

Woodland Owner Notes

Wildlife and Forest Stewardship

Developing forestland to continually produce timber and provide wildlife habitat requires an active management plan. Forest stewardship, the process of managing all of the forest's natural resources together, enables us to conserve our forest resources, including timber, wildlife, soil, and water.

Forestry and wildlife management are not only compatible, they are interrelated. Managing for wildlife habitat can even improve forest productivity. This publication describes the basic concepts of management, showing how forestry operations affect wildlife habitat.

Understanding Wildlife's Link to the Forest

Understanding the relationship between wildlife and your woodland will help you improve both. With planning and management, you can favor certain plants and animals on your property.

Wildlife have four basic requirements: food, cover, water, and space to live and raise their young. However, different wildlife species require different stages of diverse forest growth to meet their basic needs. Variations in plant cover, harvest operations, water resources, and topography determine how many species can live in a forest habitat and how abundant those species will be.

While some of North Carolina's forests are older, or *mature*, the majority are in a transition stage between seedlings and mature trees. The typical forest stand has developed from abandoned farmland. Other forests are mostly hardwoods that sprouted or were reseeded after logging operations.

Land features such as streams, swamps, rivers, and ponds also add to the diversity of plant and animal life in any woodland. Pastures

and croplands adjacent to woodlands attract many wildlife species. The edges between forest stands of different ages and between forests and open land or water are rich wildlife habitats.

Evaluating Your Property

An aerial photograph of your property offers a complete look at the land uses and vegetative covers within your boundaries and on adjacent properties. This bird's eye view can help you understand the potential of your land for wildlife and the ways you can make it more beneficial. With aerial photographs you can identify water sources, fields, forest stands, and wetland areas, and evaluate their arrangement on your property and surrounding land.

Aerial photographs of your property should be available from the Consolidated Farm Services Agency (CFSA). You also may be able to obtain aerial photographs from the Department of Transportation or your county tax office.

These organizations often have aerial photographs of your land on file dating back several

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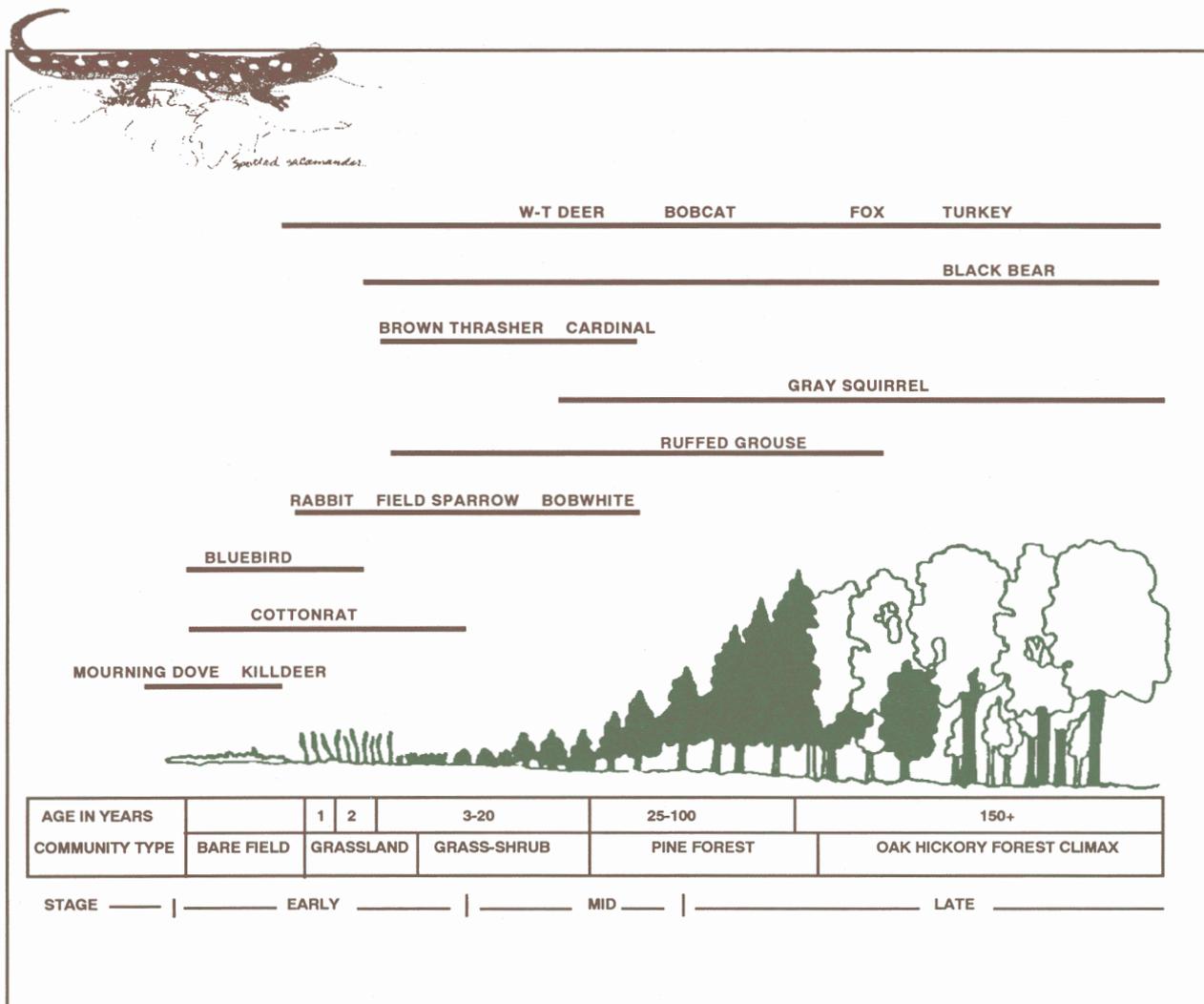


Figure 1. Successional stages, forest age, and associated wildlife.

years, which also will provide valuable information on the successional stage of your forestland.

Succession

You may find that at some time in the past at least some of your forestland was farmland. If photographs of your land have been taken every few years, you may be able to see the progression of these abandoned fields from brush to pole-sized timber and then eventually to mature timber. This progression from bare ground to mature forest is known as *plant succession*.

A knowledge of plant succession is important because all natural and human activities that affect the vegetation will also affect wildlife habitat. Because each species has a unique set of cover and food requirements, the successful wildlife manager matches forestry activities to the desired wildlife species. Plant succession begins on bare ground with light-seeded grasses, legumes, and flowering plants. Over time, small trees, brush, and briar thickets shade out the sun-loving grasses. Ultimately, light-seeded trees shade out the brush and

make conditions favorable for shade-loving mast producers, like oaks and hickories (Figure 1).

The relationship between vegetation management and wildlife is outlined in Table 1. The vegetation conditions of early- and mid-successional stages can be achieved or sustained only through periodic harvesting, mowing and disking, grazing, or burning. Without these interruptions, all field and shrublands will naturally grow into forests, and the habitat conditions for wildlife will change dramatically over time.

For example, quail and pileated woodpeckers correspond to different stages of plant succession. Quail feed on seeds from annual and perennial plants. These plants occur in the early stages of plant succession when direct sunlight is abundant. Therefore, emphasize harvesting, thinning, and controlled burning if you want to promote quail populations. Pileated woodpeckers, on the other hand, depend on dead or rotting trees found in mature forests for their food and nesting sites.

Land managers who understand plant succession and its effects on wildlife can create a diverse habitat by mixing timber stands of various ages with open areas.

Table 1. Relationship of Plant Succession and Wildlife

Successional Stage	Plant Characteristics	Associated Wildlife*	Forest Practices
Early	Grasses, legumes, forbs, fruits, herbs, flowering plants	Quail, dove, deer, bear, turkey, songbirds, rabbit	Clearcutting, planting, seeded logging roads, group selection cuts, controlled burning, wildlife food plots, mowing and disking, edge management
Middle	Shrubs, small trees, grasses, brush, briar thickets	Grouse, deer, bear, quail, songbirds, rabbit	Thinning, individual selection cuts, controlled burning, nest boxes
Late	Trees, woody undergrowth, mast producers, snags and downed logs, den trees	Squirrel, raccoon, deer, bear, grouse, wood duck, turkey songbirds, birds of prey	Individual selection cuts, controlled burning, wildlife food plots

* Animals that are listed in two or more successional stages use a mixture of cover types.

Developing Your Forest Stewardship Plan

Once you understand the relationships between the kinds of wildlife you want and your land, you can develop a forest stewardship plan.

Begin with a list of objectives. Include financial concerns as well as wildlife, timber, aesthetic, and recreational goals. Many uses will be compatible and can be worked on simultaneously, while others will involve trade-offs. You will also find that some improvements and practices are inexpensive, while others may require substantial investments of labor or capital.

Wildlife biologists, foresters, soil conservationists, Extension agents, and consultants can help you to define your objectives. They can also help you list your resources, evaluate alternatives, develop a written framework, and, in some cases, supervise management operations.

Over time your objectives may change. However, a well-designed plan will be flexible enough to accommodate changes in goals, markets, and the economy. Plan carefully from the start, but treat the plan as a living document, making adjustments for the future as your interests, resources, and needs change.

For additional information on forest stewardship, see Woodland Owner Note 23, *Enrolling in North Carolina's Forest Stewardship Program*, available from your county Cooperative Extension Center.

Forest Management Practices

Managing your forest resources requires an understanding of various forestry systems and their effects on wildlife. When left completely untouched, forests experience natural disturbances such as fires, floods, tornadoes, insects, diseases, and earthquakes. After a tornado, for instance, damaged areas in a forest must begin again with the early stages of succession. Also, insects and diseases cause openings in the forest that allow more sunlight to reach the ground. Forest management practices often simulate these disturbances. We can use these practices to manipulate the forest for maximum productivity.

The goals and objectives outlined in your management plan, along with the characteristics of your property, determine which forest management systems to use. Each system benefits different groups of wildlife, and you can use just one or any combination of systems. The following is a basic introduction to the most common forest management systems.

Even-Aged Management

An even-aged system creates a stand of trees that are all approximately the same age. Usually all the trees in a given area are harvested at one time or in several cuttings over a short time to keep the stand approximately the same in age. This method is especially common in harvesting or managing sun-loving trees like the loblolly pine and some hardwoods like the yellow poplar.



Table 2. Characteristics of Even-Aged Stands and Types of Wildlife Favored

System	Sunlight	Canopy	Wildlife Favored
Clearcut	Full	None	Early successional species that feed on annual and perennial plants, shrubs, and insects. Also birds of prey.
Seed tree	Full	Sparse; individual trees	
Shelterwood	Partial	Partially open	



Hardwood stands often appear to be uneven in age because the trees vary in size. It is not uncommon to find an oak 8 inches in diameter growing beside one that is 16 inches in diameter. Although the trees are the same age, the smaller tree may not have grown as rapidly as the larger one because it received less sunlight, nutrients, and water.

Even-aged forests can be managed through three harvesting practices: clearcutting, shelterwood cutting, and seed-tree cutting. These practices can benefit wildlife species that require open, full sunlight including forbs, grasses, and brushy vegetation. (See Table 2.)

Clearcutting is a method of harvesting and regeneration that removes all trees within a given area. Used most frequently in pine and hardwood forests that require full sunlight for growth, this method simulates a major natural disturbance and creates an early successional habitat.

As a landowner, you should keep in mind that the size of your clearcut affects the livelihood of wildlife. Generally, on most small tracts, no more than 20 acres should be cut in one area to improve habitat. However, on tracts of 500 acres or more of mature timber, larger clearcuts of 50 to 100 acres yield excellent quail habitat and economic returns. Smaller areas of less than 5 acres can be cleared near roads or as firewood and pulpwood cutting areas. These smaller sections add to the diversity of the forest and will attract wildlife year round.

In general, timber harvest areas should have irregularly shaped boundaries to maximize forest edge. These edges separate mature stands from young, regenerating stands and meadows, creating a variety of wildlife habitats. For more information on edges, see Working with Wildlife 15, *Managing Edges for Wildlife* (available from your county Extension Center and resource agencies throughout North Carolina.)

Leave strips of uncut timber at least 100 yards wide to separate clearcuts. Referred to as buffer or leave strips, these areas provide habitat diversity, edge, travel lanes, den trees, and hard mast. You can influence wildlife species that feed, nest, and travel within the buffer by varying the location and width of the buffer strips. Early successional species such as rabbit, quail, and deer generally benefit from narrower leave strips, while wild turkey and squirrels prefer wider strips with more cover and mast from mature hardwood stands. The width and location of buffer strips along stream and river edges also

can affect fish, reptile, and amphibian populations. Leave all shrubs along streams to help protect water quality.

Leaving islands of uncut timber within clearcut areas that are linked to the main forest by strips of mature trees will enhance wildlife habitat by maintaining mast-producing plants. Connected strips or islands of mature timber help develop and retain den trees. The best type of island is at least a 1/4-acre clump of mature, long-lived species of oak such as white, water, chestnut, and red. Try to maintain old oaks and other hardwoods with visible cavities that can be used by wildlife.

Shelterwood cutting clears trees in two or three cuts over several years, resulting in a stand of trees that are nearly the same age. This simulates a moderate natural disturbance. Regeneration of shade-tolerant species is possible when a "shelter" is left to protect them. Shelterwood methods provide cover for wildlife as well as early successional food. Some shade-loving species, including northern red oak and American beech, are excellent sources of food for wildlife. In addition to perpetuating timber species that produce food for wildlife, shelterwood cuts can be used to improve the appearance of your property.

Remember that shelterwood cutting involves more planning from resource professionals and higher logging costs than does clearcutting. Also, the chance for soil and early regeneration disturbance increases with repeated stand entry.

Seed tree harvesting is commonly used on light-seeded pine species that produce frequent seed crops. In a seed tree harvest, several mature trees are left standing to reseed the next stand of trees. In effect, it is a compromise between clearcutting and shelterwood methods.

The proper selection of seed trees is critical. Foresters should select seed trees that are well spaced, windfirm, vigorous, sound, and of good form and quality. Mark trees clearly to avoid accidental removal and damage during the regeneration cut. The benefits to wildlife are nearly the same as with the clearcutting system, with the exception of the seed trees. If left indefinitely, the seed trees eventually can become snags or downed logs that are important habitat for woodpeckers and many other species. Seed trees are also excellent food sources and nesting sites for hawks and other birds. For additional information on seed distribution for particular trees, contact your county Cooperative Extension Center or your local forester. See also Working with Wildlife 14, *Snags and Downed Logs*.

The seed-tree method is low in cost and creates a pleasant appearance. Landowners also enjoy the second harvest payment when the seed trees are removed after regeneration. However, seed tree harvests can require some additional investment for precommercial thinning and competition control.

Uneven-Aged Management

An uneven-aged system maintains a timber stand in many growth stages, either through cutting of selected groups of trees or of individual trees. This management method simulates minor natural disturbances such as windthrows, insect and disease damage, or spot fires. Succession is held at the mid- to late-successional stage but never allowed to reach its climax. Uneven-aged management benefits many wildlife species that need cover for nesting and brooding as well as early successional foods. (See Table 3.)

Group selection is the process of selecting groups of trees for harvest over many years until eventually—40, 50, or more years later—the entire stand has been cut. In essence, each cut is a small-scale clearcut in an area of 2 acres or less. Group selection produces high-quality, veneer-grade hardwoods that bring top dollar when sold. The method is used primarily on bottomland hardwoods.

Group selection cuts provide ideal pockets of young vegetation for grouse, woodcock, deer, and songbirds. Note, however, that this practice requires intensive management and frequent access to all areas of the property. For these reasons, group selection may be feasible only where high-value trees exist on accessible sites.

Single-tree selection is the most intensive uneven-aged practice. Individual trees are cut that are ready for harvest, of low value, or in competition with the future crop trees. Under this method, the forest continuously produces timber, with new seedlings constantly emerging to take the place of harvested

trees. Unless single-tree selection removes irregular, low-quality trees along with merchantable timber, this management system will gradually reduce the value of the timber on your property.

Single-tree selection holds the stand in a perpetual state of late succession that never reaches a climax. Many wildlife species benefit from the diversity and cover of a late-successional forest, including turkey and squirrels. The disadvantage of single-tree selection is that more frequent harvests require more mechanical disturbances to the wildlife habitat that you are trying to enhance. Also, sun-loving tree species that are important for wildlife food will not grow in this system.

Single-tree selection requires frequent harvesting and chemical or mechanical control of shade-tolerant species that would otherwise naturally dominate the stand over time. Shade-tolerant species are slower growing and typically command a lower price in most North Carolina markets.

Reforestation

Part of choosing a forest management system is planning for the future growth of the stand. Two basic methods of reforestation are *natural regeneration* and *artificial regeneration*.

Natural regeneration, just as the name implies, relies on nature to provide the seed to start a new stand of trees. If you set the proper conditions at and before harvest, you can anticipate new, vigorous growth with little cost. Natural regeneration is most appropriately used with seed tree cut, shelterwood cut, single-tree selection, and group selection systems. (See Table 4.)

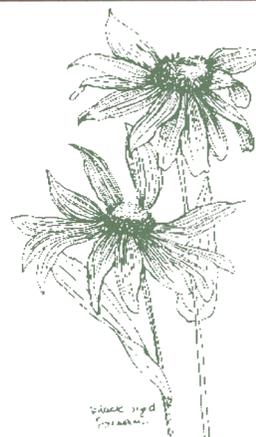
Artificial regeneration includes seeding and planting. By planting seedlings you can choose the species, genetic quality, and spacing of your future stand. Although this process requires a capital investment, the result is a more productive stand in a shorter period. Artificial regeneration is commonly

Table 3. Characteristics of Uneven-Aged Stands and Type of Wildlife Favored

System	Sunlight	Canopy	Wildlife Favored
Single-tree selection	Partial	Partial	Tree dwellers, mast feeders, herbivores, carnivores, hibernators
Group selection	Openings: full Remainder: filtered	Openings: none Remainder: closed	Tree dwellers, mast feeders, herbivores, carnivores, hibernators

Table 4. Regeneration Methods Associated with Management Systems

Management systems	Natural regeneration	Artificial regeneration
Even-aged	Seed tree cut Shelterwood cut	Clearcut
Uneven-aged	Single-tree selection Group selection	Group (oak seedlings)



used after clearcutting or is used experimentally with oak seedlings after group selection. (See Table 4.)

Pine plantations and young hardwood stands provide a multitude of wildlife benefits when properly planned and managed. Also, after you have completed your timber harvest, you can obtain professional assistance and financial incentives to start a new stand of trees or improve a young crop of seedlings.

Other information is available in Woodland Owner Note 16, *Steps to Successful Pine Plantings*; Woodland Owner Note 9, *Reforestation of Southern Pines*, and Bulletin 463, *A Guide for Regenerating and Managing Natural Stands of Southern Hardwoods*, available from your county Cooperative Extension Center.

Forest Operations that Benefit Wildlife

Depending on your goals, there are a number of additional forest operations that can help you achieve your management objectives. These operations also simulate natural disturbances and can be used to enhance and maintain wildlife habitat.

Thinning operations in a stand are prescribed by foresters to increase the growth rate of the best trees, to provide for periodic income, and to harvest trees that would die if left to natural forces. The remaining trees grow better because moisture and soil nutrients are more readily available. Understory growth is improved because of the increase in sunlight penetration to the forest floor. Thinning sets back succession yet leaves the mid- to late-succession trees. Deer, quail, and rabbits have more food and cover in the understory. Therefore, thinning operations can be managed in a way that enhances both timber production and wildlife. For additional information on thinning, see Woodland

Owner Note 13, *Thinning Pine Stands*.

Prescribed or controlled burning is a forestry operation that helps reduce the risk of wildfire and the costs of preparing harvested areas for tree planting. Burning sets back succession just like a natural fire does. It is beneficial for many species of wildlife, including quail, deer, and turkeys.

Controlled burning uses a low-intensity surface fire on a one- to four-year schedule, depending on fuel conditions. Burning helps control woody vegetation, releases nutrients to the soil, and increases seed germination and herbaceous

vegetation, including legumes and grasses. Controlled burning can simulate natural, lightning-caused fires that are required to regenerate and maintain longleaf forests. For more information see Extension Service publication AG-457, *Wildlife and Prescribed Burning*.

Burns also help the development of oaks in hardwood forests. Much of the predominantly oak forest present today is thought to be a result of repeated fires, grazing, and cutting practices throughout the past 200 years. A prescribed fire in a hardwood stand kills the undesirable, thin-barked tree species, such as red maple, and gives the oaks a chance to develop and dominate the stand. This reduces the need for herbicides to control the undergrowth.

Before you initiate any controlled burns on your property, be sure to enroll in the Hazard Reduction Burning Program offered by the North Carolina Division of Forest Resources (NCDFR). Through this program, you can learn to use prescribed burns safely to remove undesirable vegetation and enhance wildlife habitat in your forest. For additional information on this program, contact the NCDFR or your county Cooperative Extension Center.

Den and Mast Tree Selection. Regardless of the harvest system you use, you must consider the potential of den and mast tree selection on your land before you begin harvesting.

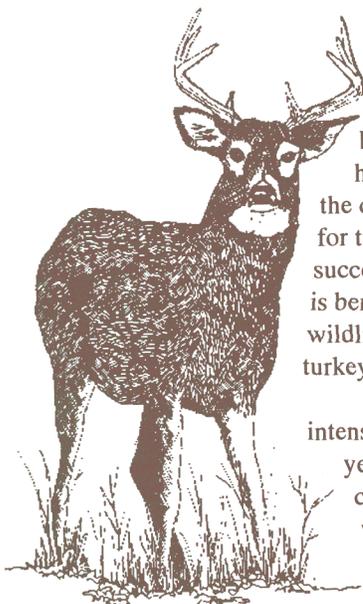
Den trees are trees that have one or more hollow chambers that are used by birds, mammals, and reptiles for nesting, roosting, and cover. As a rule, two to four den trees per acre should be left in any harvested or thinned area. Den trees can be as small as 5 inches or as large as 5 feet in diameter. The smaller trees may house chickadees, woodpeckers, screech owls, or flying squirrels, while the larger trees may house raccoons or occasionally a bear. If suitable den trees do not exist in your woodlands, installing man-made boxes or nests is a good alternative (see *Working with Wildlife 16, Building Songbird Boxes*).

Consider also the importance of *mast-producing trees*, those that produce fruits and nuts used as food sources by wildlife. While hickory, beech, persimmon, serviceberry, blackgum, American holly, hawthorne, and dogwood are not highly valued species for wood products, they produce food that is important for wildlife. Grapevines also are important mast producers, but the vines can deform your hardwood timber and reduce its value. Concentrate wild grapes on arbors in select areas where timber potential will not be affected.

Make your wildlife objectives known to the professionals conducting timber and forest management operations **before** those operations begin. Specify that mast and den trees be left undisturbed and that islands and buffers be clearly marked and protected. Wildlife management activities do not have to be expensive, but they must be planned before you harvest any timber.

Road Construction and Maintenance. Whether you enter the woods for management or recreational purposes, easy, reliable access to your property is essential. Proper location, design, and construction of roads increases the value of forest property and reduces upkeep and costs. Multiple benefits can be gained from roads having good drainage, good construction, and the application of best management practices (BMPs, or standards that *minimize* soil erosion and maintain water quality).

One practice that benefits wildlife and improves roads is known as *daylighting*. In this process, trees bordering access



roads are removed to maximize the amount of sunlight that reaches the road surface and side banks. Sunlight not only enhances the growth and proliferation of shrubs, grasses, weeds, and insects available for wildlife, but it also dries the road surface. Daylighted logging roads maximize forest edge and allow year-round use. To reduce erosion, be sure to seed roads, banks, log landings, skid trails, and other areas where soil has been disturbed.

Try to restrict or regulate the use of motorized vehicles on access roads so that wildlife species fully use the newly seeded areas. Minimize disturbance and vehicle access on roads from the first of May until October to prevent disruption of nesting and brooding activities.

Ground Cover Along Roads and On Logging Sites. Establishing ground cover controls erosion, improves water quality, and can enhance the quality of wildlife food and cover. Seed germination is best in the spring and fall. Successful plantings generally require fertilization, liming, and soil preparation, so plan ahead. Have your soil tested and prepare the seedbed properly for best results. Table 5 shows appropriate combinations for general geographic areas. Because seeding recommendations vary by site, consult your county Cooperative Extension Center or your local soil conservationist about seed mixtures, rates, shrubs, and soil treatments for your area and the wildlife species you want to help.

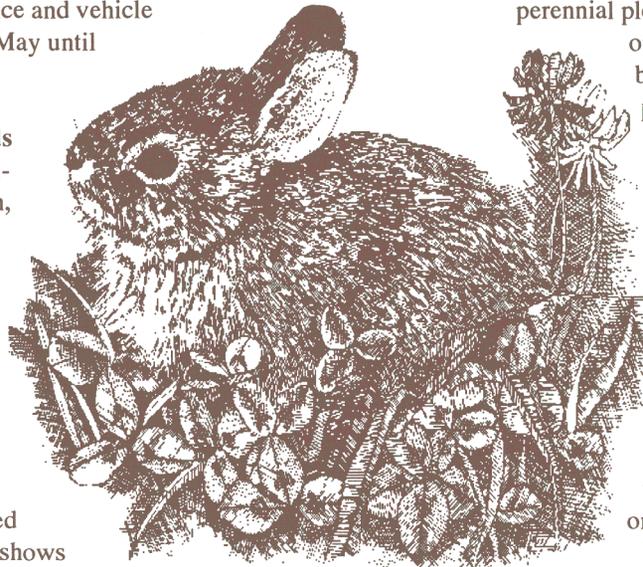
These seed mixtures will provide valuable areas in which wildlife can graze, gather seeds, or hunt for insects. Open grasslands scattered through woodlands provide *brood range* for turkeys and grouse. Hens will take their broods to these open habitats to feed on the high concentrations of insects found there.

Wildlife Food Plots. Forest properties can be further managed to attract wildlife by planting specific food crops, although such farming can become a monumental task. If you are not experienced in growing agricultural commodities, seek assistance from your county Cooperative Extension Center.

Cost is the other deciding factor in planting food plots. For example, in the mountains, the cost to convert some areas to fields that can be worked with farm machinery can cost as

much as \$400 to \$600 per acre. It costs about \$125 per acre each year to reseed and fertilize annual food plots once they are established. While these costs include labor and machine time, they are still extremely high and have forced many wildlife biologists and landowners to abandon food plots in forest stands. Another alternative is to coordinate wildlife habitat improvement with on-going farm and forestry operations.

If you decide to plant food plots, remember that annual plots tend to be more productive (and more expensive) than perennial plots. Annual plantings of field corn or grain sorghum are particularly beneficial, especially when mast production is low. If you decide to plant perennial plots, plan on disking, liming and fertilizing, and replanting about every three years. Make sure you plant in areas that receive adequate sunlight. Try to create openings at least 30 yards wide for permanent plots and, whenever possible, orient the long axis of the food plot to the south so it gets more sun. Also, keep in mind that perennial plots must be clipped or mowed early in the fall.



Summary

Wildlife management opportunities abound for private landowners in North Carolina. Forestry operations can be used to provide and enhance wildlife habitat, and information is available to help you get started right away. Talk to your Cooperative Extension Service agent about publications and technical assistance. Cost-share assistance is also available to help landowners manage their forestland for multiple benefits, including wildlife and other resources. Forest stewardship management can be effective and rewarding for you and the generations to come.

Table 5. Ground Cover Seeding Mixtures by Region

Coastal Plain	Piedmont	Mountains
Bahiagrass	Bahiagrass	Orchardgrass
Kobe lespedeza	Orchardgrass	Korean lespedeza
	Korean lespedeza	Clovers
	Switchgrass	
	Clovers	

Additional Information

Woodland Owner Note 23, *Enrolling in North Carolina's Forest Stewardship Program*. Available from your county Cooperative Extension Center.



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