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Habitat Guide for Northern Bobwhite

TEXAS A&M AGRILIFE EXTENSION
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TEXAS PARKS & WILDLIFE

Photo by Lakeview Images

The northern bobwhite (*Colinus virginianus*) occurs throughout all, or parts of, 38 states; however, due primarily to large scale changes in land use, quail populations have declined dramatically since the 1970s.

Cover: Photo by AgriLife Extension.

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Habitat Guide for Northern Bobwhite

INTRODUCTION

During the past 25 years, grassland birds experienced steeper and more consistent widespread population declines than any other avian group in North America. The northern bobwhite (*Colinus virginianus*) occurs throughout all, or parts of, 38 states; however, due primarily to large scale changes in land use, quail populations have declined dramatically since the 1970s. The bobwhite is one of the most popular game birds in Texas. A recent survey by Texas A&M AgriLife Extension Service showed that bobwhites in the hunter's bag were worth about $253 each based on expenditures, while in the field. The avid quail hunter spends ~$8,600 per year, with 46% of money spent in destination counties, and another 18% going to communities located between the hunter's home and destination. Because quail hunting represents one of the few examples of urban money flowing into rural communities, decline in quail can represent a significant impact to rural economies.

Poor habitat quality (lack of nesting cover, encroachment of brush, etc.) appears to be a significant factor in declining populations, but landowners can proactively manage for quail to help them rebound. In Texas, efforts are underway to restore and maintain bobwhite habitat and populations. Private landowners are critical to any quail restoration or management strategy, given that 95% of all land in Texas is privately owned, while 84% is considered farms, ranches, and forest, collectively known as working lands.

Quail inhabit all ecoregions of Texas (Figure 1), but their density is greatest in the High Plains, Rolling Plains, the South Texas Plains and Gulf Coastal Prairies and Marshes (Figure 2). The following information should be considered a general guide leading to creation of quail habitat, but it is important to remember it does not guarantee the presence of quail. Past management actions, and environmental conditions influence the number of quail present. Quail populations are also often affected by factors other than habitat, such as drought, predation, or disease that could have a negative effect on local populations. We recommend contacting local Texas Parks & Wildlife Department (TPWD) Biologists, Texas A&M AgriLife County Extension Agents, or Natural Resources Conservation Service (NRCS) District Conservationists for more specific recommendations for individual properties.

HABITAT REQUIREMENTS

Although plant communities and soil types may change across the state, there are some general habitat requirements needed by all bobwhites. Habitat must provide food, water, cover, and be arranged in such a way that it is "useable" to quail. Try to understand needs from a quail's point of view since predators are an important source of mortality for quail, and they can attack from the air (e.g., hawks) or the ground (e.g., snakes, raccoons, coyotes, etc.).

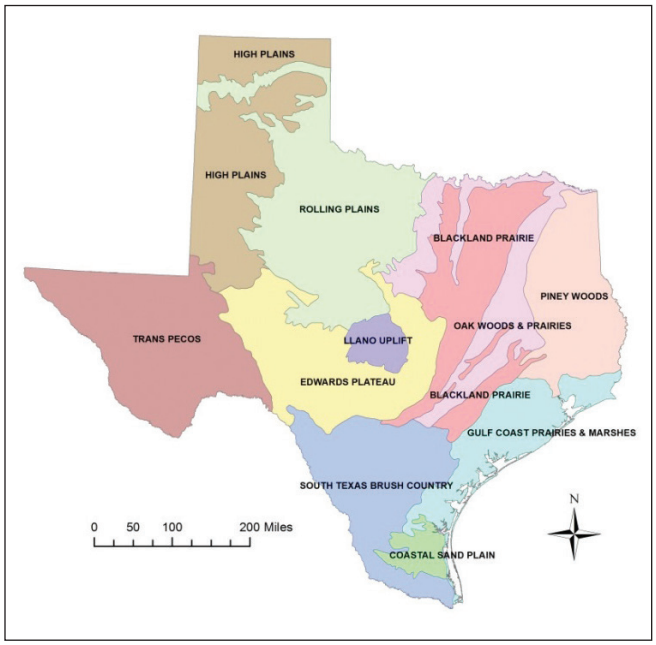

Figure 1. Texas is divided into 10 ecological regions based on differences in plant and animal communities, soils types, and climate. Bobwhites can be found in all 10 ecoregions.

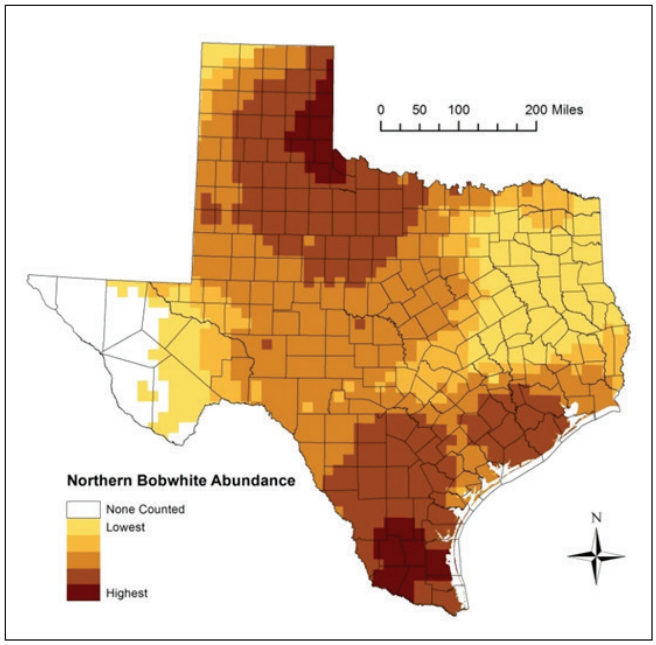

Figure 2. Distribution of bobwhite in Texas based on Breeding Bird Surveys (BBS) data (2012).

Cover provides refuge from harsh environmental conditions such as excessive summer heat, storms, and winter ice and snow conditions. In general, bobwhites need a mixture of short and tall plants with some bare ground among plants. Bare ground allows quail to move more easily when searching for food or traveling, while the combination of both short and tall plants provide screening cover from predators. All cover types should be well-interspersed, i.e., within 150-200 yards of each other so that the habitat is useable (Figure 3).

Figure 3. Northern bobwhite habitat has a mixture of bunchgrasses, low-growing brush, and bare ground distributed in a mosaic pattern across the landscape. Photo by Texas A&M AgriLife Extension Service.

Useable Space and Interspersion

Useable space and interspersion (arrangement) are two key components influencing bobwhite habitat. Useable space is the amount of area that has suitable permanent cover that allows quail to use every inch of the landscape (Guthery 1997). As the amount of useable space increases, bobwhite populations should also increase, and the reverse would happen when useable space is lost. The amount of useable space required to support quail populations varies by ecoregion, but is ~1,600 continuous acres. This would provide enough area for about 800 birds (1 bird/2 acres) which is roughly the minimum number of birds needed for a sustainable population (Larson et al. 2010). Landowners with fewer than 1,600 acres are still encouraged to manage their property for quail habitat and can have a significant impact on the local quail population.

Figure 4. To provide adequate loafing and escape cover, brush thickets should be ≥4 ft. tall and ≥10 ft. across distributed about 40-50 yards (a softball throw) from each other. Photo by Texas A&M AgriLife Extension Service.

Interspersion of multiple habitat types within a quail's home range is critical to their survival and reproduction. Diverse habitat should be present on the land, creating a mosaic pattern across the landscape. Home range is defined as the area used by quail which meets their needs for food, water, cover, and social interactions. Annual and seasonal home ranges vary in size across the state depending on environmental conditions and resource availability. These key areas have been recorded from 10-200 acres, with an average of about 40 acres. Home ranges are usually greater than 15 acres, even within high quality habitat. Distribution of food, water, and cover may impact annual and seasonal home ranges.

Protective Cover

Given that quail are prized as a food among predators (including humans), protective cover is needed as a safeguard in the different aspects of daily life. Screening cover can be grass, forb, or woody vegetation that conceals quail via visual obstruction from predators. Quail must be able to travel and forage while minimizing their exposure to various predators. Upright-growing forbs like common broomweed (*Amphiachyris dracunculoides*), partridge pea (*Chamaecrista fasiculata*), and western ragweed (*Ambrosia psilostachya*) serve as excellent screening cover. As an additional benefit, many of these plants provide seeds and attract insects that quail depend on for food.

Vegetation with a closed canopy and open base makes prime escape cover.

After feeding each morning, quail seek locations that provide protection from aerial and ground predators, while also allowing them to rest and digest food. Such "loafing" cover consists of dense brush (sometimes mixed species forming a motte) about the size of an automobile. Escape cover is an area that allows quail emergency refuge from predators. Vegetation with a closed canopy and open base makes prime escape cover. These areas become important when a covey is flushed and must quickly find safety. Escape cover is also essential during harsh weather conditions and extreme temperatures. Lotebush (*Ziziphus obtusifolia*), plums (*Prunus* spp.), sumac (*Rhus* spp.), and even mesquite (*Prosopis glandulosa*) are a few common brush species associated with loafing and escape cover (Figure 4). These cover types should be distributed across the landscape so that they are no

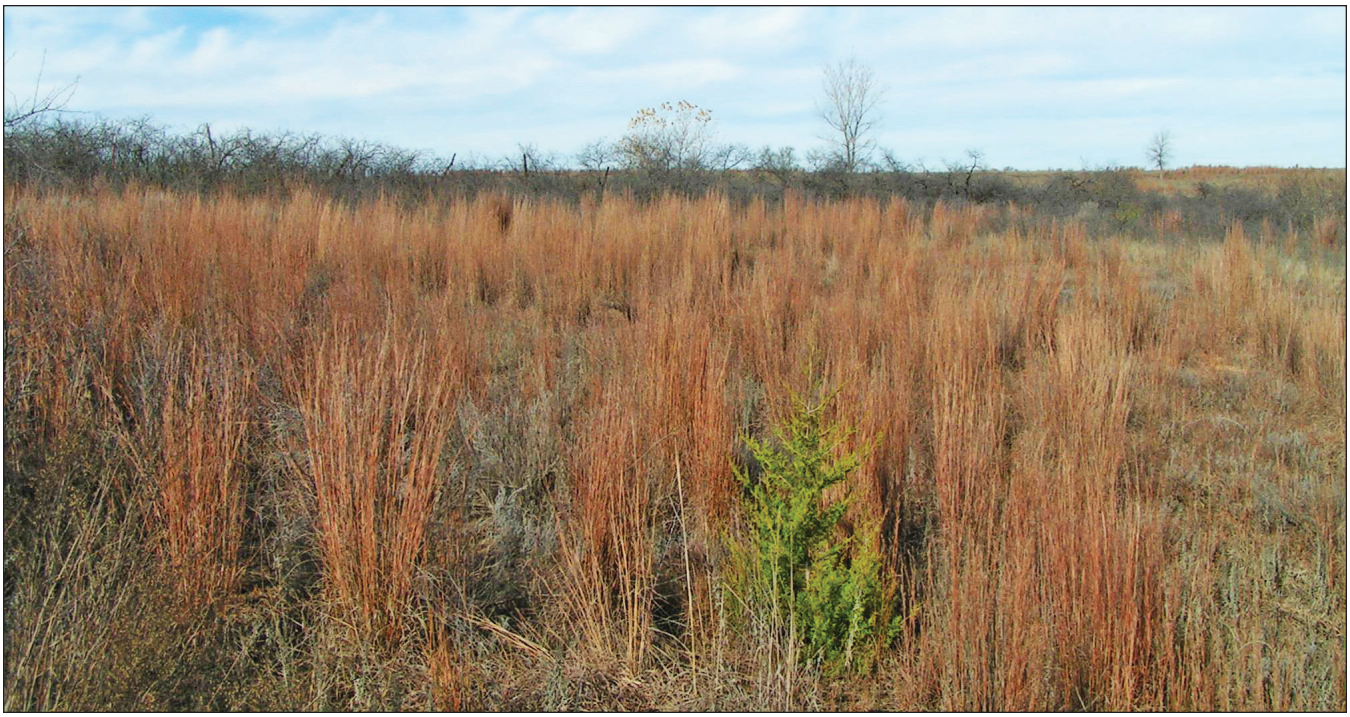

Figure 5. There should be a minimum of 250-300 bunchgrass clumps per acres to provide good nesting habitat for bobwhites. Bunchgrass clumps should be about the size of a basketball or larger, at least 12 inches tall, and have at least 1 year's residual ("old") growth to provide adequate leaf growth to conceal nesting bobwhite. Photo by Texas Parks and Wildlife Department.

more than a softball throw (40–50 yards) away from the next thicket of brush. In Texas, there is often an overabundance of brush, so loafing and escape cover are usually not limiting factors. In cases where brush canopy exceeds 30%, some form of brush management may be necessary to reduce coverage to a more desirable range of 5-25%.

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Nesting cover

Bobwhites nest on the ground and prefer to use large bunchgrass clumps as their nesting cover. Tall grass species, such as little bluestem (*Schizachyrium scoparium*) or silver bluestem (*Bothriochloa saccharoides*), should be at least the diameter and height of a basketball to provide adequate nesting cover during the spring and summer breeding season. A minimum of 250–300 clumps per acre, distributed across the landscape, is recommended. Nesting cover should make up approximately 30% of the bird's home range (Edminster 1954; Figure 5). While it may seem like a good problem to have, areas with too much grass can become an issue by reducing useable space. Prescribed grazing and fire, and strip disking are tools that may be used to create or maintain open areas to ensure that useable space requirements are met.

Introduced grasses such as the old world bluestem species, bermudagrass (*Cynodon dactylon*), bahiagrass (*Paspalum notatum*) and buffelgrass (*Pennisetum ciliare*) typically do not have the right structure and have only marginal value for quail. These exotic grasses suppress native grasses and forbs, which hold far more value for quail. Exotic species often form thick mats with little bare ground, reducing useable space for bobwhites. Landowners and managers with an interest in restoring native grasses on their property can find more information in the Texas A&M AgriLife publication EL-5456 *Restoring Native Grasslands*. In areas where bunchgrass is not sufficient due to drought or prolonged overgrazing, bobwhites have been known to use other vegetation types as alternative nesting sites. Although bunch grasses are preferred for nesting sites, the use of prickly pear (*Opuntia* spp.) and yucca (*Yucca* spp.) has been documented in parts of west and south Texas (Figure 6).

Figure 6. Prickly pear (Opuntia spp.) may serve as alternative nesting habitat for bobwhite where bunchgrasses are limited. Lower-growing forms of prickly pear, along with some grass, are commonly used for nesting in much of west Texas. Photo by Texas A&M AgriLife Extension Service.

Brood Habitat

Brood habitat is an area where bobwhites spend a significant portion of time raising their chicks. These areas are usually in close proximity to nesting cover and provide adequate screening cover to protect chicks from predators. One of the most essential components of brood habitat is the abundance of high protein food sources. Chicks rely almost completely on insects during the first few weeks of life and thereafter consume large amounts of seeds or green vegetation.

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It is also important for such "brood patches" to have bare ground so chicks can move freely in search of food. Forbs such as sunflowers (*Helianthus* spp), partridge pea, annual broomweed, and western ragweed, mixed with bunchgrasses and woody plants, create great brooding habitat (Figure 7). Sod-forming grasses like bermudagrass restrict movement of chicks because they are too dense.

Diet

Quail mangers understand the importance of diverse plant communities and the connection to healthy quail populations. Studies of quail diets in Texas show use of more than 1,000 plant species found in their crops ("craws"). A bobwhite's annual diet

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is comprised mostly of seeds (70%), insects (12%) and green vegetation (10%) (Larson et al. 2010; Figure 8). Consumption of seeds varies depending on the season, ranging from 60% in the spring, to more than 80% in the fall. Quail tend to prefer hard-coated seeds from grasses and forbs such as

Figure 7. Good brood habitat from a bobwhite's point-of-view. Note the pockets of bare ground underneath the protective canopy of partridge pea (*Chamaecrista fasciculata*). A hen or rooster with their brood will be able to forage about to find seeds in the case of the adults, and insects for the chicks. Photo by Texas Parks and Wildlife Department.

Table 1. Plants commonly consumed by Northern Bobwhite in Texas.

Forbs	
Blazing star	*Liatris* spp.
Buffalobur	*Solanum rostratum*
Bull nettle	*Cnidoscolus texanus*
Bundleflower	*Desmanthus* spp.
Butterfly pea	*Clitoria ternatea*
Croton	*Croton* spp.
Dayflower	*Commelina erecta*
Golden Crownbeard	*Verbesina encelioides*
Groundcherry	*Physalis* spp.
Hoary milkpea	*Galactia canescens*
Milkvetch	*Astragalus nuttallii*
Partridge pea	*Chamaecrista fasciculata*
Pricklypoppy	*Argemone sanguinea*
Queens-delight	*Stillingia sylvatica*
Sensitivebriar	*Mimosa latidens*
Snoutbean	*Rhynchosia* spp.
Snow on the prairie	*Euphorbia bicolor*
Spurges	*Euphorbia* spp.
Sunflower	*Helianthus* spp.
Vetch	*Vicia* spp.
Western ragweed	*Ambrosia psilostachya*
Woody	
Algerita	*Mahonia trifoliolata*
American beautyberry	*Callicarpa americana*
Black locust	*Robinia pseudoacacia*
Chittamwood	*Sideroxylon lanuginosum*
Hercules' club	*Zanthoxylum clava-herculis*
Hogplum	*Colubrina texensis*
Honey Mesquite	*Prosopis glandulosa*
Lotebush	*Ziziphus obtusifolia*
Netleaf hackberry	*Celtis reticulata*
Prickly pear	*Opuntia* spp.
Spiny hackberry	*Celtis pallida*
Grasses	
Barnyard grass	*Echinochloa crus-galli*
Fringed signalgrass	*Urochloa ciliatissima*
Johnsongrass	*Sorghum halepense*
Panic grasses	*Panicum* spp.
Paspalum grasses	*Paspalum* spp.
Plains bristlegrass	*Setaria leucopila*
Sorghum	*Sorghum bicolor*
Switchgrass	*Panicum virgatum*

croton (*Croton* spp.), panicum grasses (*Panicum* spp), plains bristlegrass (*Setaria leucopila*), and many other species found throughout Texas (Table 1). Nutritional requirements fluctuate seasonally. During the spring and summer months insects become a more important source of food, making up more than 25% of the bobwhite's diet. This is due to nutritional requirements related to reproduction and growth in juveniles. Non-reproductive bobwhites need a minimum of 12% crude protein, while breeding hens need a minimum of 23% crude protein to ensure maximum egg production and healthy body condition. Juvenile nutritional requirements are even higher, at an estimated 28% (Nestler 1945). Grass

Figure 8. Brood habitat consists of an abundance of forbs and insects to provide the high protein diet needed by chicks. These areas should be in close proximity to nesting cover. Strip disking is a quick way to provide quality brood habitat. Photo by Texas Parks and Wildlife Department.

Figure 9. Insects like this grasshopper (Order Orthoptera) are important food sources for adult bobwhite during the spring and summer and are vital to chick survival for the first month of life. Photo by Texas A&M AgriLife Extension Service.

Figure 10. Quail will utilize wildlife watering stations or livestock water troughs but they primarily meet water requirements through their diet. Photo by Texas A&M AgriLife Extension Service.

seeds tend to have 11-15% crude protein, while forbs and legumes range from 15-30%. Insects are the richest form of protein at roughly 45%, which explains why insects make up a significant portion of breeding hen and juvenile diets (Figure 9).

Surface water may actually be more important to quail for the habitat it provides nearby.

Water Requirements

Quail are able to use the moisture from seeds, green vegetation, and dew to meet daily water needs (Rosene 1969). Snails, caterpillars, and insects also provide an important source of water during the breeding season, which tends to also be the driest and warmest months of the year. Surface water, such as streams or ponds, is not critical for bobwhites but may be utilized. Use of livestock water troughs by bobwhites has been documented, especially during drought periods (Figure 10). If troughs are an important source of permanent water in the area, consider installing wildlife ramps to ensure quail can get to water and escape from troughs, or (even better) create overflows to allow water to reach the ground-level. Such moist-soil sites offer cooler microclimates [up to 40° F cooler than adjacent bare ground] on a hot day.

Surface water may actually be more important to quail for the habitat it provides nearby. Small ponds, lakes, and spreader dams (sometimes referred to as "quail oases") can be used to create habitat pockets that provide additional food resources and cover (Figure 11). Although these management practices do not address the landscape requirements for sustaining a population of bobwhites, it is a regular tool used by wildlife managers. For additional information on spreader dams, view the video *Form & Function of Spreader Dams to Improve Quail Habitat* provided by Texas A&M AgriLife Extension Service.

Figure 11. Water sources such as stock tanks and spreader dams also create habitat pockets providing food, cover, and nesting areas. Photo by Texas A&M AgriLife Extension Service.

Figure 12. Utilizing the "25% harvest efficiency" rule for grazing management promotes healthy vegetation and leaves enough foliage for quail nesting cover. Photo by Texas A&M AgriLife Extension Service.

Figure 13. Following a prescribed grazing plan can improve livestock production and bobwhite habitat. Photo by Texas A&M AgriLife Extension Service.

Habitat Management Tools

Livestock Grazing

Livestock and quail can co-exist throughout most of Texas, and with the use of proper grazing methods, livestock can benefit quail habitat. Good quail habitat usually requires tall bunchgrasses with a mix of bare ground and forbs in proximity to woody cover. To better ensure adequate bunchgrasses, which are also desirable for grazing, the "25% harvest efficiency" rule should be used (Figure 12). A YouTube video series titled *Determining Stocking Rate to Benefit Cattle and Quail* produced by Texas A&M AgriLife Extension Service, provides in depth information on how to calculate stocking rate and how utilizing only 25% of the total forage production can benefit quail, livestock, and long-term plant health. By implementing this management strategy, 25% of the plants annual production is grazed by livestock while 25% is lost to insects, trampling, etc. The other 50% of the plant remains to maintain a healthy root system in order to produce new forage in future years. This portion also represents vegetation used for nesting or brood cover by bobwhites.

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An additional benefit of livestock grazing is soil disturbance created by hoof action. This disturbance accomplishes two things: 1) creation of bare spaces, and 2) growth of new plants, particularly forbs (Figure 13). However, non-native grasses like bermudagrass and old world bluestems for livestock grazing have created situations that negatively impact quail habitat. Given intensive management (e.g., fertilizer programs, herbicides to reduce forbs, etc.), introduced non-native grasses can outcompete native bunchgrasses resulting in a monoculture with little bare ground or nesting sites. Use of sod-forming grasses should be avoided when managing for quail. Where annual rainfall exceeds about 35 inches, removing grazing completely could be detrimental for bobwhites as open bare spaces used for feeding areas can close and potentially reducing the amount of quail food on the land. If livestock grazing does not fit into

Figure 14. Prescribed fire may be used to rejuvenate pastures, reduce brush canopy, remove excess vegetation, and promote forb growth to benefit bobwhite habitat. Photo by Curtis Hodges.

the management plans of the property, there may be other tools such as prescribed fire or disking that can be used to maintain or improve quail habitat.

Prescribed Fire

Prescribed fire can be a great management tool that can play an important role in maintaining or improving northern bobwhite habitat, especially in areas receiving 30 inches of rainfall or more. Fire has been shown to increase quail food by more than 15% (Jackson 1969). Fire can be used to decrease canopy cover in areas where brush has become too thick, but remember it is important to maintain some woody plants for bobwhite escape cover. Cool season burns tend to do less harm to brush species and maintain adequate cover for quail (Renwald 1978), while hotter fires during the warm season may reduce canopy cover (Figure 14). Warm-season fires rarely root-kill brush species that are important for quail but can top–kill brush coverts for ten years or more in drier climates. Depending on the objective, to maintain or to create more open space, will determine whether a cool season or warm season fire should be used. *Fire as a Tool for Managing Wildlife Habitat*, a publication produced by the Texas A&M AgriLife Extension Service is useful to land managers interested in prescribed burning. For additional information or assistance with prescribed fire, contact your local TPWD, Texas Forest Service, NRCS, or Texas A&M AgriLife Extension Service.

Brush Management

Brush management is used extensively throughout Texas to control invasive species such as mesquite and juniper. Many times, clearing brush is done with the intention of increasing forage production for livestock, but all wildlife, including bobwhites, are affected by the amount of brush on the landscape. Good quail habitat includes a brush component, but too much brush can limit quail production. When conducting brush management for quail, studies have shown that it is beneficial to leave some brush stands intact. The average flight distance for a bobwhite is less than 100 yards. Considering this, no location within the management area should be greater than 100 yards from suitable escape cover if useable space is to be maximized. This may be done by leaving strips or blocks, or by "brush sculpting" to create a mixture of brush and open areas across

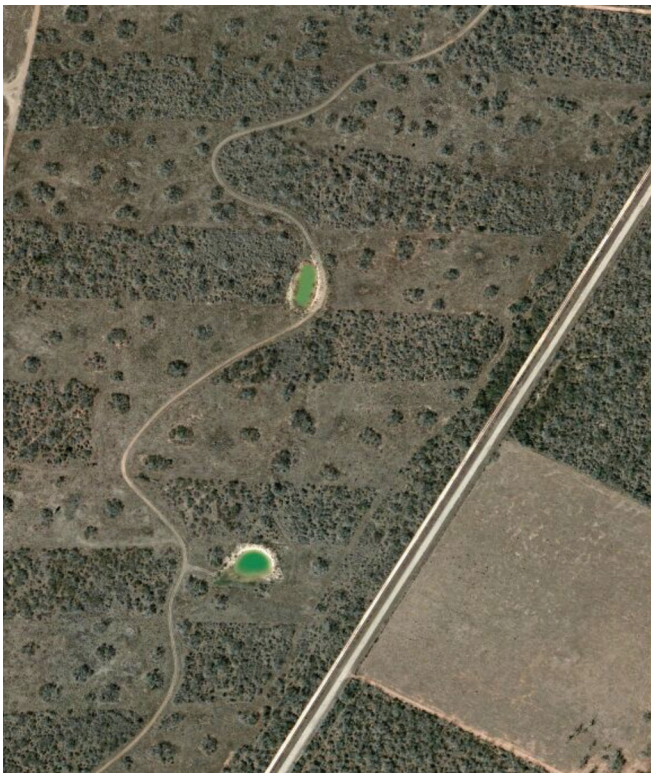

Figure 15. Brush sculpting is a management technique that may be used to reduce brush canopy cover and increase grass and forb production. This creates additional useable space for bobwhite. Photo by Texas A&M AgriLife Extension Service.

the pasture (Figure 15). Leaving valuable brush species like lotebush and plum, while only removing the invasive or problematic species, will also ensure that the necessary brush element of quail habitat is maintained. Remember, it is critical to develop a brush management plan prior to implementation. Some

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brush is critical to maintaining useable space. For a better understanding on the use of brush management to benefit wildlife, see the Texas A&M AgriLife Extension Service publication E–459, *Woody Plants for Wildlife: Brush Sculpting in South Texas and the Edwards Plateau*.

Completing the Habitat Guide

Completing the habitat guide for bobwhite will aid property owners in determining the current condition of habitat. Many times limiting factors are identified, such as a lack of nesting or escape cover that may affect useable space. Once limiting factors have been recognized, management plans may be developed or modified to include best management practices (BMPs) needed to increase quality quail habitat.

To successfully complete the habitat guide some basic information about the particular property, such as percent canopy cover, vegetation production, species composition, and plant height will be needed. A field evaluation of habitat conditions will be necessary, and maps with aerial photography and topography can also be used to assist with the appraisal.

How to Use the Habitat Guide

The habitat guide is made up of 17 statements in boxes. Begin with box #1 and follow the path that best fits. For example, in box #1 the statement inquires about the size of property. If the property is ≥ 1,600 acres then proceed to box #2. However if the property is < 1,600 acres, then consult the management suggestions following that category. Completing the habitat guide will confirm where conditions are adequate, or show limiting factors needing attention. For assistance in developing a wildlife management plan, contact the TPWD or Texas A&M AgriLife Extension Service.

Undoubtedly, many properties will have limiting factors affecting bobwhite populations. Although each should be addressed, which categories should take priority? The habitat guide was built in a hierarchical manner beginning with the most important aspect. However, our order of importance can be debatable, given local circumstances. For example, nesting or brood-rearing habitat may take precedence over protective cover in some ecological regions where escape cover is abundantly available. This guide is meant to serve as a source for identifying potential limiting factors for bobwhite across their range in Texas and can assist landowners and managers in addressing items that may limit bobwhite potential.

Habitat Guide

1. Area to be managed for bobwhite is large enough to provide suitable useable space and sustain populations

No
Areas that are <1,600 acres are usually considered too small to maintain a sustainable bobwhite population. However, working in cooperation with other adjoining landowners can create an area large enough to provide suitable useable space. If working with neighbors is not a viable option, managing your property for one or two habitat types that would allow quail to utilize the property for some portion of the year should be done.

Yes
Continue to next box 2.

2. Multiple habitat and cover types are well interspersed within the management area

No
Without interspersion (good arrangement) of all habitat types, bobwhite may not be able to fully utilize the property. It is important that all habitat types are in close proximity to each other so that useable space may be maximized for bobwhite. This could include the creation of openings, motte development, creating connections among large open areas. Consult with a local TPWD biologist for specific recommendations for improving interspersion for a specific property.

Yes
Continue to box 3.

3. Mottes, strips, or blocks of low-growing dense brush make up 5-30% of the area to provide escape and loafing

No
Is brush greater than or less than ideal amount?

Less than 5%
Providing protection from intensive over browsing and reducing the frequency of prescribed burning may be necessary to encourage brush thickets to form and serve as protective cover. If desirable brush species are lacking, planting those species can be done to address their absence on the landscape. Brush teepees can also be constructed and distributed across the pasture to connect open pastures to areas providing protective cover.

Greater than 30%
If brush canopy cover exceeds 30% some form of brush management (mechanical, herbicide, or prescribed fire) may need to be utilized to reduce canopy cover to an acceptable level. However, habitat and rainfall patterns differ greatly across the state as does brush requirements, so it is recommended you consult with your local TPWD Biologist, Texas A&M AgriLife Extension Service, or NRCS before planning large scale brush manipulation projects

Yes
Continue to box 4.

4. Dense brush thickets, strips, or blocks are ≥ 4 feet tall and 10 feet across are present

No
Dense brush thickets should be ≥4 ft. tall and ≥10 feet across to allow quail to escape from predators and loaf during the day. Ideal protective cover consists of preferred plant species (lotebush, prickly ash, wild plum, algerita, sumac, prickly pear, etc.) Providing protection from intensive over browsing and reducing the impacts from burning may be necessary for brush thickets that are too small to serve as protective cover.

Yes
Continue to box 5.

Habitat Appraisal Key (continued)

5. Brush thickets are spaced no more than a softball throw away from the next brush thicket (40-50 yds.)

No
Brush thickets should be no more than a softball throw (40-50 yds.) away from each other so that quail can quickly find cover if the need arises. If suitable brush thickets are too far apart from each other then you may consider planting desired species or creating suitable habitat out of undesirable species like mesquite through the practice of half-cutting. Make sure to protect the brush you do have from fire and overgrazing.

Yes
Continue to next box 6.

6. Protective cover consists of preferred plant species

No
Ideal protective cover consists of plant species such as lotebush, prickly ash, wild plum, algerita, sumac, and prickly pear. If desirable brush species are lacking, planting those species can be done. Establishment of desirable species may take several years but will be beneficial long-term.

Yes
Continue to box 7.

7. Nesting cover makes up about 30% of the available habitat

No
Is nesting cover considerably greater or less than ideal amount?

Less than 30%
If adequate nesting cover is limiting, a reduction in grazing pressure or complete deferment may be necessary. Grassland restoration and efforts to re-vegetate the area with native grasses and forbs could also be done to improve habitat.

Yes
Continue to box 8.

Greater than 30%
If nesting cover (i.e., bunchgrass clumps, prickly pear) becomes too dense it can impede movement of quail through the habitat. Prescribed fires, strip disking, and light grazing can be used to create openings and increase usable space.

8. There are at least 250-300 bunchgrass clumps such as little bluestem, silver bluestem, or other adequate nesting sites per acre

No
Around 250-300 nesting sites per acre give quail options to spread out and choose the best site. It also makes it harder for predators to pinpoint nest locations. Grassland restoration projects can help increase nesting cover if it is lacking. Be sure to protect nesting sites from too much grazing pressure. Clumps of prickly pear and yucca can also serve as nesting cover.

Yes
Continue to box 9.

9. Nesting sites are the size of a basketball or larger at the base of the plant and are ≥ 12 inches tall

No
If bunchgrass clumps are present but are not large enough to be adequate nesting sites then you must protect them from over grazing to allow them adequate leaf growth. Remember to take no more that 25% of the plant.

Yes
Continue to box 10.

Habitat Appraisal Key (continued)

10. Brood habitat is in close proximity to nesting cover

No
It is important that brood habitat is available in the immediate vicinity of nesting habitat. Long treks to brooding habitat from the nest can be dangerous for chicks. If nesting and brooding habitats are not close together then create nesting habitat near existing brooding habitat or vice versa.

Yes
Continue to next box 11.

11. Bare ground is 15-40% of brood habitat

No
Is bare ground greater than or less than ideal?

Less than 15%
If bare ground is limited (i.e., ground cover is too dense) chicks will not be able to utilize the area due to limited mobility. Light grazing, prescribed fire patches, or disked strips can open up more usable space.

Greater than 15%
If there is too much bare ground then there will not be enough screening cover to hide chicks from predators and food availability could be limited. Disking and seeding native grasses and forbs will increase cover and food in brood habitats. A reduction in grazing pressure to allow more residual forage should also be considered.

Yes
Continue to box 12.

12. High protein food sources such as insects are noticeably abundant during the summer

No
Chicks need high protein food sources during the summer to support their growth. Insects and legumes are important sources of protein. Disking and seeding legumes can increase available protein and may attract insects as well.

Yes
Continue to box 13.

13. A diverse assortment of food items is available throughout the year

No
Food for adult quail is rarely a limiting factor but it is essential that a diverse assortment of preferred plant species be available throughout the year for bobwhite quail. Although seeds from mostly forb species are their primary diet, they do consume other green matter and insects during certain times of the year. While a prescribed burning will promote the growth of new native vegetation, the use of shallow disking and light to moderate grazing can also achieve similar results.

Yes
Continue to box 14.

14. Permanent water sources are available within the habitat

No
Permanent water sources are not a priority for bobwhite. However, quail do utilize water sources when they are available. Spreader dams may be created along roadsides to slow run-off and create microhabitats with green vegetation consisting of prime seed producing plant species.

Yes
Continue to box 15.

Habitat Appraisal Key (continued)

15. If water troughs for livestock are being used, is access provided or an escape ramp been installed, or have the floats been set to provide overflow at ground level?

No

If water troughs exist on the property, a wildlife escape ramp should be installed along the edge of the trough to prevent quail and other small animals from being trapped and potentially drowning in the water. Adjusting floats to allow water to spill over will create an overflow pool to access water at ground level.

Yes

Continue to next box 16.

16. A prescribed grazing plan has been developed to maintain or improve rangeland conditions and meet the needs for livestock and wildlife in the area.

No

Following a prescribed grazing plan for cattle and other livestock can be beneficial to bobwhite habitat. It is essential to remember the 25% harvest utilization rules to prevent overgrazing that could damage potential quail habitat. However, grazing management is ultimately driven by how much grass and nesting cover is needed and readily available. Stocking rates generally range from low to moderate.

Yes

Congratulations! If you've been able to answer "yes" to all of the above questions then you are well on your way to great bobwhite habitat. Remember that habitat is only one of the many factors that affect quail populations, albeit an important one. In areas with quail present, habitat improvements such as those described above are the best way to stabilize and increase the local population.

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Useful Management Videos

TAMU Wildlife and Fisheries Extension YouTube Channel – https://www.youtube.com/user/WFSCAgriLife/playlists

Quail Habitat – Softball Habitat Evaluation Technique – https://www.youtube.com/watch?v=KxcyJViY_sw

Quail Houses –https://www.youtube.com/watch?v=Ci9p0RaF9g4

Ragweeds and Quail – https://www.youtube.com/watch?v=E4fd_qc9CnY&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P&index=33

Proper Grazing of Quail Nesting Habitat – https://www.youtube.com/watch?v=k7bIsMKHpW8

Quail Oases – https://www.youtube.com/watch?v=nTczFuDBvbo&index=34&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P

Brush Sculpting to Improve Quail Habitat – https://www.youtube.com/watch?v=yzdsJMwLff0&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P&index=26

Half-cutting Mesquites to Enhance Quail Coverts – https://www.youtube.com/watch?v=s4j6FRKl4YM&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P&index=18

Prescribed Burning For Quail – https://www.youtube.com/watch?v=UwJ5rRmHLJA&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P&index=11

Quail Management: Coping with drought – https://www.youtube.com/watch?v=wm2vI6XQNO0

Grazing as a Tool for Managing Wildlife Habitat – https://www.youtube.com/watch?v=sOQjUFLps3E&index=30&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P

Grazing Management for Quail – https://www.youtube.com/watch?v=dF5hrS-fbzk&list=PL10QCALWCnPRY5IYXcIHQulVTFuYI_M3P&index=37

Cattle and Quail Part 1 – https://www.youtube.com/watch?v=1Nj8n5x78Bk

Cattle and Quail Part 2 – https://www.youtube.com/watch?v=QuQ8uGsAekM

Cattle and Quail Part 3 – https://www.youtube.com/watch?v=jB3_lTXDuy8

Softball Habitat Evaluation Technique – https://www.youtube.com/watch?v=238PRCbHR5A

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Wright, Byron D., James C. Cathey, and Robert K. Lyons. 2005. "Habitat Monitoring for Quail on Texas Rangelands". *Texas Cooperative Extension Publication B-6172*. College Station, Texas, USA.

Helpful (App)lications

Northern bobwhite management calendar – https://itunes.apple.com/us/app/northern-bobwhite-management/id903580244?mt=8

Northern bobwhite habitat evaluation – https://itunes.apple.com/us/app/northern-bobwhite-habitat/id903595892?mt=8

Useful Web Resources

Texas AgriLife Extension Service Wildlife and Fisheries Unit – https://wildlife.tamu.edu/quail

Texas Parks and Wildlife Department – http://tpwd.state.tx.us/

Institute of Renewable Natural Resources – http://irnr.tamu.edu/

Books

Brennan, Leonard A., Katherine Armstrong. 2006. *Texas Quails: Ecology and Management*. Texas A&M University Press. College Station, USA.

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