



Chapter 3

HABITS

REPRODUCTIVE ECOLOGY

Breeding Season

During winter, bobwhites live in a covey, a group usually composed of 12 to 18 individuals. The covey moves and feeds together on the ground during the day, roosts on the ground in a tight circle to conserve heat a night, and functions as a unit to avoid predators. As spring approaches, the covey assembly, which serves bobwhites so well in winter, begins to weaken. Warming days bring on behavioral changes as pair-bonding begins. Males often pair with females within the covey, which at this time is composed of mostly unrelated individuals. During loafing periods, covey members are more dispersed as pairs rest away from others in the covey.

The first “bobwhite” whistle usually happens in early to mid-April in Alabama, signaling the beginning of the breeding season. Occasionally, during periods of unseasonably warm weather, male bobwhites may whistle as early as February, or even in January. Most bobwhite calling activity occurs from mid-June to mid-July at the height of nesting season when hens are near the end of incubation and their mates are left alone.

Nesting activity normally gets underway in late April, following covey break-up. Bobwhites are indeterminate nesters and will continue to nest throughout the summer as long as weather and cover conditions are suitable. Mild summers with frequent rainfall tend to be most favorable for nesting and brood rearing in Alabama. Hot and droughty conditions during breeding season are harmful to quail reproductive success. Drought is especially detrimental to quail populations when recurrent over a period of years.

By the end of August most nests have hatched. Rarely, a few nests may still be incubated as late as October and hatch in November.

Covey Dispersal and Individual Movements

Coveys typically break up in late April, when the first nests are constructed. Spring is a transitional period, and birds will rejoin to loaf and roost as a group during cold or inclement weather. In Alabama, bobwhites typically move short distances, usually less than a mile, when shifting from winter covey ranges to sum-



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In breeding season bobwhites select weedy-grassy habitats. The summer home range of adult bobwhites is 30 to 40 acres.

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mer breeding ranges. Though uncommon, spring movements greater than seven miles have been documented.¹⁸ In summer, birds are located in more open, grassy habitats compared to winter ranges, which are associated with woody and brushy protective covers. The summer home range of adult bobwhites is 30 to 40 acres.

Mating Systems

Bobwhites exhibit a variety of mating systems. During the course of a breeding season that involves continuous mortality and varied mating systems to produce young, nearly all breeding birds will be associated with more than one mate.^{6,10,12} Some pairs remain together during nesting and re-nesting attempts. Some females mate and lay a clutch that is incubated by the male. The hen may then lay and incubate another clutch alone, or mate and produce a nest with another male. Up to one-fourth of nests may be incubated solely by males.⁶ Bobwhite breeding mechanisms act to overcome high natural mortality of nests, chicks, and adults, and to cope with weather changes during breeding season.



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Nesting Behavior

Pairs begin building nests in late April. Natural herbaceous cover in open woods, fallow fields, field borders, fence rows and roadsides are common nest locations.⁵¹ Sites selected for nest construction characteristically have open, scattered growths of bunch type grasses that combine bare ground and overhead concealment. In Alabama, this ideal composition occurs in natural herbaceous plants that grew the previous summer and remain standing for the current nesting season.³⁷ A mixed stand of broomsedge, dewberry, blackberry, legumes and other broad-leafed weeds provides ideal nesting cover. Such cover types offer dead grass (broomsedge) leaves for nest material. They are tall enough, about 18 inches or more, to conceal the nest and birds. And, they afford open travel ways to and from the nest.



Bobwhite nest sites typically have a mix of bunch grasses and broadleaf weeds that offer bare ground and overhead concealment.

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Nest distribution is not uniform. Many nests may occur close together. One four-acre field in Tennessee, for example, was documented to contain 41 bobwhite nests during a single nesting season, 12 of these with eggs.¹⁴ On landscapes subjected to burning, disproportionate numbers of nests are constructed in unburned areas than in areas burned immediately preceding the nesting season.¹⁴

The male and female construct the nest of primarily dead grass material, often of broomsedge leaves. The nest may be placed in or at the base of a broomsedge clump for concealment. Pine needles are also used for nest material, especially where grass is sparse. The birds scratch and peck out a slight depression on bare ground, line it with dead grass blades, small leaves, plant stems or pine needles and often arch it over the top with dead grass, stems or needles. If nest material is scarce, as on ground just recently burned, the arched top may not be present. Late summer nests may also be more poorly constructed, without an arched top. Such nests are more exposed and vulnerable to predation.³⁷

Nest building in spring may occur over the course of a week and include construction or partial construction of nests that are never utilized. Once a nest site is chosen, the hen lays one egg



Bobwhite nests are often placed in or at the base of a broomsedge clump for concealment. Look closely for the incubating hen on the nest.

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each day until the clutch is complete. Clutches average 12 eggs.^{15,41} Incubation begins after the clutch is laid and requires 24 days. The female and male do not share incubation. Some males incubate the nest solely, or may take over incubation if the hen is killed.

Once incubation begins, the bird stays on the nest except for short periods, during which time it leaves the nest to feed. Incubating birds need an abundance of foods near the nest site. This allows them to forage nearby, quickly regain energy, and reduce their time away from the nest. Dewberries and blackberries are preferred foods during nesting season. Insects and early maturing seeds are also important foods.



From beginning of nest building to hatching requires about 50 days, with a first peak of hatching around mid-June.

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From beginning of nest building to hatching requires about 50 days, with early nests hatching in late May.³⁷ However, incubation of most nests begins in late May and results in a first peak of hatching around mid-June. Second and third hatching peaks may occur in July and August following re-nesting activity. The bobwhite range should be managed to make the most of first nesting attempts and the first hatching peak.³⁷ As summer progresses, weather becomes hotter, dryer and less favorable for nesting. Fewer birds are alive to breed, and the breeding condition of remaining birds declines.

Nesting effort varies significantly with rainfall fluctuations. In Alabama, above average July and August rainfall increases and extends nesting. Summer drought ends nesting activity prematurely.⁴¹ During very hot and dry weather hens may not attempt to nest, but shortly after summer rains that create moist, warm conditions and new plant growth, nesting activity resumes.²⁵

Most nests are not successful. Only one-third to one-half of incubated nests results in a brood.^{41,51} Of those hens alive at the beginning of breeding season, less than half hatch a nest,⁵³ a con-

About three-fourths of hens and one-fourth of males that survive the breeding season hatch a brood.

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Predators cause at least three-fourths of nest failures. The destroyed nest in the background and recovered radio of a telemetered hen indicate a mammalian predator.

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sequence of continuous breeding season mortality.⁵ Bobwhites are persistent nesters, and most hens (about three-fourths) surviving at the end of breeding season hatch a successful nest due to re-nesting.¹² In addition, male incubation of nests contributes substantially to annual production. Males incubate more than one-fourth of nests.⁶ Of those males alive at the end of breeding season, one-fourth hatch a brood.⁶

Most hens that fail on an initial nesting attempt will re-nest. Because of high nest losses, hens must initiate two or three nests to produce one that is successful.³³ Attempts to raise second broods, after successfully raising a first brood, are not uncommon. In an Alabama study, four of 16 radio-marked hens successfully hatching first broods re-nested, and two successfully hatched second broods.⁴² Although rare, third broods have been documented in early-laying hens.²⁸ Though multiple broods occur, their usual incidence makes only minor numerical difference in autumn bobwhite populations.¹⁹ Double clutches are a regular component of bobwhite reproduction, but are not necessary to replace populations during normal conditions.³⁴ Variation in the rate of second clutches could substantially affect reproduction,⁶ primarily when bobwhites are recovering from population lows.

The largest contributor to nest loss is depredation by egg eating predators. Predators account for at least three-fourths of nest failures. Nest depredations along with predation of incubating adults, both on and away from the nest, may account for 90 to 100 percent of nest losses.^{12,41} Nest predators include snakes, raccoons, opossums, skunks, armadillos, rats, weasels, squirrels, foxes, coyotes, bobcats, dogs, cats, hogs, turkeys, crows, jays and ants. The list of egg-destroying predators is so long that it becomes apparent that nest predation cannot be eliminated. However, nest predation can be moderated by habitat management and judicious control of major egg predators. Nest predation is generally highest early in the nesting season and declines as summer progresses. This is the time when cover is greater and alternative predator foods such as fruits and insects are abundant. Nest depredations are also higher during dry summers when covers are thinner and natural food production is low. The bobwhite's persistence to re-nest helps overcome high nest losses.

Adult mortality contributes substantially to nest failure. An Alabama study documented that about one-fourth of all unsuccess-

ful nests resulted from death of the incubating hen and that mortality was greatest during recesses away from the nest.⁴¹ In the study, the predation rate of adult bobwhite hens during breeding season was 60 percent and most losses were to avian predators.

Nest abandonment can result in the failure of 10 to 20 percent of nests.^{12,51} Reasons for abandonment are not always apparent, but birds are sensitive to disturbance during the laying period and will readily desert the nest.⁵¹ Human disturbance, such as mowing agricultural areas during the nesting season, causes nest desertion and destruction.³⁴ Flooding, heavy rains and extreme drought also contribute to nest abandonment.⁵¹

The total number of nests produced each season¹⁴ and number of chicks hatched³⁴ (nesting success) are the primary determinants of annual quail production and quail population fluctuations. Small differences in nesting success dramatically affect the numbers of juvenile birds in the fall population¹⁹ and may mean the difference between an increasing or a declining population.⁵¹

Hatching

A couple of days before incubation ends the chicks begin to peep and pip their shells. With its egg tooth, the heaving chick eventually cracks a small hole in the shell near the large end of the egg. Once a hole is made hatching progresses rapidly as the chick pips an arc around the large end of the shell until the area is weak enough for the chick to push the "hinged" portion of the shell free and emerge. Most of the eggs will hatch within an hour or so of the first chick's emergence. In over half the nests, all eggs hatch. On average, about 8 percent of incubated eggs do not hatch due to infertility or dead embryos.³⁴ In the warm summer air, the wet chicks dry quickly as the parent on the nest fluffs out its feathers and broods them. The active brood is led away from the nest, usually within a few hours of hatching. If a hen hatched the brood, the family may join with the cock bird waiting nearby.

Brood Rearing

The newly hatched chicks only weigh about six to seven grams each, less than a quarter of an ounce. They are alert and can move quickly to hide and "freeze" when confronted with danger while the parent(s) may perform a crippled wing act to lead an enemy away. The chicks feed at once, searching for small insects, tender leaves, berries and seeds. Most of the time during the first week is spent brooding. A parent fluffs out its feathers to cover the downy chicks and keep them from getting chilled or takes them into a shady area to escape heat. The chicks may be brooded by one or both parents. Abandoned broods and orphaned chicks are often adopted and raised by lone adults, both female and male.¹²

By the end of the first week the chicks' wings are strong enough for them to fly a few feet, and by two weeks of age they will flush when disturbed. During this time the weekly home range of broods may vary from as small as four acres up to about 15 acres in size.⁴¹ The chicks feed almost continuously. Their diet consists predominantly of insects — mostly beetles, true bugs and small grasshoppers — as well as some caterpillars, moths and spiders.^{22,51} The seeds of early maturing grasses, primarily those of panic grasses, are also taken frequently by chicks.²² The adults, particularly the hen, are feeding on the same insects, although their diet still mostly consists of soft fruits and weed and grass seeds. In summer, quail are often taking fruits and seeds directly from plants, seed pods, and seed heads, whereas in winter they are retrieving seeds fallen to the ground.⁵¹

More than half of quail chicks die within two weeks of hatching, mostly from predation.^{12,41} After two weeks of growth, chicks experience much lower mortality. By this time they are feathered enough for short flights and can better escape predators. After the

FALL AND WINTER BEHAVIOR

Covey Formation and Winter Range Selection

The covey assembly is a behavior mechanism that promotes bobwhite survival during the harsh environment of winter. Concentration of birds into a group lowers the chance of encounters with predators, and the watchful eyes of the group assist in predator detection. The close association of birds into a roosting disk conserves heat and energy during cold winter nights. In autumn, bobwhite coveys form into group sizes that are presumably optimal for fall and winter survival. Fall coveys space themselves on ranges that have accessible food sources near protective cover.

During late summer and early fall, large associations of birds may be encountered. Several adults with broods of various ages form large combination coveys of 30 or more birds. These are often encountered in field areas where weed growth is at its rank-est and large quantities of seeds are beginning to fall. As nights become chilly and the weed covers thin, the birds re-form into smaller winter coveys of 12 to 18 birds. This is the fall shuffle. Birds select locations that offer brushy security cover and woodlands for escape. This is usually near field borders and in open woods that are rank with grass, legume and other seeds.

After the fall shuffle, the covey is typically composed of a couple of adults or pairs with surviving broods and a few adults that did not successfully produce young. The average covey is 14 birds, the size of which is partially dictated by their behavior of roosting in a circle or disk, heads out, sides and tails tightly pressed together. It takes a certain number of birds to form an adequate heat-conserving roosting disk. With too few or too many birds, the roosting structure does not perform efficiently.³⁷ For this same reason, late winter coveys tend to be about the same size as fall coveys if the range is well populated and coveys are close enough to interact and join together as bird numbers decline.

Most individuals in a covey are raised within a quarter to a half mile of the winter covey range. A few birds may move longer distances during the fall transition period. Of 213 banded bobwhites in one Alabama study, 201 moved one-half mile or less, and only two moved slightly in excess of two miles during the fall.²⁴ Daily movements in winter are normally short and even more restricted during cold, rainy or windy weather. On excellent range, a covey may move only a few hundred yards throughout the course of a day, with a winter seasonal home range of less than 20 acres. In less favorable habitat, a covey may have to range over 80 acres or more during winter.

Daily Activity

On clear, still autumn mornings bobwhite coveys often whistle at dawn. Their "koi-lee" calls begin about a half hour before sunrise just after the coveys break from their roosting disks. An initial call rings out, and it is presently answered by callers from other sites until a chorus of whistling coveys are pronouncing their locations across the countryside. Then, after brief minutes, the covey calls end with daylight's rapid advance. Bobwhite coveys are somewhat territorial, and morning covey calling in autumn is believed to be a spacing behavior as the coveys settle into winter ranges. Only one to a few birds in a covey will call, and all coveys do not call each morning. Calling rates in Alabama are highest on cool, calm, fair mornings in late October and early November.

Coveys may linger at their roost sites on chilly autumn mornings if cold dew soaks the vegetation. They will be off to feed early when days are mild and dry. The birds have to feed for only short periods on fall days because grass, legume and other weed seeds are

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age of two weeks, their diet shifts to include more soft fruits, berries and grass seeds. Quail populations are highest, however briefly, in mid-summer after most nests have hatched. This population high does not last long because so many chicks die within two weeks of hatching.

At three to five weeks of age broods are capable of surviving independently of parents. Some hens abandon broods by this time and re-nest.⁴¹ By this age the broods may have ranged over more than 40 acres.⁴¹ At seven weeks of age, the young birds roost in a circle as the adults and survive rainstorms without brooding. At eight weeks hens and cocks are identifiable by the respective buff or white and black throat patch. They weigh a little more than half that of adults and are capable of strong flights of 100 yards or more. They are increasingly feeding on summer maturing grass and other seeds. At 12 weeks they are nearly mature in size and weight, and at 15 weeks their plumage is almost indistinguishable from that of adults. Fully grown birds, at least 21 weeks old, are 165 to 180 grams in weight, or about six ounces.³⁷

Out of a successful bobwhite nest of 12 eggs, about 11 eggs hatch, five chicks are alive after two weeks, and three or four chicks make it into the fall population. Based on average population dynamics, if one-third of quail chicks survive to autumn, 80 percent of the fall population will be birds produced that year, and the quail population will have doubled from spring to fall. This is good production. In less productive years, the quail population does not double itself from spring through summer.

The quail population at its autumn high may average six or more young birds per surviving adult hen in a good production year. During excessively hot and dry summers, production may be three or fewer young per hen. Of those birds that make up an autumn population, 20 percent or less will survive to the following autumn.



Coveys have one or more small activity centers associated with thicket areas. Most of the day, particularly mid-day, is spent loafing in or near plum, sumac, honeysuckle or other thicket areas, and often engaging in dust baths.

TED DEVOS

at their greatest abundance. Coveys will feed in open woods and field borders lush with plants dropping their seed. In some years when pine mast is abundant they will use it heavily. As seed abundance declines, acorns may become important, especially on marginal range, and the birds will move into thicker woods.

Coveys have one or more small activity centers associated with thicket areas within their home range.⁵⁸ Most of the day, particularly mid-day, is spent loafing in or near plum, sumac, honeysuckle or other thicket areas, and often engaging in dust baths. In mid to late afternoon the coveys move to feed again, typically where protective or concealing covers are nearby. The birds feed more heavily in the afternoon than in morning, taking in energy reserves to power them through a chilly night.

When threatened, the birds prefer to stay on the ground. They may freeze and remain motionless for minutes to escape detection. If pressed, they will run considerable distances, sometimes several hundred yards. When necessary, the covey launches into clamorous flight, usually heading for some familiar retreat.

At dusk the coveys go to roost in open broomsedge or in scattered honeysuckle or briars. Usually they move to the location on foot, but may fly to roost to elude ground predators. They may roost in the same vicinity several nights in a row. Roost sites are often on upland locations, in part because elevated sites are warmer at night than low elevations, a result of temperature inver-

sions. In extreme winter weather coveys seek thermal protection of dense honeysuckle or thickets for roosting, and on cold, raw days may form day roosts.

During the course of fall and winter, roosting locations will change according to weather, and winter ranges will shift with available foods, but the daily routine remains much the same. In late winter when most seeds are gone and food reserves are low, the birds may have to wander farther to feed. Fortunately, days are becoming milder, and the birds can afford longer movements without expending too much energy. Cover will be much thinner following winter rains and cold. The birds that survive to this point will be savvy and likely to run or flush at a distance when disturbed or threatened. During the late winter to early spring transition, coveys are generally moving to more open habitats than they utilized in winter. This is in preparation for occupying spring breeding ranges when the coveys disintegrate in late April.

On excellent quail range where winter mortality is low, 60 percent or more of the birds present in November will be alive to enter breeding season.^{32,45} Winter survival could be less than 20 percent in areas of poor habitat, extreme weather, heavy predation, or heavy hunting.^{9,16} High winter survival means that more birds enter the breeding season with the potential to produce more nests, more broods, and a high fall population.