat requirement is space for living. The average bobwhite lives on about 60 acres in the typical South Texas brushland during drought. Some birds use areas as small as 40 acres or as large as 80 acres. Core use areas, where the birds spend 75 percent of their time, average 22 acres. Use areas are likely to be smaller during normal or rainy years because food and cover are more abundant. A covey may live on as little as 15 acres of a quality, early successional habitat with well-distributed refuge cover.

Decision Management

"Good" range management for cattle may not be "good" range management for quail, although bobwhites and beef are compatible on South Texas rangeland. Cattle management focuses on higher range conditions (more perennial grasses) to which bobwhites are poorly adapted. On productive sites with 25 inches of annual rainfall and fertile soils, a poor to fair range condition is optimum for bobwhites. A fair to good range condition is optimum on poorer sites with less rainfall and less fertile soils.

The manager making range management decisions faces a dilemma. The optimum range condition for bobwhites is not optimum for cattle because the lower range condition classes support fewer cattle than do higher condition classes. A reasonable compromise to benefit both species is a fair range condition on more productive sites and a good range condition on less productive sites.

Range manipulation techniques vary greatly but may be classified as either

extensive or intensive practices. *Extensive practices* include grazing practices and the use of fire. *Intensive* or "*action*" practices such as brush management, fertilization and seeding are more expensive and involve more risk, although benefits are usually greater. A combination of practices is usually necessary to meet objectives.

Grazing Management

Quail habitat needs can often be met with extensive range management techniques using soil and climatic constraints. Low input, low-cost technologies may be the only way to produce quail cheaply.

Grazing management with livestock can be used to maintain and/or change range condition. Flexibility of the stocking rate (number of livestock per unit area) is the primary method of attaining a target range condition class. Higher stocking rates benefit quail habitat on a productive site because cattle consume and trample dense plant growth to which bobwhites are not adapted. Moderate or low stocking rates are better on less productive sites because maintenance of ground cover is a primary concern.

A hallmark of successful bobwhite management with grazing animals is flexibility in stocking. The ideal cattle stocking rate varies from year to year and season to season because of variable annual rainfall in South Texas. Cattle numbers can be increased during rainy periods but should be reduced during droughts.

Periodic breaks from grazing should be implemented if range condition is lower than desired. Deferment increases plant vigor and results in stronger root systems and also in establishment of new plants. Perennial bunch-grasses, palatable herbaceous legumes and other desirable forbs respond favorably to periodic rests from grazing.

The type of grazing program used appears to be unimportant if the stocking rate is correct for the situation. Bobwhites do well under continuous, yearlong grazing or under a specialized system that involves herd movement from pasture to pasture. On rich vegetative sites, grazing systems that concentrate livestock on small areas for short periods are beneficial. Livestock concentrations reduce vegetation biomass and increase bare ground. High-intensity/low-frequency and short-duration grazing have benefited quail habitat in wetter portions of South Texas. In drier areas, rotational grazing systems probably are better than continuous grazing. This is because deferment helps maintain the higher range condition class appropriate to less productive environments.

Brush Management

Most ranchers do not want to lose their bobwhites to brush control, nor do they want to lose their grass to brush invasion. Good quail habitat requires some low shrubs and taller trees. However, quail are not adapted to dense stands of mesquite, huisache, oaks or other brush. Woody plants use water and nutrients otherwise used by grass and forbs, which may suppress these plants. This decreases the diversity of herbaceous cover and seed production by annual and perennial forbs. Rangeland may lose bobwhites as brush coverage exceeds 15 percent. Conversely, 5 percent brush coverage is probably the minimum amount necessary to meet the needs of bobwhites. Brush cover requirements can be achieved with judicious use of brush management practices, depending upon the species present, density, growth habit and method of treatment.

A variety of brush species is desirable to provide both cover and food. Granjeno, lotebush, oaks, mesquite and tasajillo are important woody plants for quail in South Texas. These brush plants must be present in the proper patterns as well as in the proper amounts. Thus, woody plants (or mixtures of plants) may best be situated as scattered plants, mottes or small blocks.

A management program should have brush patterns where birds are never more than 200 yards from woody cover. Brush can be cleared in strips, mottes, check-boards or blocks (Figure 2). Strip patterns allow the bulk of the pasture to be cleared while maintaining cover for bobwhites. Another option is to preserve mottes of desirable species, one-half to one acre in size, every 200 to 300 yards. Treated areas around the blocks should not exceed 40 acres. If larger, scattered mottes should be left in the cleared areas. Preserve mottes of brush rather than single, mature trees. Strips are usually the best design for the quail and for ease of establishment. Brush strips should always be wider than the desired width because some plants on the edges will eventually die, thus narrowing the strip. This is especially

true when soil-applied herbicides are used.

Treatments should be scattered in different pastures throughout the ranch so structural diversity is maintained. It is also important to intersperse new treatments with older treatments and untreated areas. As much as 85 percent of the brush can be removed for quail if the correct configuration of brush remains. However, at least 30 to 40 percent should be left intact if deer are also an important asset.

The methods used for brush management are very important. The proper selection depends upon brush species composition, density, soil and climate, management goals and costs. A range in poor condition may require broadcast mechanical treatments and seeding (for livestock). Higher condition ranges may need only maintenance practices.

Mechanical

Mechanical methods usually disturb the soil, promote forb growth and may offer a higher degree of selectivity. Several mechanical brush management technologies are available. Rootplowing has been a valuable means of manipulation and usually produces good results, but at high costs. Rootplowing does decrease

diversity in the brush community. Mesquite tends to dominate post-rootplowed communities as do huisache, whitebrush and pricklypear. The life expectancy of a rootplowed treatment is 15 to 20 years. The use of a roller chopper or large disc may be preferable on short to mid-height brush (such as black-brush), and also on shallow soils. Regrowth will occur after any of these practices. However, the regrowth is nutritious for browsing animals and also provides escape and loafing cover for birds. Discing and chopped areas must be retreated in three to five years.

Chemicals

Herbicides have the disadvantage of killing or suppressing forbs, as well as brush species on the treated areas. Forbs may respond immediately or may return in one to two growing seasons post-treatment. An advantage of herbicide use is that it is extremely unlikely to achieve greater than 65 percent root kills on mixed brush. Mortality may be even lower for resistant species (such as lime pricklyash). Foliar-applied herbicides can be used on mesquite-dominated mixed brush and huisache. Pelleted herbicides are effective on

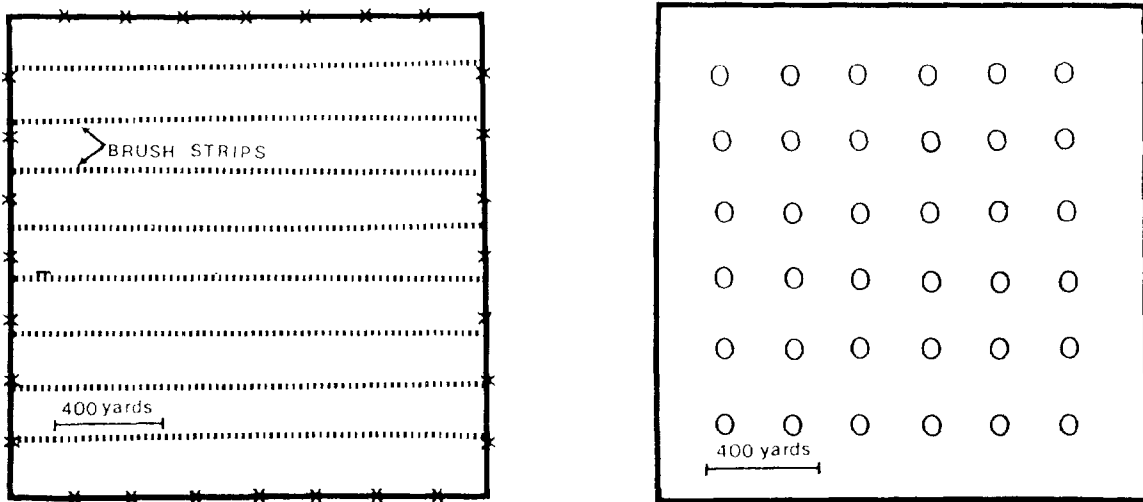


Figure 2. Brush management patterns designed to optimize bobwhite habitat. A square mile with 10-yard brush strips and 200-yard cleared strips clearing 95 percent of the pasture (left). A square mile with 2-acre brush mottes preserved in a 250-yard grid leaving 11 percent of the pasture in brush (right).

various species of oak and whitebrush. Herbicides can be applied as broadcast treatments or as individual plant treatments. Strip or checkerboard patterns can be incorporated if desired.

Fire

Prescribed fire can be used to suppress woody plant regrowth and to renovate pastures. Habitat can be improved if quail requirements are considered in the prescription. Litter buildup, particularly on tall bunchgrass (such as bluestem and balsamgrass) savannahs, is detrimental to quail because it inhibits movements and reduces bare ground for feeding. A controlled burn coupled with good grazing management controls litter buildup and suppresses brush regrowth. The positive effects of burning are usually short-term. Fire is a tool that should be used in conjunction with other practices, particularly grazing.

Timing of the burn is important. December burns are best because forb growth is fostered, whereas February-March burns may kill some forbs and tend to promote grass over forbs. Winter burns do not appear to reduce the total availability of bobwhite foods. In fact, insects and seeds become more accessible to quail as a result of the reduced stature and open canopy of herbaceous vegetation following the burn.

Fine fuel (dormant grass) should exist in patches so that a "spotty" burn is achieved. This allows some tall grass cover to remain unburned. Quail will use this taller, old growth for nesting and escaping cover from aerial predators. When the fuel is not discontinuous, then selected areas, mottes or individual brush plants should be protected by discing fire guards around them or by using a chemical fire retardant.

Soils should be moist at the time of burning to achieve the best post-burn results. A pasture should not be burned more often than every four to five years. When a burn is performed, over half of a pasture should be done to prevent livestock concentration on any portion of the pasture. Controlled

grazing should be practiced following a prescribed fire or wildfire.

Seldom does one method of brush management achieve all the desired goals. The brush management program should be carefully planned, the resources inventoried, the impacts on enterprises analyzed, the economics studied, the plan timely implemented and the results monitored. The use of brush management to increase bobwhite habitat diversity is limited only by the imagination.

Revegetation

Often a forage grass for livestock is planted following mechanical brush management on poor condition ranges or in areas of extreme soil disturbance (such as rootplowing). Such plantings are not in the best interest of bobwhites, however. Introduced grasses such as buffelgrass, bermudagrass, Kleberg bluestem, Kleingrass, Bell Rhodesgrass and Wilman's lovegrass are commonly used in South Texas. These grasses have limited value in quail management, although they provide screening cover for travel and nesting cover. Some native grass alternatives are little bluestem, sideoats grama, plains bristlegrass and switchgrass. Kleingrass is the most acceptable introduced grass.

There may not be a need to seed a range if sufficient native grasses and forbs are available. If seeding is necessary, however, then avoid large, monocultural stands. Plantings should be in strips or blocks interspersed within native range vegetation. The species chosen for planting should be adapted to the area's soils and climate.

Re-establishment of brush is more difficult and expensive. Commercial sources of seeds or seedlings for many of the major brush plants are available and planted brush stands have been successful. Pricklypear cactus is easily planted and can be used to improve quail habitat.

Active Management Practices

Feeders

No active management practice is applied with more vigor than supplemental feeding. However, feeding programs often fail to increase bobwhite density because basic conditions necessary for success are not met. Supplemental feed can provide the opportunity to increase the nutritional levels of the food supply, but certain conditions must be met before feeding increases bird numbers:

1. Supplement should be available to all birds in the population. Establishing feeders at one per 50 acres ensures that this condition is met.
2. Habitat factors other than food should not be limiting. If, for example, refuge cover is deficient, providing food will be wasted effort. Quail managers must address the limiting habitat factor.
3. Use of feeders should not expose birds to greater risk than birds not using feeders. Feeders may increase losses from predation, food contamination (aflatoxins, aspergillosis, etc.) and spread of diseases and parasites. If birds on feeders die at a higher rate than birds not on feeders, benefits will be cancelled by losses.
4. Energy (calories), as opposed to some other nutrient, should be the limiting factor. Corn or sorghum (milo) is traditionally fed to bobwhites. These seeds are excellent sources of energy but inadequate sources of protein and some minerals and vitamins.

5. If food is not limited, there is no reason to provide food. Supplies of native seeds have been measured at about 1,000,000/acre in October and 500,000/acre in March. If the seeds were of average size and nutritional value, enough seeds existed on one acre in March, after winter, to feed 60 bobwhites for one day. Provision of food under such conditions serves no biological purpose.

Perhaps because one or more of the above conditions often fail, supplemental feeding has proven a weak management practice. Eight studies in Texas report autumn density on fed areas averaged 0.7 bird/acre versus 0.6/acre on unfed areas. The average cost of each bird gained through feeding was \$50.00.

Food Plots

Food plots can improve inferior habitat, carry birds through weather emergencies, favor more than one game species, supply essential nutrients at specific times and concentrate birds for hunting. Unfortunately, planted areas are not dependable in an area with less than 25 inches of rainfall, such as South Texas.

Certain characteristics should be considered if food plots are to be provided. Food plots should:

1. be adjacent to woody escape cover
2. be long and narrow to create edge and maximize interspersed habitat types
3. provide one acre of food plot for each 20 to 40 acres of rangeland
4. be planted with an adapted plant species.

This adapted plant must be one that matures early, drops sufficient seeds, tolerates drought and has nutrient-rich

seeds. Some important annual plants to consider are the millets, grain sorghum and sesame. A good seedbed is necessary, and food plots usually must be fenced to exclude cattle.

Discing

Discing and other methods of soil disturbance encourage growth of pioneer plants that provide food for bobwhites. Discing fire guards around pastures is advisable, particularly if adjacent to a public road. Disturbed areas, such as fireguards, support a variety of forbs such as sunflower, ragweed, doveweed and cowpen daisy. These forbs are a readily available food supply for quail. Discing also cuts travel lanes through dense herbaceous cover and creates an edge between grass and bare soil. Discing is most effective in pastures with an 85 percent or more grass cover.

A light discing along senderos, fencelines, right-of-ways or brush lines in late February or early March promotes diversity in quail habitat. Sites for discing should be selected on three factors: soil texture, seed source and supporting cover. The sod has to be thoroughly broken to allow seed germination. Forb seeds are always in the soil, and all that is required for germination is a shallow discing of the soil. Discing may also be combined with food plots to further diversify the plant composition.

Waterers

Bobwhites need water to survive and reproduce. Laboratory research has proven that (1) quail hens subjected to mild water stress will not begin laying, (2) hens subjected to water stress after having initiated laying will quit laying and (3) male reproductive systems are unaffected by mild water stress.

Because bobwhites cannot survive on metabolic water alone, establishing watering systems seems to make sense. However, another factor should be considered: how much water is available in foods?

An acre of South Texas rangeland has enough water in greens to quench the thirst of more than 40,000 bobwhites for one day during springs with adequate rainfall. During spring droughts, water from greens is sufficient for 7,000 to 8,000 bobwhites for one day.

When permanent waterers (one per 20 acres) were added in areas where water was available in greens, waterers had little effect on bobwhite density or productivity. They are worthless during years with normal to above-normal rainfall. During drought years, waterers added only about three birds per 100 acres to fall populations. Brush management alone added about 30 birds per 100 acres during drought. In other words, brush management has proven to be 10 times more effective than watering as a drought management strategy. Generally, money spent on watering systems would be better spent improving habitability and attaining the proper successional stage.

Half-cutting

Some cover is necessary in areas lacking herbaceous ground cover and where the growth of existing brush plants is off the ground. This situation may be remedied by half-cutting. Half-cutting involves using a machete, axe or saw to cut halfway through small branches of shrubs and low trees to let them bend down and rest their tips on the ground. The brushy portions of the limbs remain alive and create small coverts. These protect grass that can be used as nesting sites, provide loafing cover for broods and provide taller cover interspersed with shorter cover. Generally, the practice is best applied on heavily grazed pastures with heavier soils.

The minimum number of half-cut trees depends upon other species present and configuration of the

available cover. Limbs should be half-cut during the early to mid-growing season. If done correctly, the half-cut limbs will remain alive for several years.

Brush Shelters

Quail managers construct brush shelters to provide refuge cover on areas lacking natural, woody vegetation. Shelters may be helpful on any areas 25 acres or larger where canopy coverage of brush is less than 5 percent. Shelters are generally unnecessary and have little influence on bobwhite density where brush coverage exceeds 5 percent.

Bobwhites use artificial shelters of various designs. Simple brush piles with no provisions for an elevated canopy are acceptable on cool days. Coverts for hot days should have an elevated canopy and provide dense shade.

It is important to provide lateral screening cover with any shelter. For example, if a platform is elevated on legs, limbs or similar material should be allowed to overlap on the sides to ground level. Thus, the birds cannot be seen by a predator approaching on the ground. A shelter constructed by

stacking limbs in a tepee configuration is simple, economical and preferred by bobwhites over some other designs.

Bobwhites select sites with relatively high canopy coverage of brush when they loaf in natural brush mottes. Quail managers should erect clusters of shelters instead of single ones to simulate high canopy coverage. For example, construct a tepee shelter surrounded by four to six simple brush piles within a 10- to 20-yard radius. An alternative is to construct a cluster of tepee shelters where refuge cover is deficient.

Summary

Since wildlife, including the bobwhite, is an important enterprise on South Texas rangeland, it benefits the rancher and manager to consider bobwhite needs in ranch management decisions.

The ranch today must be operated as a business, with every opportunity used to reduce costs and increase income. If soils, water and vegetation are favorable, the wildlife resource will need little encouraging.

Fortunately, range management for bobwhites and cattle is largely compatible. Providing the correct

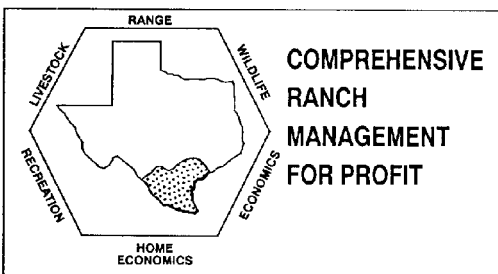
quantity and quality of forage to cattle through proper stocking and pasture rest encourages production of quality quail foods and cover. Judicious use of brush management provides food and cover for both quail and cattle. Special use practices such as discing, food plantings and erection of shelters benefit quail and have minor effects on the livestock operation.

Suggested Reading

More information on bobwhite management in Texas, particularly South Texas, can be found in the following books.

Beef, Brush, and Bobwhites – Quail Management in Cattle Country by Fred S. Guthery, published by the Caesar Kleberg Wildlife Research Institute, Kingsville, Texas, is a practical guide to management.

Bobwhites in the Rio Grande Plain of Texas by Val W. Lehmann, Texas A&M University Press, College Station, Texas, is an authoritative text for the study and management of bobwhites.



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