

# Bobwhites of the Wild Horse Desert: Status of Our Knowledge

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**Wildlife Management Bulletin  
of the  
Caesar Kleberg Wildlife Research Institute  
Texas A&M University-Kingsville**

**Management Bulletin No. 4**

1999

# BOBWHITES OF THE WILD HORSE DESERT: STATUS OF OUR KNOWLEDGE

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**Abstract:** This bulletin is a synthesis of published work on northern bobwhites in the Wild Horse Desert, better known as South Texas. We reviewed over 140 scientific articles, 43 popular articles, and 2 books. We relied heavily on the 2 pioneers: Valgene Lehmann and Fred S. Guthery. While this report serves as an initial reference point, there is so much more to learn. To mention a few, how can we best predict quail abundance? And, what are the impacts of road feeding, pen-raised birds, brush management, and livestock grazing on quail populations? Only through sustained funding and long-term research will we be able to answer these kinds of questions, which will permit land-owners and biologists to manage better northern bobwhites in South Texas.

Northern bobwhites undoubtedly are the most important gamebird in South Texas. Their biology, ecology, and management is of interest to wildlife enthusiasts throughout Texas and the United States. We offer the following synopsis in outline format to provide pertinent information about northern bobwhites in South Texas.

## Home Ranges, Core Areas, and Movements

Most species of ground-dwelling gallinaceous birds range over a limited area of the landscape. Habitat requirements should be provided within this “space” to ensure their continued survival.

- Average annual home range of bobwhites varies from 10-80 acres.
- Core areas, where bobwhites spend 75% of their time, average 22 acres.
- Most bobwhites spend their lives within a quarter to a half mile of where they were hatched.
- The longest recorded movement was 65 miles by a male bobwhite trapped on the King Ranch.
- Bobwhite densities in South Texas vary from 1 bird per 1-2 acres during a banner year to 1 bird per 7-9 acres during a poor year.

## Activities During the Annual Cycle

Behavioral activities are important for reproduction and social order.

- Coveys “breakup” and form pairs during spring.

- Pairs begin to establish breeding territories during February-April.
- Whistling by males occurs during February-July, with a peak during late-June.
- Nest construction can begin as early as March.
- First clutches usually are laid in April and May.
- Majority of the hatch is completed by July.
- Hatches as late as November have been recorded when a “wet” fall follows an exceptionally “dry” spring and summer.
- Bobwhites move to areas with high insect densities after chicks hatch.
- Fall “shuffle” occurs during August-September when juvenile bobwhites leave their broods to join other coveys.



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**Male bobwhites begin calling for mates as early as February in some years.**

## Food Habits

A variety of food sources must sustain bobwhites during their short life-span. Bobwhites are considered diet generalists for most of the year, except for young chicks during their first few weeks of life, during which they eat insects.

- Spring diet is composed mainly of insects, leavenworth vetch, rosettegrass, groundcherry, and tropic croton.
- Summer diet consists of woolly croton, insects, tropic croton, parks croton, and dayflower.
- Fall and winter diets include 6 species of croton, cowpen daisy, annual sunflower, ragweed, partridge pea, and grass seeds.
- Important grasses are thinseed paspalum, signalgrass, sarita dichanthium, and bristlegrass.
- Chicks require 28% protein for maximum growth, adult females require 23% protein for egg-laying, and adults of both sexes require 11-12% protein for maintenance.
- The best sources for protein are insects and legumes (nitrogen-fixing plants).
- Food sources fluctuate greatly, being influenced by rainfall.
- On an annual basis, seeds with hard coats are the primary diet item for bobwhites.
- Bobwhites will use food plots, feeders, and constructed waterers.
- “No study has ever demonstrated that the addition of food plots and/or feeders increased bobwhite quail populations”—F. S. Guthery.

## Desirable Habitat Traits

Habitat should have loafing, reproduction, and feeding areas. These features center around brush density, plant species, and open areas.

- Brush should be maintained in strips or a patchwork pattern of mottes so bobwhites are never more than 75-100 yards away from a thicket.
- Scattered brush clumps between strips or mottes allow for more usable area.
- Overall, brush canopy should cover 5-20% of the land area.
- Important brush species, as habitat components, are lotebush, tasajillo, prickly pear, granjeno, and running mesquite.



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**Bobwhites are among the most widely hunted gamebirds in the Wild Horse Desert.**

- Pastures should contain at least 1 shade tree per 8 acres and 1 “headquarters covert” (a brush clump with tall grasses or forbs at the base) per 20-25 acres.
- Bare ground should range from 25-75%.
- Proper habitat management (i.e., brush control, discing, prescribed fires, etc.) shows its greatest effects during drought years when bobwhite densities will be 5-8 times higher on these areas versus densities on non-managed areas.
- Introduced exotic grasses, especially KR bluestem, buffelgrass, and bermudagrass are not beneficial to bobwhites.
- Native grasses, such as the bluestems, sideoats grama, and bristlegrass are much better for bobwhites than exotic grasses.
- Spring and summer nesting cover is best where residual perennial grasses occur in “pie plate” clumps at rates of at least 250-500 per acre.
- Big bluestem and little bluestem provide the best nesting clumps, but threeawns and cordgrass also can be important.
- Summer and early fall cover includes brooding areas that contain different species of single-stemmed forbs with bushy canopies that are variable in height.
- Forbs are important for attracting insects, which are a critical diet item during summer and fall.
- Important species are broomweed, ragweed, sumpweed, and croton.
- All seasons - loafing cover should have a dense canopy but be open at ground level.
- Important brush species for bobwhite loafing areas are granjeno, tasajillo, and lotebush.



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**Prescribed burning is an effective management tool to improve bobwhite habitat.**

- One current hypothesis to explain the large annual shifts in bobwhite production involves “heat at quail level.” High daily temperatures during July-August may reduce the nesting season as much as 45 days.

### Habitat Management Techniques

Several techniques or tools are available to “manage” or “sculpt” bobwhite habitat features.

- Effective habitat management practices are those that create more usable space. Simply, “you can not make more quail by improving the *quality* of the homes they live in. You can only make more quail by building them new homes (improving the *quantity*)”—F. S. Guthery.
- Altering the habitat to create the appropriate plant successional stage maximizes usable space.
- *Herbicides* to control brush have the advantage that they normally root kill 65% of the brush, but the disadvantage is that they also may kill some forbs for 1-2 growing seasons.
- Herbicides should not be applied to solid blocks of brush larger than 40 acres.
- Herbicides should be applied in variable rates or in strips.
- *Discing* disturbs soil, increasing forb growth.
- Forb canopy coverage during summer should be greater than 10%.
- Discing is best during late-February to early-March or during late-August to early-September.

- No more than 5-15% of the area should be disced.
- Discing should be concentrated in pastures where grass cover is greater than 85%.
- *Prescribed fires* should be conducted during midwinter to stimulate grasses and forbs.
- Fires should be “spotty” so that residual perennial grasses are left behind in scattered clumps for nesting.
- Areas should be burned once every 4-5 years.
- *Man-made brush shelters* and half-cutting mesquite, granjeno, and huisache are methods that increase the number of loafing areas and headquarters coveys where brush cover is lacking.
- In every study examined, a *grazing system* (i.e., short duration and high intensity-low frequency) resulted in higher bobwhite densities than did continuous grazing.
- A King Ranch study indicated bobwhite densities were 2.3 times higher under short duration versus continuous grazing.
- Trampling of nests is not a concern under any grazing system unless stocking densities exceed 1 animal unit per acre.
- Higher stocking rates generally benefit bobwhites on good-to-excellent range because cattle consume and trample dense plant growth, allowing increased bobwhite mobility and foraging.
- Low-moderate stocking rates are preferred on areas of poor-fair range because maintenance of groundcover is a major concern.
- Low-moderate stocking also should be considered during drought and when brush canopy coverage (the amount of ground shaded by the canopy at noon) is less than 5%.
- *Water supplementation* is a questionable management practice because water “held” in plants often exceeds bobwhite requirements by a factor of 10,000.

### Harvest

Because about 80% of a bobwhite population dies annually, prudent harvesting is essential in maintaining a good population.

- Annual bobwhite harvest should be no more than 25-45% of the fall population, involving no more than 1-3 bobwhites from each covey. Harvests above these levels will cause the bobwhite population to decline over the long-term.

- During drought years the harvest should be reduced to 10-20% of the fall population.
- January and February bobwhite hunting has a greater negative impact on the population than hunting during November and December.
- Managers should determine the threshold of brood stock needed to maximize the spring-to-fall increase and then harvest up to this threshold. Normally, the threshold is 1 bobwhite per 3-4 acres on March 1<sup>st</sup>.
- Percentage of bobwhites wounded by hunting but not found can be 5-25% of the total harvest.
- Secondary predators include skunks, armadillos, and snakes.
- Overall nest success will almost always be high because of the ability for bobwhites to renest if their first nesting attempt fails.
- Some predation may be beneficial because it shifts the average hatching date to later in the season when chances of survival to fall are increased because of the shorter time involved.
- Predators become increasingly productive as their densities are reduced. For example, when coyote numbers are reduced, the remaining coyotes produce larger litters of pups and they attain puberty at a younger age.
- Removal of primary predators, such as coyotes, results in heavier predation by secondary predators, such as skunks.
- Intensive predator control is costly and is usually not recommended because success of control efforts is limited.

Mortality and Survival

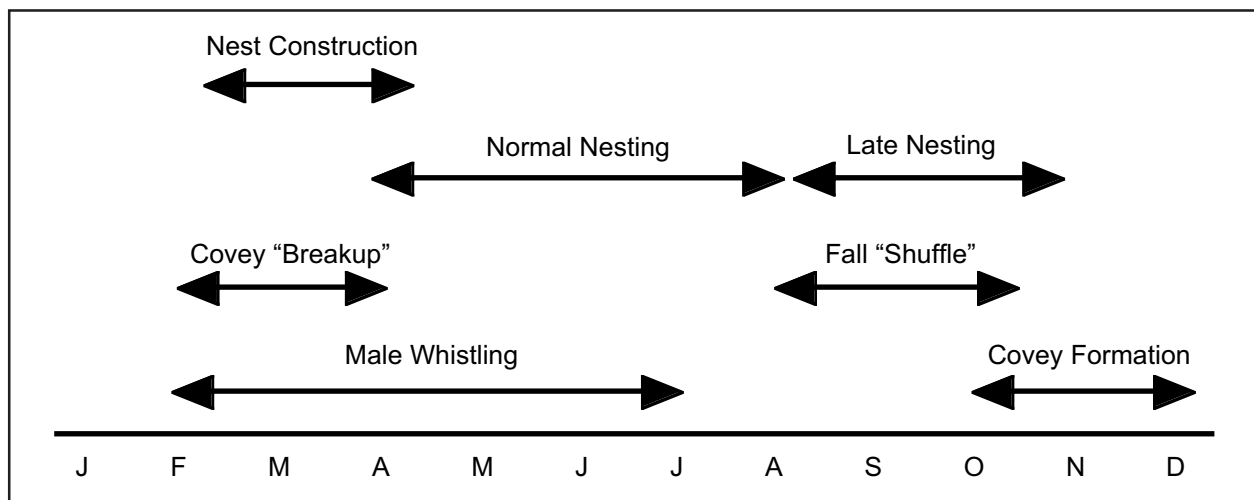
Like all species, bobwhites die at certain rates from many causes. However, managed habitats can improve survival rates and reproduction.

- Annual bobwhite mortality varies from 70-95%.
- Winter mortality may be as high as 80% following a severe drought.
- Average life expectancy is 8.5 months.
- Natural causes of bobwhite mortality account for 20-40% of the population annually.
- Sixty-two percent of bobwhite chicks die before reaching 20 days old, but survival equals that of adults after 2-4 months.
- Fire ants may reduce bobwhite production by killing hatching chicks.
- Coyotes, raccoons, and feral hogs are the major nest predators; however, the primary predator species can vary between areas.

Rainfall

Rainfall is the key to producing bobwhite quail in South Texas. Proper management is most critical during years of drought.

- Timing and amount of rainfall may explain 70-80% of the variation in bobwhite production.
- May-July rainfall is most important for bobwhites on the King Ranch.
- Less than 4 inches of rainfall results in less than 3 young per adult.



Annual biological cycle of northern bobwhites in South Texas.

- Greater than 5 inches of rainfall results in at least 5 young per adult.
- Fall rains are important for producing cool-season forbs and for producing late bobwhite hatches following a dry summer.
- Spring rains are important for producing warm-season forbs.
- Bobwhite mortality increases if rainfall during August-September falls below 6.5 inches.

Release and Translocation

Translocation of wild bobwhites and release of pen-reared bobwhites have occurred for over 50 years in South Texas.

- Releasing pen-raised bobwhites is a very expensive and ineffective method of increasing bobwhite densities.
- Fifty percent of pen-raised bobwhites die within 8 days and 75-90% die after 20-25 weeks.
- Releasing pen-raised bobwhites increases the danger of disease transmission.
- Interbreeding of released pen-raised and wild bobwhites may result in genetic changes that are deleterious to the fitness and survival of the overall wild population.
- When it is necessary to quickly increase bobwhite densities, the best method may be to trap and transplant wild bobwhites.
- During the 1940's, 200 bobwhites were successfully transplanted to a study area on the King Ranch, which resulted in an increase in bobwhite coveys from 2 to 50 over a 3-year period.

<u>Bobwhite Habitat</u>	<u>Actual Density</u>
Excellent	1 bird/0.5 - 1 acre
Good	1 bird/2 - 4 acres
Fair	1 bird/5 - 6 acres
Poor	1 bird/7 - 9 acres

**A general rating of northern bobwhite habitat based upon bird densities.**

Reproduction

Bobwhite quail populations boom and bust. Understanding how they “boom” may be as important as why they “bust,” and vice versa.

- The number of bobwhite chicks produced may be directly related to insect abundance.
- To increase reproduction, the effective nesting season should be extended into August by managing herbaceous cover to provide cooler temperatures for bobwhites.
- Bobwhites use 4 basic nesting strategies, resulting in the following percentage of chicks produced by each strategy:
  - Forty-six percent of chicks produced are the result of the female’s first nesting effort.
  - Twenty percent of chicks result from the second, third, or fourth nesting effort by the female if her earlier nest(s) is (are) destroyed.
  - Six percent of chicks result from a second nesting effort by females whose first nest also was successful (double clutch).
  - Twenty-eight percent of chicks result from nests incubated by males.
- Males incubate an average of 1.0 nests, which amounts to as much as 14-28% of all nests.
- Males raise 5-35% of broods.
- The bobwhite age structure (juveniles per adult) from the fall harvest can be used to assess the previous summer’s bobwhite production.
- Age ratios of 3-4 juveniles per adult in the fall harvest indicate good bobwhite production.
- Age ratios of only 1-2 juveniles per adult indicate poor bobwhite production.
- Reproductive facts:
  - One egg is laid per day.
  - Clutch size varies from 12-15 eggs.
  - Incubation takes 23 days.
  - All eggs hatch within 1-2 hours, so chicks can leave the nest at the same time.

Surveys

Estimating bobwhite populations is inaccurate, expensive, and time-consuming. New, less expensive techniques are needed for reliable estimates.

- Surveys are useful to determine the trend in the bobwhite population from year-to-year.



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**Management should strive to carry over at least 1 bobwhite per 3-4 acres for next year's brood stock.**

- Surveys also can be used to establish the fall harvest quota.
- Line transects are the best current method available to survey bobwhites in South Texas:
  - Four permanent 1-mile-long transects should be established for every 640 acres.
  - Each transect should be walked a minimum of 3 times each survey season.
- Helicopter census methods for bobwhites show promise but need additional research.
- Drive counts, whistle counts, morning covey call counts, and capture-removal census techniques are additional survey methods.

### Summary

Over the past 50 years, we have gained valuable information about the ecology and management of northern bobwhites in South Texas, particularly from the pioneering work of Valgene Lehmann and Fred Guthery. Yet, there is still much to be learned about this gamebird. During the past decade, researchers at the Caesar Kleberg Wildlife Research Institute have taken the lead in studying bobwhites in South Texas. Today, they are continuing quail research using the latest technologies, such as radio telemetry and Geographic Information Systems, to provide essential information needed by land managers and biologists. Only through new discoveries will we learn to appreciate, manage, and conserve northern bobwhites in this harsh region we fondly call "The Wild Horse Desert."

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Kingsville, Texas 78363-8202**

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Editor: Alan M. Fedynich, Ph.D.



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U.S. Postage Paid  
Kingsville, TX 78363  
Permit #172