



# Chapter 5

## HABITAT MANAGEMENT



### A MANAGEMENT APPROACH

The Alabama landscape can be differentiated into two broad cover types: fields and forests. Of the open lands, 4 million acres are agricultural croplands,<sup>38</sup> and about 5 million acres are in pasture, hay, forage crops and other grassland.<sup>3</sup> Forest lands occupy about 23 million acres; about 17 million acres are held by non-industrial private owners, 5 million acres are owned by forest industry and other corporations, and 1 million acres are owned by government.<sup>21</sup> On a landscape level, very little of Alabama's 33 million acres currently affords adequate habitat for quail.

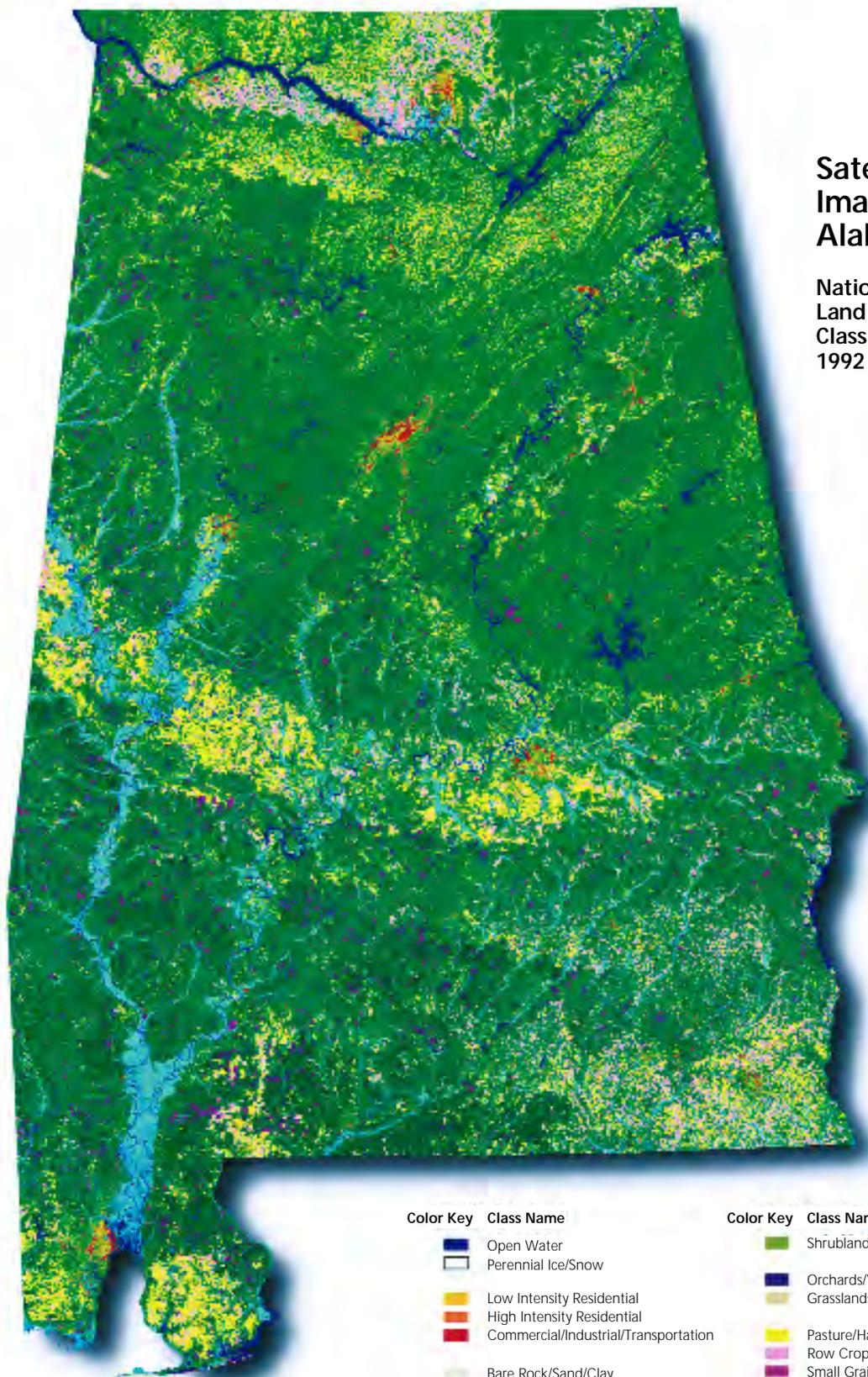
### Giving Bobwhites the Edge

The current arrangement of cover types in the landscape presents a likely zone in which to begin quail habitat developments. The border areas of field and forest make up an extensive zone across the landscape. This, for the most part, is where bobwhites are still holding on in remnants of available cover. However, the ubiquitous sharp change from field to dense woodland offers few of the habitat types required by quail. Numbers are chronically low in these environments because the birds have no suitable area in which to expand, mostly due to inadequate reproductive habitat.



*Most of the current Alabama landscape affords poor habitat for quail.*  
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*Naturally vegetated field borders have been demonstrated to increase bobwhite breeding activity and populations in agricultural lands. This is an initial step toward increasing quail numbers.*  
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## Satellite Imagery of Alabama

National Land Cover Dataset Classification 1992

Color Key	Class Name	Color Key	Class Name
	Open Water		Shrubland
	Perennial Ice/Snow		Orchards/Vinyards
	Low Intensity Residential		Grasslands/Herbaceous
	High Intensity Residential		Pasture/Hay
	Commercial/Industrial/Transportation		Row Crops
	Bare Rock/Sand/Clay		Small Grains
	Quarries/Strip Mines/Gravel Pits		Fallow
	Transitional		Urban Recreational Grasses
	Deciduous Forest		Woody Wetlands
	Evergreen Forest		Emergent Herbaceous Wetlands
	Mixed Forest		



## Quail Habitat A Management Approach

### Forests

1. Thin Forest Edge
2. Thin Along Forest Roads
3. Create Forest Openings
4. Thin Forest Stands

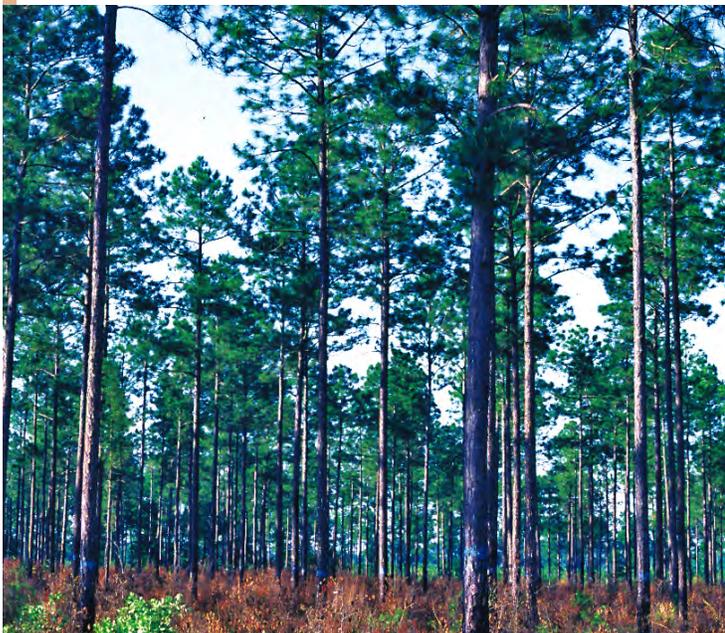
### Fields

1. Create Field Border Along Forest Edge
2. Extend Field Borders Along Field Roads, Ditch Banks, and Fence Rows
3. Establish Hedge Rows, Tree Corridors
4. Create Fallow Fields

## Field Borders

Development of naturally vegetated field borders has been demonstrated to increase bobwhite breeding activity and popula-

tions in agricultural lands. This is an initial step toward increasing quail numbers. Habitat can be extended by creating additional natural weed-grass covers along field roads, ditch banks, and fence



*Thinning a forest to open the canopy and stimulate herbaceous groundcover allows the quail population to expand.*

TED DEVOS



*Natural weed-grass field borders are valuable wildlife habitat in farm landscapes, and benefit bobwhites as well as numerous other birds and animals that use similar plant associations for raising young in summer and/or feeding in winter.* STAN STEWART

rows. These areas provide quality summer range that will attract breeding birds following covey dispersal. Rank weed growth in field borders provides adequate security cover for the birds during summer in these mostly open habitats.

### Shrub Covers and Tree Corridors

Weed structure is not durable enough to remain intact through winter and is not adequate protection for winter coveys. Woody cover is required for this. Protective shrub covers installed at intervals within field borders enhance the value of the zones to bobwhites.

Tree corridors established across open fields can create protective habitat and locations for holding winter coveys. Tree corridors should have naturally vegetated field borders developed along each side and protective shrub covers installed at intervals within the field borders. This arrangement supplies year-round habitat for bobwhites in open field environments where quail would not otherwise exist.

### Fallow Fields

Tree corridors break large fields into smaller fields. With small fields, a pattern of rotational cropping, seasonal disking, and fallow fields can be instituted to further increase reproductive habitat. This landscape arrangement approximates the "patch

farming" regime once so productive of bobwhites.

### Thinned Forest Corridors

Forests can also be improved for quail, beginning with thinning operations along the forest edge. In conjunction with established field borders, thinning creates more nesting habitat and winter range. Thinning can extend into the forest along road systems, creating open forest corridors of quail habitat.

### Permanent Forest Openings

Bobwhites require open lands maintained in natural weeds and grasses, especially during the spring and summer breeding season. A distribution of forest openings should be created and managed to supply habitat for bobwhites in forest landscapes. Openings are most beneficial when adjacent to or surrounded by open canopy forest. Forest openings for quail do not necessarily require planted food crops. Greatest bobwhite benefits are achieved if forest openings are maintained by seasonal disking to encourage natural herbaceous plants that quail use for cover and food.

### Open Forest Stands

Thinning and timber harvesting operations in a forest allow the quail population to expand. If all stands are thinned to create

## A MANAGEMENT UNIT

Bobwhites have several critical habitat requirements that must be met for the birds to survive and for populations to flourish. The critical components of quail habitat structure include nesting cover, brood habitat, protective cover and feeding areas. The nature and composition of these habitat types are described in *Chapter 4, Habitat Requirements*.

In any location chosen for quail management, a complete habitat unit that includes all of these necessary elements must be developed for quail to increase. Concentration on a single element will not bring success. For example, efforts to increase quail numbers often fail because practitioners tend to focus on food provision. Other less understood habitat requirements are not addressed, and no quail population improvement follows the management practice. Subsequently, the practitioner gives up on habitat improvement and quickly concludes that some other factor, such as predators or a mysterious environmental phenomenon, has rendered quail increase impossible. A single element of quail habitat, no matter how good, cannot alone produce quail.

The goal of quail habitat management is to bring all of the essentials for survival and reproduction into close association as a complete habitat unit. This reduces the land area necessary to support breeding birds and winter coveys, and increases the number of birds the land can sustain. Frequently, it is not the quantity of any one habitat component that limits wildlife numbers, but the spatial relationship to other requirements. This is especially true of animals of low mobility like bobwhites. Properly arranging habitat components in close proximity enhances survival. A habitat unit includes nesting cover, brood habitat, protective cover, and feeding areas.

In this sense, management is a task of arranging habitat requirements on the landscape in units that produce and support a covey of quail, then duplicating these across the landscape to increase quail numbers. The winter home range of a covey of quail may be 20 to 30 acres when all winter feeding and protective cover requirements are available to them. This is a workable habitat unit size.



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## A MANAGEMENT SEQUENCE

A knowledge of the seasonal habitat requirements of bobwhites suggests a sequence of management actions for restoring and increasing quail populations.

### Produce

Assuming a breeding population is present, the first and most important management action is to produce more birds in the landscape. This requires nesting cover. Since 80 percent or more of a quail population dies annually, substantial annual nest production is critical to restore the population. The composition of nesting cover is described in *Chapter 4, Habitat Requirements*.

### Raise

After hatching, chicks need the best chance of survival. High quality brood habitat is needed to raise chicks. Brood habitat is profuse with annual herbaceous plants that support high insect populations, the primary food for growing chicks. Ideal brood range includes fields of ragweed and partridge pea, and open, burned pine woodlands lush with new herbaceous plant growth.

### Protect

Because predation pressure on quail is always high, escape cover and travel zones are needed to protect birds from enemies. Quail need a secure zone to travel in and feed nearby, a concealed area to loaf, and a place to fly into to escape a threat. A dispersion of shrub growth, thickets of plum, Japanese honeysuckle, hardwood sprouts, and tree covers offer protection from predators and extreme weather.

### Feed

Finally, food is a continual requirement, so birds must be supplied with food resources and areas in which to feed. The orderly sequence to develop nesting habitat, brood habitat, and protective covers inherently enhances natural food production as part of the system. Many cover plants produce food and food plants offer cover. Often, natural food sources are not obvious because they are intermingled with cover. This however, is the desired condition because birds are feeding in their normal covers in relative security. Supplemental feeding, whether in the form of plantings or direct feeding, should follow the same principle of supplying food in or near cover.

an open canopy forest, all of the forestland can become suitable quail range. The culmination of this approach is a quail plantation, but landowners can choose any management intensity based on how much of the landscape is desired as quail range.

## MANAGEMENT PRACTICES FOR AGRICULTURAL LAND

### Field Border Systems

Stoddard recommended that cultivation “should be held back a few rods” from hedgerows and thickets on agricultural lands because such border covers are productive and favored feeding grounds of bobwhites.<sup>51</sup> Rosene advocated the development of 15 to 60 foot wide grassy-weedy transition cover bands along borders of agricultural fields to provide nesting habitat, insects for chicks and adults in summer, and seeds in winter.<sup>37</sup>

Recent research in North Carolina and Virginia demonstrated that farms with 15-foot wide field borders of natural vegetation such as broomsedge, goldenrod, ragweed and blackberry had almost twice the number of fall coveys after one year of field border establishment than very similar farms without the field border treatments.<sup>55</sup>

Utilization of farm field edges for bobwhite habitat development is desirable for several reasons. Bobwhites naturally travel in this zone, feeding and raising young along field edges, and finding security in adjacent woodland or brushy hedgerows. Natural weed-grass field borders are valuable wildlife habitat in farm landscapes, and benefit bobwhites as well as numerous other birds and animals that use similar plant associations for raising young in summer and/or feeding in winter.

Field borders and filter strips of natural vegetation trap sediments, pesticides and nutrients contained in agricultural field runoff. Soil bacteria associated with the plants' root systems nitrify excess nitrogen fertilizers.<sup>20</sup> Field borders and filter strips are effective structures that minimize agricultural pollution. Crop monitoring for precision agriculture shows that field borders adja-

cent to tree lines are usually low crop yield zones where farming is not profitable. The zones are much more useful for achieving soil protection and water quality benefits as part of overall farm conservation efforts than farming them for minimal crop yields.

The typical sharp change from crop field to dense woodland offers little of what quail or other wildlife need. The vital natural weeds and grasses they depend on are absent or diminished in this environment. The poor habitat picture may be further complicated by the presence of sod-forming tame grasses that compete with native plants. Reproductive covers are severely limited, so bobwhites, if present, persist in chronically low numbers. The most important component that field border systems create in this landscape is additional reproductive habitat, a critical requirement for populations to expand. In North Carolina, farm fields with filter strips that occupied less than 10 percent of the area contained 44 incubated bobwhite nests, and comparable fields without filter strips contained nine incubated nests, a more than four-fold difference.<sup>30</sup>

Field border establishment may require nothing more than excluding the zone from cropping, allowing it to become fallow ground that grows natural weeds and grasses. Initial disking of the site during the dormant season will encourage the growth of plants most beneficial to bobwhites. Remedial herbicide treatment will be necessary if bermuda grass, bahia grass or fescue are present.

Field borders as narrow as 15 feet offer some benefits, but wider borders of 30 to 60 feet provide more usable quail habitat. A 30-foot wide field border around a 40-acre square field occupies a little more than 3 1/2 acres of land. That is not a lot of land to remove from cropping systems, especially since it is the least productive land for crops. While not as profitable for crops, it can be a very productive habitat zone for quail.

Bobwhites will begin using border covers for nesting during the first growing season of establishment, but two or three years of plant growth may be needed for the site to develop ideal nesting habitat that contains broomsedge. After three or four seasons of growth, habitat quality begins a rapid decline as plant growth changes, becomes too rank, and bare ground diminishes. Many of the annual plants and the bare ground that quail require will be

disappearing by this time. Perennial plants such as goldenrods and broomsedge become dominant, and trees and shrubs begin to invade. Routine management will be needed to maintain an appropriate mix of plant types.

Periodic ground disturbance is essential to expose bare

## CRP CP33 HABITAT BUFFERS FOR UPLAND BIRDS

The U.S. Department of Agriculture announced its Northern Bobwhite Quail Habitat Initiative, effective October 1, 2004 through December 31, 2007, to restore bobwhite quail habitat to farm landscapes in 35 states across the bobwhite's range. This initiative is implemented through the USDA Farm Service Agency's highly popular Conservation Reserve Program with a new CRP practice, CP33 Habitat Buffers for Upland Birds. The practice will create critical nesting and brood-rearing cover for bobwhites and other upland birds by installing habitat buffers of native grasses and weeds along agricultural field borders. The habitat buffers will also reduce soil erosion, protect water quality and enhance overall farm conservation.

- Program sign-up at local Farm Service Agency offices will run on a continuous basis, meaning eligible land may be enrolled at any time.
- To be eligible for enrollment, land must have been cropped at least four years during 1996 to 2001.
- Contracts will last for ten years during which time landowners will receive annual rental payments of 120 percent of the rental rate for comparable land and a \$5 per acre per year maintenance payment.
- Landowners also receive an up-front Signing Incentive Payment of \$100 per acre, and 50 percent cost-share reimbursement for practice establishment plus an additional 40 percent Practice Incentive Payment for establishment costs.
- Habitat buffers must be established in natural volunteer herbaceous vegetation suitable for bobwhites or appropriate buffer vegetation may be planted if needed. Buffer species may include native warm season grasses, legumes, wildflowers, forbs, and limited shrub plantings.
- Buffers must be a minimum width of 30 feet and may be up to 120 feet wide.
- Buffer vegetation must be managed by:
  - Fall-winter disking of one-third of the buffer area each year in a prescribed rotational pattern.
  - Control of exotic grasses like tall fescue, Bermuda grass and bahia grass, and undesirable woody plants with herbicides as necessary.
  - Exclusion of buffer from use as an area for turn rows, roads, or equipment and crop storage.
  - Protection of habitat buffer from mowing, disking or other disturbance during the nesting season.



*Field borders may also be established with planted native grasses.*

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ground and encourage production of annual seed-bearing plants on portions of the field borders. The majority of the border covers, however, should remain standing each year so that most of the zones offers suitable nesting habitat.

To maintain desired cover types and amounts, field borders should be managed with a rotational system of late winter or early spring disking. Disk one-fourth to one-third of an established field border system each year in convenient segments. A segment, for example, may be one side of a field. Rotate disking to an adjacent segment each following year. The rotational disking regime will perpetually maintain different stages and types of herbaceous plant growth that quail require. Without this routine management, field borders will lose their value for quail.

Annual plantings such as browntop millet and kobe lespedeza can be made in portions of recently disked field borders. Farm



*Field border habitats are enhanced with the addition of shrub cover patches such as Chickasaw plums that provide loafing and protective cover for quail.*

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## Field Border Management

1. Disk entire field border zone in fall/winter of year 0.
2. Plant wild (chickasaw) plum patches every 300'. Patches should be at least 30' x 30'. Protect from any disturbance.
3. Field border vegetation may be enhanced by planting 7-10 pounds per acre common ragweed or a mix of 7-10 pounds per acre ragweed and 5 pounds per acre partridge pea in late winter-early spring.
4. Manage herbaceous habitat and control undesired woody vegetation by disking 300' segments in rotation each fall/winter.
5. Control tame grasses (tall fescue, Bermuda grass, Bahia grass, Johnson grass) throughout field border with application of approved herbicide according to label.

machinery should not disturb field border covers except for scheduled management. Field borders should not be used as turn rows or disturbed any time during the nesting season.

The installation of natural weed-grass field border systems around fields, along ditches, beside field roads, along fencerows, hedgerows and tree lines will increase quail production on farm lands because it adds needed reproductive habitat in landscapes where little or none currently exists.

### Protective Shrub Covers

Field border habitats are enhanced with the addition of shrub cover patches that provide loafing and protective cover for quail. Winter coveys will often establish a headquarters area and loafing site around one or more shrub patches.

Chickasaw plum, *Prunus angustifolia*, provides ideal protective cover for quail. Plum seedlings can be planted within field borders to establish protective cover patches. Patches should be at least 30 feet across. Space plum seedlings four feet apart at planting. Patches should be spaced about every 100 to 200 yards to be easily accessible to quail. Existing plum growth should be identified and protected from disturbance. Plum is very susceptible to fire and precautions should be taken to exclude fire with disked lanes around patches.

Shrub patches in field borders serve other useful functions. Once established, they form a permanent visible structure that demarcates the width of a field border system. It is easy for farm equipment operators to encroach on a stand of weeds. The permanent shrub patches help set the zone apart from farm operations. The established shrub patches also physically segment the field border systems for rotational disking patterns.



The establishment of tree corridors through agricultural fields creates quail habitat where none would otherwise exist. Tree corridors such as these young planted pines and associated field borders supply bobwhites with suitable year round habitat and increase the number of winter coveys in agricultural landscapes.

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### Tree Corridors

Natural grasses and weeds supply excellent summer range but generally do not afford enough protective cover for winter covey locations. More substantial plant structures are required in the

form of shrub covers and tree corridors. When coveys form in the fall, they will naturally select winter ranges associated with woody protective cover.

The establishment of tree corridors through large agricultural fields creates habitat for winter coveys across areas where none would otherwise exist. Tree corridors can provide a secure zone for birds to travel along and escape into. Corridors at least 100 feet wide provide better habitat and management opportunities than narrower strips that may not offer sufficient cover to hold winter coveys. The corridors should connect with existing woodland, except to allow for vehicle and equipment passage. Field borders with protective shrub patches should be placed along each side of the corridor.

For maximum bobwhite benefit, tree corridors should be spaced 100 to 200 yards apart and follow land contours. High populations of bobwhites can be expected where about half the land area is in fields and half is in woods or brush.<sup>37</sup> Tree corridors 100 yards wide separated by 100-yard wide fields would create this habitat composition for quail, as well as provide substantial land in timber production.

Pine tree plantings develop woody corridors quickly. They must be planted in a manner that permits ground and shrub covers to also establish and continue to grow in the corridor. Ten or more rows of trees spaced 10 feet apart, with individual trees planted eight or 10 feet apart in the row, will create cover suitable for winter coveys. This spacing is open enough to prolong other plant growth as the trees become dominant and still allow self-pruning of loblolly and slash pine timber. Establishing a relatively wide corridor also contributes to useful timber production from the zone, with more interior rows of better formed trees.

Longleaf pine is the most desirable pine species to plant for bobwhites, where feasible. Its small crown size allows more sunlight and weed growth within the tree corridor. Other pine species require early thinning to maintain an open canopy. Longleaf can be planted on wider spacings than other pines and still develop good tree form, due to its fewer limbs. Longleaf plantings on 12-foot by 12-foot spacings (302 trees per acre) create open stand conditions favorable to quail and other wildlife. Additionally, longleaf is very tolerant of fire except when emerging from the grass stage, and this permits early and frequent fire management of ground covers.



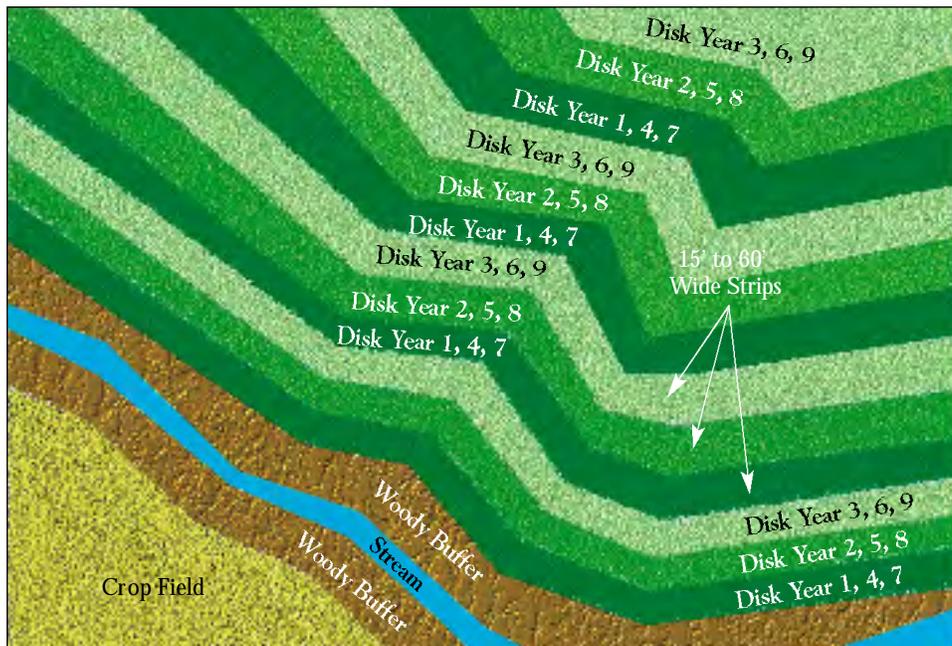
*Whole fields or substantial portions of them in natural grasses and weeds provide more summer range and better quality reproductive habitat than field borders only.*

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Tree canopies must remain open for optimal bobwhite use. Canopy closure will shade out needed food and cover plants. Prescribed burning is also necessary to maintain appropriate cover conditions. With correct development and management, tree corridors and associated field borders with protective shrub covers will supply bobwhites with suitable year round habitat and increase the number of winter coveys.

### Fallow Fields

Dividing large agricultural fields into a series of small fields introduces an opportunity for a system of rotational cropping and temporarily idle lands. A system such as this could approximate the patch farming regimen that formerly produced high quail populations. Whole fields or substantial portions of them in natural grasses and weeds provide more summer range and better quality reproductive habitat than field borders only. For maximum bob-



### Fallow Field Management

1. Disk a strip 15'-60' wide through fallow herbaceous vegetation in fall/winter in year 1, following land contour.
2. Leave standing vegetation twice the width of the disked strip.
- 3 Repeat disked /undisked pattern across field.
4. Disk new strips adjacent to old strips in subsequent years.
5. Control tame grasses (tall fescue, Bermuda grass, Bahia grass, Johnson grass) throughout the field with application of approved herbicide according to label.

white habitat development, given fields should be cropped about once every three years, with other fields in varied stages of natural weed-grass cover. A pattern of cropped and idle fields can be designed based on this rotation period. An alternative to this system is rotational strip cropping or strip disking within selected fields.

Idle field utilization by nesting bobwhites is enhanced with the inclusion of strip disking because bobwhites prefer to nest along edges near bare ground.<sup>36</sup> Periodic disturbance of idle fields is required to maintain appropriate plant composition. Strip disking can be performed any time from fall to early spring to encourage desired plants and not interfere with nesting. Disk strips 15 to 60 feet wide through idle fields. Separate them by bands of standing cover that are two or three times the width of the disked strip. In subsequent years, disk new strips adjacent to strips that were disked the previous year. Such a pattern of rotational strip disking will perpetually maintain idle fields in a plant composition that is ideal for bobwhite reproduction.

## MANAGEMENT PRACTICES FOR PASTURE LAND

Improved pastures and hay fields of tame grasses such as tall fescue, Bermuda grass and bahia grass provide extremely poor habitat for quail because they rarely exhibit the physical plant structure and composition required for quail survival at any season of the year. Tall cover with bare ground underneath is lacking, and food producing plants are eliminated. To support quail in appreciable numbers, these landscapes require eradication of tame grasses, conversion to more quail friendly land use, and habitat management on those areas where quail are desired.

Alternative pasture management that includes native warm season forage grasses in the grazing system offers potential habitat for bobwhites. Eastern gammagrass, switchgrass, indiagrass, side-oats grama, big bluestem, and little bluestem are examples of warm season grasses with a widespread natural range that includes Alabama. They are found naturally in prairie and savanna landscapes. Native grasses produce excellent cattle forage and are still the primary grazing plants of the Great Plains rangelands. Their current natural occurrence in Alabama and the Southeast is greatly reduced due to past overgrazing, introduction of tame grasses,



*Pasture management that includes native warm season forage grasses offers potential habitat for bobwhites.*

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agricultural development and fire protection. Native warm season grasses can still be seen in varying amounts in open woodlands with a long fire history, such as quail plantations, and along roadsides that are not dominated by tame grasses.

Native grass pastures that are rotationally grazed or properly hayed contain plant cover tall enough for bobwhites to use for nesting.<sup>7</sup> The grasses generally grow in clumps with bare ground between, a plant structure that is attractive to quail. Specialized equipment and techniques are necessary for establishment of some native warm season grasses. Native grasses cannot withstand overgrazing because removal of too much leaf growth weakens the root systems. Landowners should closely follow recommended planting and cultural practices to grow native grasses successfully.

Grazing systems that include legumes, especially kobe and common lespedeza, also provide habitat for bobwhites. Kobe and common lespedeza produce insects for broods during summer and seed for winter food.



*Improved pastures and hay fields of tame grasses such as tall fescue, Bermuda grass and bahia grass provide extremely poor habitat for quail.*

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## CONTROLLING PASTURE GRASSES WITH HERBICIDES

### TALL FESCUE

- 2 Quarts/Acre Roundup Ultra (Glyphosate)
- 6.4 Ounces Nonionic Surfactant
- 10 Gallons/Acre Water

Mow or burn fescue in late winter for spring kill or late summer for fall kill. Apply herbicide uniformly with ground spray equipment when plants are vigorously growing and fescue leaves are 8-12 inches tall. Applications made at time of seed-head production will be less effective. Do not mow or disturb site for at least one week after treatment. Follow-up with periodic spot treatments as needed.

### BERMUDA GRASS

- 18-24 Ounces/Acre Arsenal Applicators Concentrate (Imazapyr)
- 3.2 Ounces Nonionic Surfactant
- 10 Gallons/Acre Water

Mow or burn Bermuda grass prior to treatment to insure herbicide contact with actively growing plants. Apply herbicide uniformly with ground spray equipment when plants are vigorously growing and before seedhead production occurs. For best effect do not disturb the site during the remainder of growing season. Follow-up with periodic spot treatments as needed. Arsenal is foliar and soil active and may kill nearby trees or shrubs by root absorption. Residual soil activity may continue for several months.

### BAHIAGRASS

- 0.33-0.50 Ounces/Acre Escort XP (Metsulfuron Methyl)
- 3.2 Ounces Nonionic Surfactant
- 10 Gallons/Acre Water

Mow bahiagrass prior to treatment to stimulate new plant growth. Apply herbicide uniformly with ground spray equipment when plants are vigorously growing and before seedhead production occurs. For best effect do not disturb the site during the remainder of growing season. Follow-up with periodic spot treatments as needed. Escort is foliar and soil active and may kill nearby trees or shrubs by root absorption. Residual soil activity may continue for several months.

### JOHNSON GRASS

- 1.33 Ounces/Acre Outrider (Sulfosulfuron)
- 6.4 Ounces Nonionic Surfactant
- 10 Gallons/Acre Water

Mow Johnson grass at least two weeks prior to treatment to stimulate new plant growth. Apply herbicide uniformly with ground spray equipment when plants are vigorously growing and before seedhead production occurs. Do not mow or disturb site for at least two weeks after treatment. Follow up with periodic spot treatments as needed. Outrider is a selective herbicide that may be used over the top of native warm season grasses. Outrider is foliar and soil active, although soil activity lasts for only about two weeks.

In addition to suitable grasses and other herbaceous plants, pastures require adequate protective cover to support bobwhites year round, especially during winter. Open pastures require islands of woody cover, at least one-fourth acre in size, protected from grazing,<sup>37</sup> or corridors of shrubby escape cover.

## MANAGEMENT PRACTICES FOR FOREST LAND

### Forest Conditions That Favor Quail

The general structure of productive quail habitat in southeastern forest consists of open pine woodland with a distribution of small fields and adequate dispersion of thicket cover through-



*Productive quail habitat in southeastern forest consists of open woodland with native grass-weed groundcovers.*

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*To support an abundance of quail, forests must be open enough so that about half of the ground area receives full sunlight at mid-day. This allows the growth of grasses and weeds that quail require for reproduction and food.*

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*Pine Forest with Basal Area of 40 or less permits an optimal environment for quail*  
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out the habitat. The open woodland and field edges should be managed for nesting habitat and winter range. The small fields can be managed primarily for brood habitat.

Although most forestland in Alabama is poor quail habitat, pine forests can be excellent habitat when managed with period-



*Pine Forest with Basal Area of 60 permits a favorable environment for quail*  
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*Pine Forest with Basal Area of 80 or greater affords a poor environment for quail*  
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### BASAL AREA AND TREES PER ACRE BY DIAMETER AT BREAST HEIGHT

DBH (Inches )	BASAL AREA (Square Feet)		
	40	60	80
	TREES PER ACRE		
5	293	440	587
6	204	306	408
7	150	224	299
8	115	172	229
9	91	136	181
10	73	110	147
11	61	91	121
12	51	76	102
13	43	65	97
14	37	56	75
15	33	49	65
16	29	43	57
17	25	38	51
18	23	34	45
19	20	30	41
20	18	28	37

Pine Forest with BA of 40 or less permits an optimal environment for quail  
 Pine Forest with BA of 60 permits a favorable environment for quail  
 Pine Forest with BA of 80 or greater affords a poor environment for quail

ic thinnings and prescribed burning. The forest must have an open canopy to support quail. The tree canopy should be open enough to allow about half of the ground area to receive full sunlight at mid-day. This will allow the growth of grasses and weeds that quail require for reproduction and food.

Tree covers compete with herbaceous ground covers for sunlight, water and nutrients, so tree stocking must be reduced for desired quail food and cover plants to grow. In silvicultural terms, the stand should be managed at a basal area of 40 to 60 square feet per acre or less, depending on pine species. (Basal area is the cumulative cross sectional area of each tree within a given land area; the trees are measured at breast height, 4.5 feet above ground). For example, a stand of 14-inch diameter trees managed for optimal quail habitat would have no more than 37 to 56 trees per acre. The same stand fully stocked for timber production would have 75 to 85 trees per acre.

Longleaf pine has a small crown with fewer limbs compared to other pine species. For this reason, it is well suited to quail management in forests. Stands of longleaf can be managed at the upper



*Longleaf pine forest is well suited to quail management because stands can be managed with open canopies and frequent fire.*

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recommended stocking, about 60 basal area, and still maintain the open canopy necessary for bobwhites. Longleaf is also very tolerant of the regular burning required in quail management. Where applicable, and in its range, longleaf is the preferred timber tree when quail are also managed. Because loblolly and shortleaf pines have large spreading crowns, they must be carried at lower stockings of about 40 basal area or less to maintain open canopies. Slash pine crowns are intermediate in size between longleaf and loblolly, and stand densities can be managed accordingly.

Bobwhite numbers are generally very low in hardwood forests because the heavy canopy typical of hardwood stands shades out ground covers required by quail. For these landscapes to support quail, the hardwoods must be thinned and managed as a hardwood savanna or converted to open pine forest managed for quail.

### Thinned Forest Corridors

Forest landowners may not want to give up optimal timber production to create quail habitat in all stands. When thinnings are made, selected locations can be thinned to the stand conditions suitable for quail. A thinned forest zone as narrow as 100 feet



*When commercial thinning operations begin, loblolly plantations managed for quail should be thinned to about 100-150 trees per acre.*

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wide can create usable quail habitat. Thinning forest edges that are adjacent to established field borders will increase available nesting habitat and winter covey ranges. Thinnings along forest road systems create open forest corridors of quail habitat in woodland. To be effective, enough trees must be removed so that the thinned zones retain open canopies. Routine prescribed burning and other quail habitat management applicable to open forest must be performed.

### Permanent Forest Openings

A distribution of forest openings created in connection with open woodland areas can provide year-round quail habitat that includes nesting cover, brood rearing areas, feeding areas and winter covey ranges. With appropriate management, bobwhites will nest in field borders and open woods near fields, raise broods in the fields and open woodland, and establish winter covey ranges in the same general landscape.

Ideally, 20 to 40 percent of the quail range should be in three- to five-acre fields that are evenly distributed over the forest landscape. A field 100 yards wide and 200 yards long will occupy about 4 1/8 acres. Small fields of this size distributed at a rate of one per



*Twenty to forty percent of the quail range should be in three to five acre fields that are evenly distributed over the forest landscape. Fields located in open woodland should be managed primarily for brood habitat.*

STAN STEWART

20 acres will occupy about 20 percent of the land and can create many new quail ranges in forest land.

Fields located in open woodland should be managed primarily for brood habitat. Ideal quail brood habitat is composed of annual weeds, plants that grow one year and come back from seed. The plants must be attended to every year to keep them coming back. A mixture of common ragweed and partridge pea provides excellent habitat for quail broods. Annual dormant season (October to March) disking promotes and maintains a summer ground cover of these desired annual plants that offer protective cover and attract insects for quail broods.

When disking, leave a 30-foot or wider band of vegetation standing along a border of the field to provide some cover for quail during spring and early summer while the disked areas are re-growing sufficient cover. In spring, fruiting of dewberries and blackberries, seeding of early maturing grasses and weeds, and insect pro-



*A mixture of common ragweed and partridge pea provides excellent habitat for quail broods. Ragweed volunteers well on most sites disturbed by fall-winter disking, and seed can also be planted. Disk and fertilize fields, then broadcast ten pounds per acre common ragweed seed and lightly cover in late winter or spring. Disk annually in fall-winter to maintain stand.*

STAN STEWART



duction will occur in the border cover. All are foods that will be utilized by nesting hens and early broods. Early nesting activity may also occur in this band. The cover band should alternate to the opposite field border the following year to maintain suitable cover composition.

Delaying the disking of some fields or portions of fields to late winter allows quail coveys to utilize the covers for feeding and security as part of their fall and winter range. Quail eat ragweed seeds in the fall, and the hard seeds of partridge pea are used later in winter when many other seeds are gone. Delayed disking, however, also means that new cover growth is not as advanced in spring and summer when hens are searching for brood habitat. A

combination of fall disking and late winter disking provides the most diverse benefits in annual weed fields.

Common ragweed volunteers well on most disturbed sites, but can be planted to rapidly develop a field for brood habitat. Fertilization of ragweed fields during early spring, especially on poorer soils, will stimulate more rapid weed growth and provide well-developed, secure cover for early hatching broods.

Portions of fall disked fields can be planted in winter grains such as wheat, oats, and rye for deer forage crops if the planting rates are reduced by one-third. Conversely, deer forage plots can provide brood habitat for quail if allowed to grow up in weed covers during summer.

Fields located in dense woodlands have reduced value to quail. Essentially, the fields are the only usable habitat, especially as reproductive range. Such fields can be managed with strip disking to supply nesting habitat, brood range and some natural food production. Quail production may be poor in these small and isolated habitats.



*Hardwood brush quickly dominates open forest and crowds out herbaceous plants that support quail. Frequent prescribed fire is the best tool to control dense brush. This stand was not burned for four years.*

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### Open Canopy Forest

Open canopy forest can supply bobwhites with nesting habitat, brood range and winter covey ranges. As described earlier, the tree canopy must be open enough to allow half or more of the ground area to receive full sunlight at mid day. Herbaceous ground covers that quail require for reproduction and food can grow profusely in these open forest conditions. Hardwood brush and sprouts also grow rapidly. Without control, they quickly dominate the site and crowd out the herbaceous plants that support quail.

### Prescribed Burning

Prescribed burning is the best tool to control dense brush and maintain a favorable environment of grasses, weeds and scattered shrubs that quail use for nesting, food and protection. To achieve a burn that benefits quail, the tree canopy must remain open so that ground covers can grow following the burn. Also, burning should be repeated often, with some burning done each year to adequately control hardwood brush and to favor grasses and weeds.

Most successful quail nests are located in one-year-old broomsedge cover because it has the desired characteristics for



*When prescribed burning, care must be taken to leave unburned grassy cover on well-drained upland sites for spring nesting. Twenty-five to fifty percent of the quail range should be in well distributed unburned upland spring nesting cover.*  
STAN STEWART

nest construction and concealment. Care must be taken to leave some of this cover unburned on well-drained upland sites for spring nesting. These sites should be at least two or three acres in size, preferably near open fields managed for brood habitat. Ideally, 25 to 50 percent of the quail range should be in well distributed unburned upland spring nesting cover.

Nesting cover can be excluded from fire by utilizing roads, streams, or constructed firebreaks around selected locations. Firebreak establishment should begin well before actual burning so that enough locations for fire exclusion are planned and installed.

To maintain proper cover characteristics, unburned sites should escape fire only one year. Different sites for nest cover retention should be selected the following year. If the same sites were habitually excluded from fire, the cover would advance to stages of plants unsuitable for nesting. Hardwood brush would soon take over and become difficult to control.

Annual burning that leaves selected unburned areas each year for early nesting activity is the preferred approach on most quail ranges. Biennial burns are practical if burn units are around 60 acres or less and adjacent units are alternately burned.

Generally, prescribed burning should be conducted in late winter and early spring. Spring burning when plants are growing can control hardwood brush, but may also destroy early sprouting legumes which produce important quail foods. The timing of burns can be varied between the growing season and dormant season to maintain the herbaceous plant types that quail require. Locations dominated with hardwood brush may benefit from growing season burns done in May or later. Sites with mid-story hardwoods will require mechanical clean-up and/or herbicide treatments followed with a fire regime.

Extensive burning leaves few spring nesting sites for quail. In rolling terrain particularly, fire cleanly burns the upland covers that are preferred for nesting. Fires burn less intensely along drainages, and some cover remains intact. Quail will nest in these locations, but the nests are vulnerable to flooding and predation.

The insidious effects of excessive burning are not immediately apparent. Since bobwhites are indeterminate nesters, they will attempt nests throughout the summer when weather is favorable. If they are unsuccessful in early nesting, later attempts can still

result in good reproduction. Success is characteristically low for nests constructed prior to July on areas burned in the spring.<sup>43</sup> The covers normally grow back rapidly after the burn and may be suitable for nesting by July. Reproduction may still be good to excellent on these areas if favorable weather occurs, with normal to above normal rainfall. Production declines, however, if hot and droughty weather prevails. Early nest production is poor by reason of over-burning. Late production does not materialize because of heat and drought. Effectively, there has been little or no nesting season. During continuing drought years, the quail population declines severely with the excessive burning regimen. This limiting factor may not be apparent because the habitat continues to look excellent during hunting season. The scarcity of birds is the



*The herbaceous groundcovers that follow late winter and spring burns in open woods supply excellent brood range for quail. By mid-summer the plant growth is tall enough to protect broods and conceal late nests. The cover will be ideal for nesting the following spring if left unburned.*

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The quail range should include a good dispersion of thicket cover, with one to three shrub thickets for each covey range. STAN STEWART

only clue, but excessive burning is often not recognized as a reason for the poor production.

### Protective Cover

The quail range should include a good dispersion of thicket cover, with one to three shrub thickets for each covey range.<sup>37</sup> Such sites will often serve as covey headquarters, particularly as weed and grass covers thin during winter.

Chickasaw plum patches can be established along the borders of forest openings. Plums should be established and managed as previously described. Naturally occurring plum growth should be noted and patches excluded from fire with disked lanes. If undisturbed, plum patches will last for many years and retain the characteristics attractive to quail.

Bobwhites also use thickets of Japanese honeysuckle as headquarters or activity centers, often for loafing and roosting.<sup>58</sup> Honeysuckle thickets should be retained.

### Reforestation and Regeneration

Fields and harvested woodlands established to pine plantations support quail during the first few years of the new forest when natural weeds and grasses are dominant. As the tree canopy closes, ground covers are shaded out, reproductive habitats are lost, and few quail are present for many years. If continued quail production is desired on these sites, management practices must be planned prior to stand establishment.

Plantations established on pastures or hay fields will require herbicide treatment prior to tree planting to eradicate tame grasses adverse to quail. Agricultural fields with a history of Bermuda grass must be inspected and the Bermuda grass controlled prior to tree planting. Band spraying only the tree rows to control grass competition is not adequate.

Tree planting rates should be modified to delay canopy closure. Loblolly pine trees planted on 8-foot by 10-foot spacings (544 trees per acre) create a well stocked but relatively open stand that permits growth of ground covers suitable for quail. Longleaf pines planted on 12-foot by 12-foot spacings (302 trees per acre) create a forest environment that may remain favorable for quail throughout the life of a managed stand.

Permanent openings should be planned. At least one four-acre field for each 20 acres of land (20 percent in openings) is needed to allow for good quail production. Fields should be well distributed through plantations. Their locations should be determined and marked on the ground prior to tree planting operations. Open corridors through stands can be developed as an alter-

native. Leave at least 20 percent of the land area open in 100-foot or wider corridors. If trees are planted in 10-foot rows, a pattern of 40 rows of trees separated by the equivalent of 10 unplanted rows will create the desired open land.

Initially, nesting habitat will develop in the young pine stands. The fields or corridors can be managed with annual disking to supply brood habitat. Nesting habitat will be lost after a few years if the tree canopy closes. The openings will become critical for all reproductive habitat requirements, and the management regime should be modified. In this circumstance the best approach is to rotationally disk one-third of each field/corridor annually. This will permit some of the cover to advance to a stage of perennial bunchgrass (broomsedge) for nesting, while a portion of the site is maintained in annual weeds.

Thinning operations should be conducted in closed-canopy pine plantations as early as practicable. A stand with an open tree canopy that allows about half of the ground area to receive full sunlight at mid-day can support good quail populations. Following this rule, a loblolly pine plantation with six-inch diameter trees should be thinned to about 200 trees per acre. A stand of eight-inch diameter loblolly pine should be thinned to about 115 trees per acre. A prescribed burning regimen will be necessary to manage groundcovers after the tree canopy is opened.

## FOOD PROVISION AND FEEDING AREAS

### Natural Foods and Feeding Areas

Bobwhites utilize a variety of foods throughout the course of a year. Chicks and adults require an abundance of insects, fruits and seeds in summer. The bulk of the bobwhite winter diet is made up of seeds of a variety of forbs (broad-leaf herbaceous plants), legumes in particular. Their winter range, therefore, should be managed to produce an abundance of such plants.

As previously noted, natural food production, particularly of the seed-bearing plants used in winter, can be an inherent result of other habitat development practices. Plants that offer necessary seasonal covers may also produce fruits and seeds. Practices that develop and maintain appropriate cover composition, such as prescribed burning and disking, also promote growth of natural foods. Many natural food producing plants are also cover plants on the quail range. This is the desired condition because birds can feed in their normal covers in relative security.

A prerequisite to abundant natural food production on the quail range is the development of open land and open canopy forest because most quail food plants are not tolerant of shade conditions and require almost full sunlight to grow. Dense forest and extensive brush are unproductive of quail. Thinning operations must be conducted to maintain open forest conditions. A substantial portion of the quail range must be in open lands to permit growth of quail food and cover plants and to achieve adequate responses to ongoing management practices.

Disking and prescribed burning are simple tools that encourage growth of natural quail foods in profusion when correctly and systematically applied. Conversely, when applied haphazardly without an understanding of the plant regime bobwhites need, the effect will likely be more destructive than beneficial.

Normal plant succession is such that bare, disturbed ground is initially colonized by annual plants. In following growing seasons, perennial grasses gradually replace the broad-leaf plants and eventually dominate the site. This may happen as early as three or four years after disturbance in Alabama. Bobwhites require both herbaceous plant types. The grasses provide nesting habitat, screening cover, roosting sites, and some seed. The broad-leaf plants produce most of the seed and fruits and attract most of the insects on which bobwhites depend. Management must balance these plant

components to create natural food supplies that will carry bobwhites year-round and provide other critical needs.

Annual groundcover disturbance produces bobwhite food plants in great abundance. However, if all of the bobwhite range were subjected to annual disking and burning, nesting habitat supplied by perennial grasses would be in disastrously short supply. The practices must be systematically applied to balance natural food supplies and nesting habitat. Food producing plants and productivity of the quail range decline rapidly in the absence of systematic disturbance.

Disking encourages seed-bearing plants used by quail, especially when performed from fall to early spring. Annual fall/winter disking of the same site (as in small fields managed for brood habitat) will create annual plant communities of just a few species, primarily common ragweed and partridge pea. Disking on longer rotations (strip disking of fields and open woodlands) will develop more varied plant communities composed of annual and perennial plants. Both methods should be employed on the quail range to produce a diversity of food plants.

Prescribed burning promotes production of legumes and other quail food plants. Burning controls competing plant growth, removes ground litter and dead vegetation, exposes mineral soil, scarifies seeds and thereby encourages abundance of seed-bearing plants. However, fire can also destroy quail food plants. Annual fire will diminish food producing plants, particularly the legumes, when applied after the plants have sprouted and are actively growing. To minimize injury to legume production, it is best to finish the burning of uplands by early March.<sup>51</sup> But, this must be balanced against the need to perform the amount of prescribed burning necessary to properly manage the quail range.

Annual fire is necessary to maintain appropriate plant associations, but substantial portions of the quail range must remain unburned for spring nesting. This is also the appropriate management regime for soft mast such as blackberries and dewberries. Because these plants require a year of growth before first bearing fruit, they must be permitted to escape fire at least one season for fruit production. Portions of field borders that are reserved from disking will similarly produce blackberries and dewberries.

## Plantings

The values of plantings for bobwhite quail are generally summarized by the example of the widespread application of *Lespedeza bicolor* as a quail management practice. Rosene performed an extensive appraisal of the use of bicolor plantings as a quail habitat improvement. He determined that the seeds were a preferred winter food of bobwhites and tended to attract and localize coveys in winter. As a management measure, however, the plantings did not increase quail populations. Such plantings might result in excessive harvest on areas where hunting pressure is high. He concluded that other factors, particularly the availability of nesting cover, had greater effect on quail populations than presence or absence of bicolor.<sup>36</sup>

The establishment of plantings, food patches and food strips should not be primary in bobwhite habitat management. They generally do not produce additional quail in the environment. Their effect is to attract and provide an additional food source for winter coveys. The value of plantings is often over estimated because quail are often located in and near food strips and are very visible in these locations. Plantings have utility but must not replace more important management actions.

Planting operations during the nesting season can destroy nests. Planting sites should be prepared for seeding, at least by pre-disking, prior to the onset of nesting season to minimize nest destruction. Cultural practices for selected plantings are listed in the Appendix.

## Direct Feeding

Direct feeding is occasionally employed to improve quail survival and/or reproduction and assumes that lack of food is a population limiting factor. Supplemental feeding only addresses food supply limitations and cannot compensate for other habitat deficiencies.

Environmental conditions can cause poor natural food production and availability in otherwise favorable habitat. Poor production of bobwhite winter foods is generally associated with summer droughts, but other circumstances also create food shortages. A severe quail population decline in Texas was attributed to winter food deficiency. In this case, excessive summer rains encouraged growth of grasses that were suitable for quail reproduction, but which limited the growth of plants that produced winter foods.<sup>23</sup> A bobwhite population decline occurred in western Tennessee due to loss of a winter food supply. Mild weather caused mid-winter sprouting and deterioration of waste soybeans, resulting in a sharp population decline after the loss of this staple winter food.<sup>15</sup>

The success of feeding programs varies, depending on natural food availability and other necessary habitat components. In south Texas, feeding increased winter survival of quail on deep sand sites where food production was poor, but did not improve survival on more productive sites.<sup>17</sup> Quail feeders did not increase bobwhite survival or populations in an Oklahoma study.<sup>11</sup>

An intensive quail feeder project in Alabama determined that feed had little effect on a quail population in habitat that was unmanaged and in a stage of plant succession not very productive for quail.<sup>24</sup> Feeders were distributed over 2,000 acres at a rate of one for each 40 acres, and were maintained with scratch feed (cracked corn and wheat) year-round for 3 1/2 years of study.

Studies on quail plantations with high quality habitats in southwest Georgia documented higher winter survival of quail with access to supplemental feed from October to June, especially in years with poor native food and cover resulting from drought. Higher survival was due to reduced daily feeding movements that lessened exposure to predators. Fed birds entering breeding season weighed more, and had a higher reproductive output, with more nests and chicks per hen than unfed birds.<sup>47</sup>

Supplemental feeding throughout the year on quail plantations in northwest Florida resulted in earlier nesting, a longer nesting season, and more nests per hen than areas without feed.<sup>29</sup> Feeding appeared to reduce the impact of weather (drought) on reproductive performance, and also increased production during a normal weather year.

Supplemental feeding has been demonstrated to benefit quail populations in terms of survival and reproduction in some instances. Supplemental feeding should not divert the attention of quail managers from a comprehensive habitat management program that addresses all of the bobwhite's life requirements at each season of the year.

## Water

Bobwhites require water for survival and reproduction. However, free ranging bobwhites generally do not require or regularly utilize surface water.<sup>51</sup> Succulent leaves, fruits, seeds and insects in their diet supply water in varied content, and some water is created when food is metabolized.<sup>19</sup> Bobwhites also acquire water in the form of morning dew by moving the open mandible along moisture-laden grass blades, collecting water drops into the lower mandible.<sup>49</sup> For these reasons, the provision of surface water is not a concern in bobwhite management in Alabama.