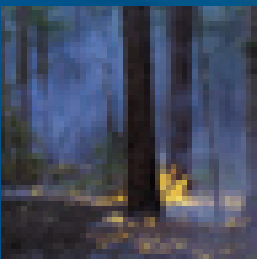
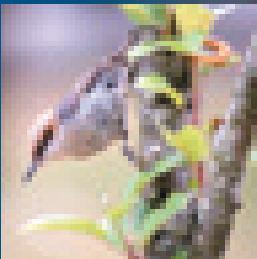
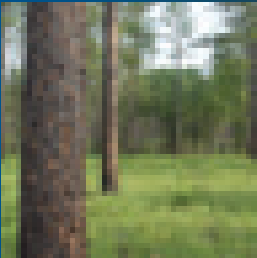
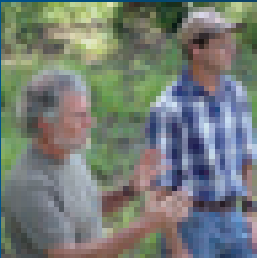


# Forest Ecosystem

## CONSERVATION HANDBOOK

for Birds in Georgia

A GUIDE FOR FAMILY FOREST OWNERS



by Drue DeBerry

Cover photo by Phillip Jordan.  
Inset photos by Drue DeBerry, Todd Schneider and Phillip Jordan  
Feather art by Susan Cooper

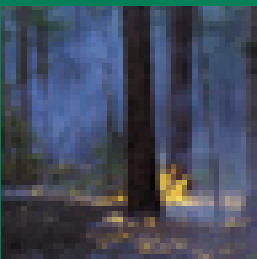
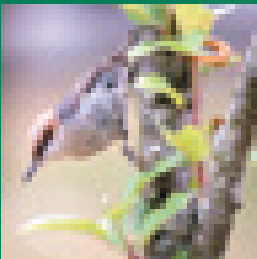
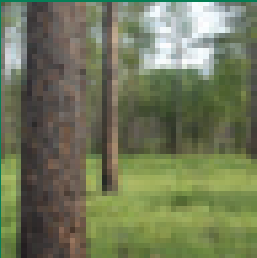
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# Forest Ecosystem

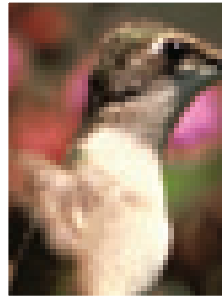
## CONSERVATION HANDBOOK

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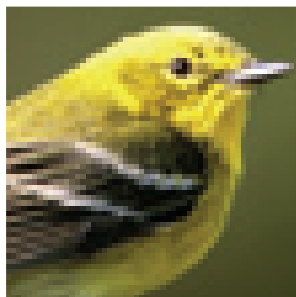
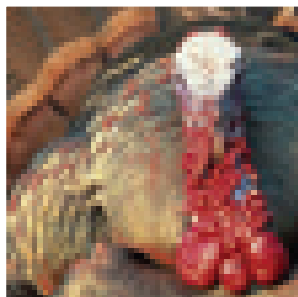


by Drue DeBerry



*Thanks to those who provided input on the handbook contents and helped review it. Those who generously gave their time and shared their ideas and suggestions are: American Bird Conservancy, Rita Fenwick, Merrie Morrison and Dr. David Pashley; American Forest Foundation, Vanessa Bullwinkle; Clemson University, Dr. George Kessler; F&W Forestry Services, Wade McDonald; Georgia Forestry Association, Carla Rapp and Tim Lowrimore; Georgia Forestry Commission, Steve Chapman and Buford Sanders; Georgia Department of Natural Resources, Eric Darracq, Nathan Klaus, Todd Schneider, Reggie Thackston and Mark Whitney; Georgia-Pacific, Steve Loveland; Joseph W. Jones Ecological Center, Mike Conner, Dr. Steve Jack, Kevin McIntyre and John Stober; The Longleaf Alliance, Mark Hains; USDA Forest Service, Laurel Moore; U.S. Fish & Wildlife Service, Dean Demarest, Chuck Hunter, Julie Moore, Peter Range and Emily Jo Williams; University of Georgia at Athens, Dr. Robert Cooper; Weyerhaeuser Company, Dr. Darren Miller and Chris Reynolds.*

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Written by Drue DeBerry, M.F.S.  
[ddeberry@forestfoundation.org](mailto:ddeberry@forestfoundation.org)



*Its use of feeders around peoples' homes makes the Ruby-throated Hummingbird one of the Southeast's favorite birds. It nests in deciduous forests, feeding naturally on a season-long sequence of blooming flowers. They concentrate most at feeders after the young have fledged, before embarking on a migratory route that is astonishingly long for a species as small as a hummingbird.*

Photo by Phillip Jordan

## Ensuring a Future for Wildlife and Family Forests

*“When land does well for its owner, and the owner does well by his land;  
when both end up better by reason of their partnership, we have conservation.”*

Aldo Leopold, 1949

Most forest landowners today have many reasons, not just economic ones, for owning a forest. They include recreation, hunting, wildlife viewing, and the aesthetic pleasure of enjoying a natural place of scenic beauty free from the distractions of modern life. Although not solely interested in or dependent on generating income from their land, most forest owners need to generate some

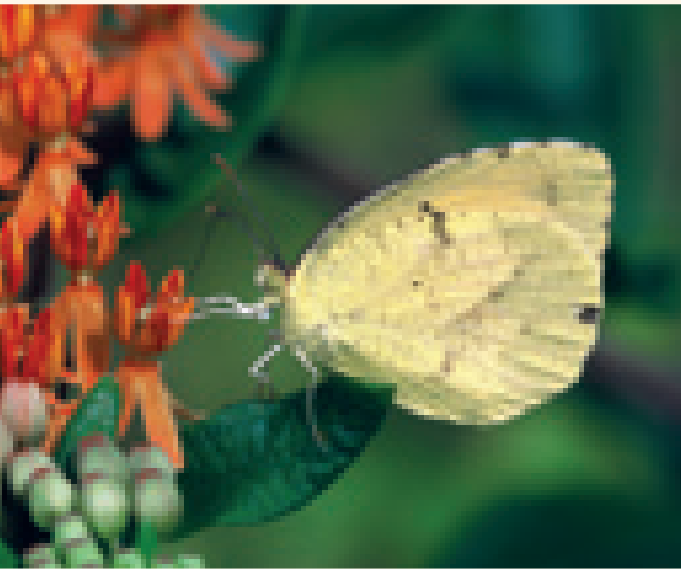


income to help with property taxes, road maintenance, invasive species control, etc. This handbook attempts to help you find a balance that will ensure you, and those that serve as forest stewards after you, have the ability to generate income from your property while increasing the recreation, wildlife, and aesthetic aspects of your land.

Over the past 60 years, rural landscapes have changed. Fallow fields or farms that have brushy edges around crops have become rare. Pine forests planted at high densities to maximize production of pulpwood have become common. Housing developments have increasingly encroached on what was once countryside and have led to decreased use of fire as a management tool because of smoke management and liability issues. From an ecosystem perspective, these changes have meant a sharp decline of quality early- and mid-successional pine forest habitat, essential to

the survival of many bird species.

In the Southeast, resident birds and Neotropical migratory birds that depend on forested habitats with open understories have declined. Neotropical migratory birds are birds who spend the winter in Central America and summers in North America. Understory, for purposes of this handbook, is defined



*Sulfur butterfly on butterfly weed*  
Photo by Phillip Jordan

as the community of small trees, bushes and plants that grow under the canopy of a forest. According to data from the North American Breeding Bird Survey, a number of bird species have declined. For example, the Henslow's Sparrow has experienced a 96% population reduction since 1966. The Northern Bobwhite, formerly known as the Bobwhite Quail, has had populations decline by two-thirds in the last 40 years. Bird conservationists in the Southeast recognize that one of their greatest challenges is

to conserve sufficient pine habitat with an open, healthy understory or many bird species may disappear.

Forests and forest management recommendations have also seen dramatic changes during the past 60 years. Until recently, pine forests were managed on very short rotations to produce a variety of wood products, but with a focus on quick and consistent returns from the sale of pulp. While this management strategy was profitable for a time, it no longer provides significant income for family forest owners due to competition from plantations with seven-year pulpwood rotations in South America, South Africa, and Australia. Because most forest landowners need some income to support their forest, they must now change their management strategies to ensure long term economic viability. This handbook outlines management strategies that provide economic return and at the same time create critical habitat for birds and other species. The handbook focuses on birds, but the recommendations for improving forest habitat they depend upon will benefit many plants and other animals as well.

*Wild Turkey*  
Photo by Jim Flynn

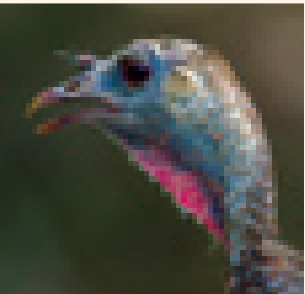
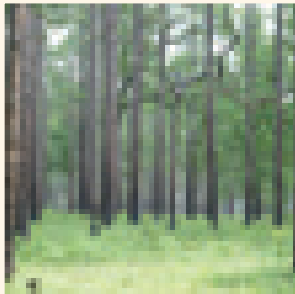


Photo by Drue DeBerry



*Hooded Warbler*  
Photo by Ty Ivey





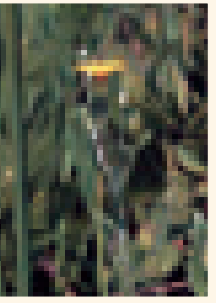
## MANAGING YOUR FOREST AS AN ECOSYSTEM

A forest ecosystem is more than just trees. It is the community of all things such as plants, animals, fungi and bacteria found in a healthy forest. The interrelated physical and chemical environment is equally important. Each part is connected to every other part to some degree in space and time.

A strong connection exists between trees and birds. A healthy pine forest depends on birds, and vice versa. Birds that are year-round residents, or birds that arrive from the Caribbean in the spring, eat pine beetles and other potentially harmful insects. In turn, pine trees provide birds a specific physical environment (tree spacing, tree size, understory vegetation, etc.) that provides food and shelter.

Some connections are less obvious and others have yet to be explored through scientific research. What happens when prescribed fire is no longer used in a pine forest because of liability issues? The loss of fire-dependent plants is obvious, but will availability of nutrients in the soil needed by trees change as well? Will this weaken the root system and increase damage to the forest each time a storm passes? Each question leads to another as each change affects something else.

*Grass-leaved golden aster*  
Photo by Thomas Barnes,  
USDA-NRCS



*Birders enjoy the bird trail on the Devendorf family forest near Midway, Georgia*  
Photo by Drue DeBerry

Fifteen percent of Georgia residents are birders. Recent economic data indicates that, nationwide, birders spent \$32 billion dollars in 2001 pursuing birds ("Birding in the United States: A Demographic & Economic Analysis" USFWS 2001). Forestry is also important to Georgia's economy. Georgia's forest resources support nearly 170,000 jobs and have \$16.1 billion direct economic impact (Georgia Forestry Commission).

This handbook is intended to provide information that helps you manage your forest as an ecosystem. As you work in your forest, take time to observe and appreciate its intricate and dynamic nature. This will help you monitor how your woods change. A healthy forest ecosystem is a wonderfully complicated thing where beauty lies in the details.

## A LEGACY

Georgia is losing rural lands to development faster than most states in the U.S. (“USDA Natural Resource Inventory” revised 2000). It’s not hard to come across areas where forestland is giving way to sprawling subdivisions and development. To imagine what might be lost, ask yourself: What do you miss about the Georgia woods when you are away? Will the same smells, sights and sounds still be around for your grandkids? Will they have a sense of place for the Georgia woods?



*The Kentucky Warbler is a stunning bird of the undergrowth and midstory of Southeastern deciduous forests. Its striking yellow body with a bold black slash on the sides of its head is as enchanting in winter in lowland rainforests edging the Gulf of Mexico and Caribbean as it is on its northern breeding grounds. Photo by Ty Ivey*



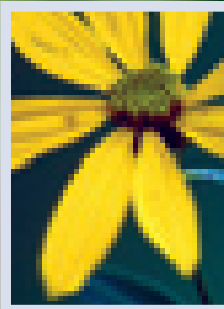
Most family forest owners say that leaving a legacy to heirs is one of the most important reasons for owning forestland. Yet, many have not had discussions with their heirs about what will happen once they are gone. A wonderful way to start such a conversation is to explain how you are working to create a legacy that conserves Georgia's natural and cultural heritage that you hope they will continue. The more involved heirs are in present management decisions, the more likely they are to carry on this heritage to the next generation when the torch is passed.

Aldo Leopold, a famous conservationist and a family forest owner in Wisconsin during the first half of the twentieth century, wrote, "In our attempt to make conservation easy, we have made it trivial". This handbook, with its simple and basic recommendations, can help you take initial steps in the direction of ecosystem management. To truly perpetuate your forest ecosystem, you will need to work with a good, qualified forester and logger to adopt the recommendations based on your forest's specific conditions and history, and you will need a lifelong commitment to learning.



If you truly come to know your forest, your greatest reward will not be paid in dollars from timber revenue. It will come from knowing that your hard work and perseverance have made a place better. It is a legacy that will survive you and testify to your character and values long after you are gone.

*Swainson's Warblers skulk low in canebrakes and other tangled undergrowth on the higher ridges between wet swales of bottomland hardwoods. As most remaining bottomlands are the lower, wetter areas, habitat for this species is quite limited. Photo by Ty Ivey*



*Greater tickseed*  
Photo by Thomas Barnes,  
USDA-NRCS



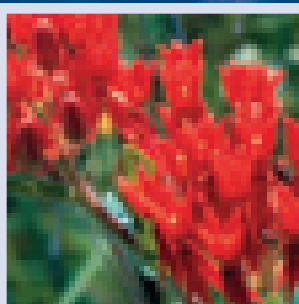
*Devil's shoestrings*  
Photo by Thomas Barnes,  
USDA-NRCS

## The Importance of the Forest Understory

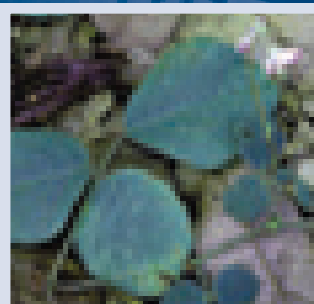
Trees are the dominant feature of a Georgia forest, but it is largely the understory that determines whether a forest is beneficial for many wildlife species. A basic way to gauge forest understory health is to look at its physical structure and contents. Is it mostly pine needles, or are there also lots of grasses and other plants? Are there many woody shrubs and hardwood trees? Learning the many different species of plants and grasses found on the forest floor is a lifelong process. To start, six plants commonly found in a healthy understory are profiled on pages 14 and 15. If you can recognize these beneficial plants, as well as the damaging invasive plant species you don't want, you will be off to a great start.



*Southern blazing star*  
Photo by Larry Allain,  
USGS



*Butterfly weed*  
Photo by Larry Allain,  
USGS



*Prostrate ticktrefoil*  
Photo by Thomas Barnes,  
USDA-NRCS

A pine forest with a healthy understory is a beautiful place. It is open and easy to walk through. There are many herbaceous forbs and grasses and few, if any, hardwood shrubs or trees. The pines are spaced far enough apart to allow sunlight to reach the forest floor. If the trees are too close together and sunlight does not reach the forest floor you will find it covered in pine needles and little else.

Forbs and grasses are the foundation of a healthy pine forest. They provide direct food and shelter for many birds and small mammals, and also harbor many insects that are an important part of their diet. The Northern Bobwhite exemplifies a species that needs clumped native grasses for nesting along with forbs and other plant species that attract insects and produce seeds high in nutritive value.

*Partridge pea is promoted by fire and is an important component of the Northern Bobwhite's winter diet.*  
Photo by Randy Browning,  
MFWF/USFWS

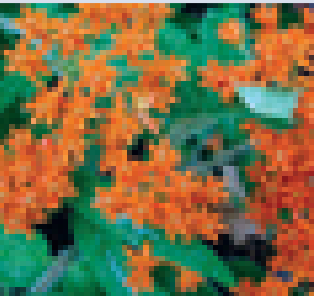
The forest understory needs fine fuels from grasses, forbs and pine needles to support prescribed fire. If prescribed fire is not used regularly, hardwood trees and shrubs will create a dense midstory that will block sunlight from reaching the forest floor and prevent plants and grasses from growing. Although a thick midstory is useful for some bird species (e.g., Northern Cardinal, Eastern Towhee), these are generally common species that can find homes in a lot of forest conditions. Invasive plant species pose another threat to the understory. Invasive exotic species outcompete and replace native plant species but frequently have minimal wildlife value.



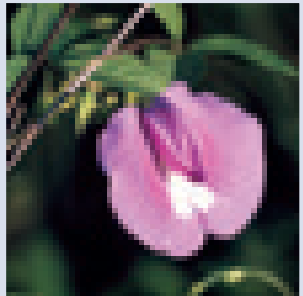
## MAINTAINING A HEALTHY UNDERSTORY

Your forest management must address three important issues to restore or conserve healthy ground cover. First, your management plan must include frequent use of prescribed fire. Second, you must be vigilant to ensure that exotic invasive plant species do not outcompete and replace native vegetation. Third, you may need to reintroduce native plant species.

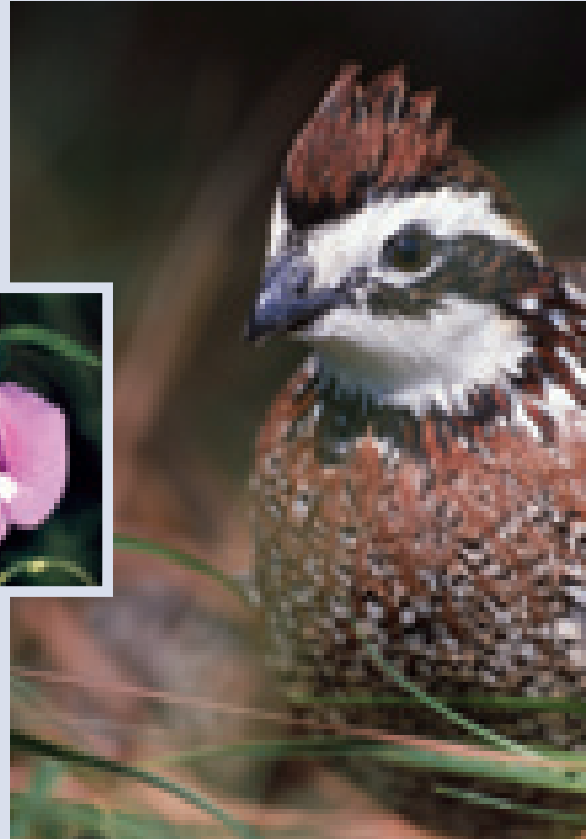
Once a frequent prescribed fire program has been in place for several years, a forest that lost native ground cover may fully recover all of the species needed for a healthy ecosystem. Seeds of many native plants may lie dormant in the soil for decades waiting for the proper disturbance (disking, fire, etc.) to germinate. Some of these seeds require fire to “scarify” the seeds, allowing germination. In other instances, reintroduction of native plant species may be necessary. Condition of the local seed bank, distance to a seed source, and land use history are obvious factors that determine a site’s ability to recover native species.



*Butterfly weed*  
Photo by J. Scott Peterson,  
USDA-NRCS



*Spurred butterfly pea*  
Photo by Larry Allain,  
USGS



## A HEALTHY UNDERSTORY VERSUS FOOD PLOTS

Some landowners choose to create food plots for wildlife but studies show that a similar high quality and quantity of forage can be obtained by promoting understory health and ground cover – for less cost. Mississippi State University recently compared healthy understory test plots (treated with combinations of fertilizer, herbicide applications, and prescribed fires) with fertilized test food plots. The studies found that intensive understory management with herbicides and prescribed fire provides more forage of higher nutritive value than do food plots. Unlike the planted annuals found in food plots, most native vegetation that flourishes using understory management are perennials and many are drought resistant. Understory management also provides year-round food source for deer and other wildlife, rather than a seasonal source provided by food plots. Thus, management that creates a healthy understory can be less expensive and have better results than planting food plots.



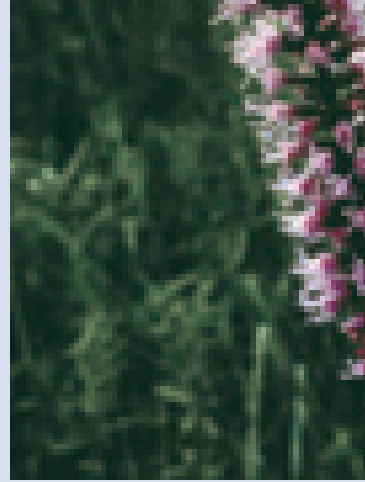
*One of the most popular gamebirds in the country, the Northern Bobwhite has undergone decades of precipitous population decline. It requires a mixture of woodland and grassland, and suffers due to “clean” agriculture and exotic grasses. Photo by Phillip Jordan*

## HERBACEOUS FORBS

Six forbs commonly found in a healthy pine ecosystem are listed below. Forbs are any plant species, excluding grasses, that lack the woody stems of trees and shrubs.



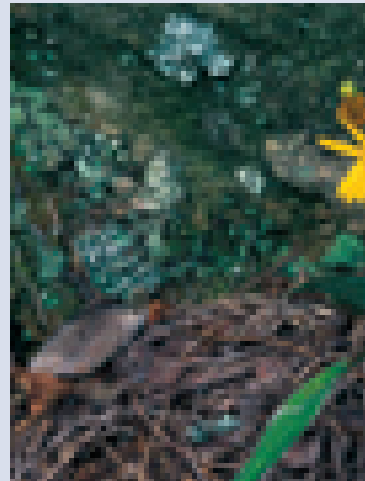
**Devil's shoestrings** (*Tephrosia virginiana*)  
*A lovely white and pink bean of pine woods, that resprouts and blooms after burning. Flowers May-October.*



**Southern blazing star**  
(*Liatris spicata*)



**Butterfly weed** (*Asclepias tuberosa*)  
*Insects and butterflies feed on the copious nectar of this milkweed. Flowers May-August.*



**Grass-leaved golden aster**  
(*Pityopsis graminifolia*)



Source: "Forest Plants of the Southeast and Their Wildlife Uses"  
James H. Miller and Karl V. Miller, 1999.  
Photos by Larry Allain, Thomas Barnes and J. Scott Peterson



A tall, attractive and distinctive flowering plant with spikes of deep violet flowers. Butterflies enjoy the flowers' nectar and songbirds feed on the seeds in fall. Flowers September-November.



**Atlantic pigeonwings** (*Clitoria mariana*)  
This viney legume provides seeds for birds and browse for deer. Flowers June-August.



This perennial resembles grass until July when flowers grow and it is an important food for the gopher tortoise. Flowers July-October.



**Littleleaf sensitivebriar** (*Mimosa microphylla*)  
The leaves of this briar close when touched or moved by the wind, thus earning its name. Its seeds are eaten by the Northern Bobwhite and songbirds. The gopher tortoise is known to regularly consume its foliage. Flowers June-November.



*A mature longleaf stand with native ground cover.*  
Photo by Randy Browning, MFWF/USFWS

## *Choosing a Pine Species*

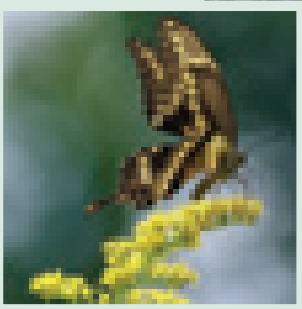
One of the most important decisions a forest landowner makes is which species of pine tree to encourage – either through planting or selective thinning. The decision is an investment that must take into account risks associated with future markets and weather conditions. However, most importantly, the decision should reflect the suitability of each site on your property. You may find that site differences will lead you to work with more than one pine species in upland areas. In Georgia, a forest landowner should always start by identifying a site's soil type. A Natural Resources Conservation Service (NRCS) agent or other qualified resource professional can help you determine your soil type and provide soils maps that contain a wealth of information. Past land uses and recent weather trends are also important to consider when choosing a pine species.

Once you have the necessary information on local conditions, you should discuss species selection with your forester. Because selection of a species is such a major commitment, a landowner should have a basic understanding of what a site is capable of and what desired future conditions are. Then a landowner is better prepared to evaluate a forester's recommendations. A forester may recommend loblolly or slash because he or she has more positive experience with them, even though longleaf may be better suited to a landowner's management goals. On the other hand, recommendations to plant longleaf without proper consideration of soil type can also be made by individuals enamored with longleaf. When discussing the recommendations of your forester, be sure to ask why the recommended species is adapted to your site and how it will maximize your management objectives as the trees mature.

Pines can be separated into two categories for the purposes of discussing management considerations: loblolly and slash, or longleaf. Loblolly and slash pine have served as the workhorses of forest management in Georgia for much of the past century. Longleaf formerly covered much of the Southeast, but fell out of foresters' favor because its regeneration dynamics were not understood when virgin stands were harvested. All three pine species can be managed in a variety of ways. The success of different management strategies is influenced by the dominant pine species in a stand.



*Giant swallow tail butterfly*  
Photo by Phillip Jordan

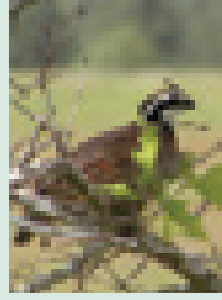


*25-year old planted loblolly stand.*  
Photo by David Stephens,  
[www.forestryimages.org](http://www.forestryimages.org)

## LOBLOLLY AND SLASH PINE

Loblolly will grow almost anywhere but it grows best in the Coastal Plain on soils with poor surface drainage, and a deep surface clay layer with firm subsoil within 20 inches of the soil surface. In the Coastal Plain, productivity decreases as surface drainage increases. Loblolly does poorly on deep, well-drained sandy soils. In the Piedmont, loblolly does best on uneroded soils with a deep surface and friable subsoil. It does poorly on eroded Piedmont soils with clay subsoil exposed or near the surface.

*Northern Bobwhite*  
Photo by Randy  
Browning,  
MFWF/USFWS

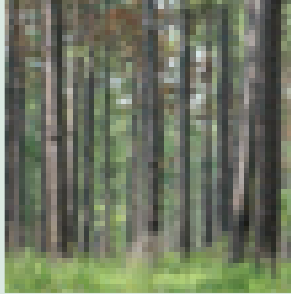


*Male slash pine cones.*  
Photo by Chris Evans, University of Georgia,  
[www.forestryimages.org](http://www.forestryimages.org)

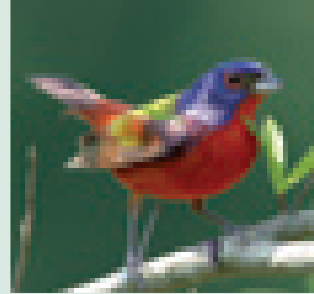
*Swainson's Warbler*  
Photo by Jim Flynn



*Mature pine stand*  
Photo by Drue DeBerry



*Painted Bunting*  
Photo by Jerry Amerson



Slash does well where spodosols (a soil type with heavy clay content) have depth to a clay layer greater than 20 inches from the surface. These are common soils of the flatwoods. They are characterized by light-gray to white sands over dark sandy loam subsoils. Hardpans or fragipans (dense soil layers that are harder than clay) that restrict root growth and downward water movements are common to areas where slash grows. Slash does better than other pines on sites that are very wet and flooded for prolonged periods as they are more tolerant of poor drainage conditions.

**Loblolly and Slash Management Considerations:** Loblolly and slash start vertical growth sooner than longleaf so, in the absence of fire, they are better suited to tolerating early competition than longleaf. However, adequate site preparation is still needed for establishment.

Loblolly and slash have been primarily managed as even-age planted stands during much of the past century. Intolerance of prescribed fires until trees reach a height of 10-15 feet makes uneven-age management and retention of a healthy understory extremely difficult. Loblolly and slash are more susceptible to pine beetles, root rot, and fusiform rust, thus rotation length seldom exceeds 80 years.

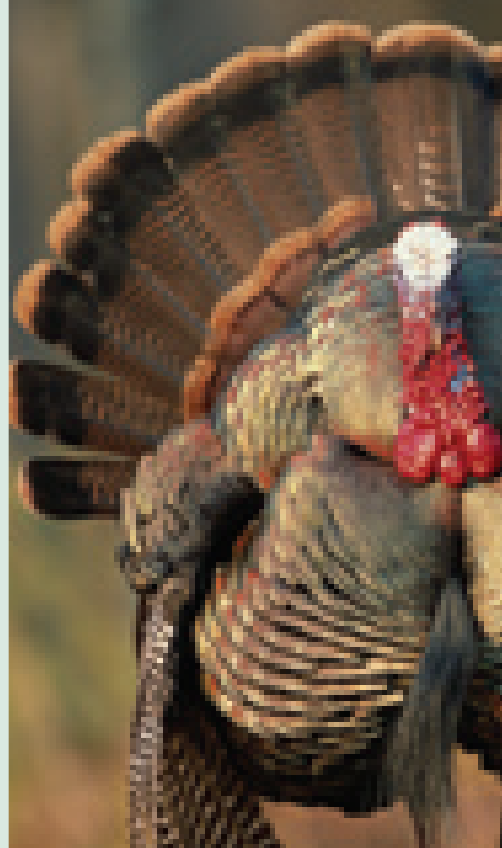
## LONGLEAF PINE

Longleaf prefers well-drained to moderately well-drained light-colored sandy soils that are acidic and low in organic matter. When intensive weed control is used, longleaf does well in more productive loamy soils. Longleaf grows at the same rate as loblolly on poorly drained soils.

### **Longleaf Management Considerations:**

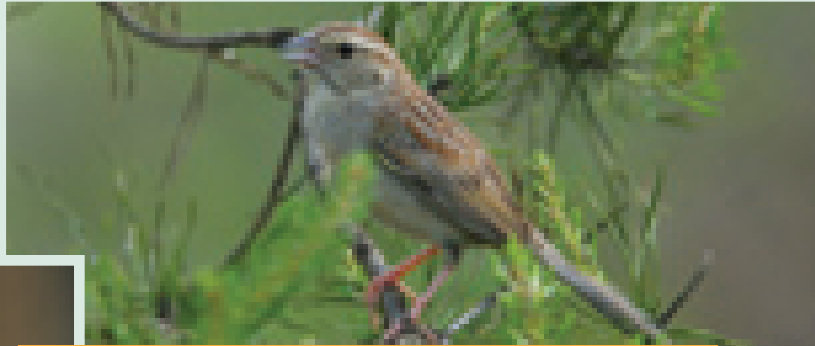
Assuming that a landowner is not lucky enough to start with native longleaf, site preparation is critical to successful longleaf establishment so that competition from vegetation is minimized. If heavy competition is anticipated, application of herbicide followed by a prescribed fire is recommended. In less competitive situations a prescribed fire alone may suffice. Natural stands should be burned at least a few months prior to seed fall to allow the heavy seeds to reach the soil surface.

If vegetation grows over and shades out young longleaf they can remain in the grass stage for an extended period. It is usually advisable to strip head a cool season prescribed fire (set a series of lines of fire upwind of a firebreak) the winter after planting seedlings or when vegetation shades out naturally regenerating seedlings. Early fire also kills brown-spot needle blight. Once young longleaf leaves the grass stage and shoots up it must be protected from fire until it is greater than six feet tall.



*The rebound of the Wild Turkey during the last half of the 20th Century is one of the greatest conservation victories in this country. Work for turkey habitat brings great benefits to many other high priority bird species.*  
**Photo by Phillip Jordan**

*The former name of the Bachman's Sparrow was "Pine Woods Sparrow" and this is clearly indicative of its habitat preferences. It is a year-round resident of Southern pines, particularly longleaf, but is such a reclusive skulker that it is rarely seen outside of springtime, when males sing from exposed perches. Photo by Jim Flynn.*



## LONGLEAF ALLIANCE

The Longleaf Alliance was established in 1995 to coordinate partnerships among private landowners, forest industry, state and federal agencies, conservation groups, researchers, and other enthusiasts interested in managing and restoring longleaf forests for their ecological and economic benefits. It encourages the establishment of functional longleaf forest ecosystems in today's Southern forest environment. The Alliance also serves as a clearinghouse of information on longleaf and the longleaf ecosystem. Membership is comprised of ecologists, foresters, wildlife biologists, landowners, and land managers. To learn more about the Longleaf Alliance, visit [www.longleafalliance.org](http://www.longleafalliance.org), email [longleaf@auburn.edu](mailto:longleaf@auburn.edu), or call 334-427-1029.

Longleaf's tolerance of prescribed fire permits even and uneven-age management strategies while maintaining an open and productive understory. This is one of the many reasons

longleaf is considered the best pine species for overall benefits to wildlife, aesthetics, and timber – on sites that are suitable for growing longleaf.

If you want to transition from loblolly or slash to longleaf you can achieve this by underplanting. This involves either creating an opening in a stand and planting longleaf seedlings, or planting longleaf seedlings in a heavily thinned stand. As long as the remaining trees in the thinned stand are taller than 15 feet, you can continue to use prescribed fire and maintain ground cover.



*A mature stand with a low basal area (BA40)*  
Photo by Ron Masters, Tall Timbers Research Station

# Establishing a Forest Stand

## **SITE PREPARATION PRIOR TO PLANTING**

Site preparation, or site prep as it is more commonly phrased, is the practice of preparing an area so that planted pines will thrive. Site prep is critical to the successful establishment of seedlings as it removes vegetation that would otherwise compete with the young pines as they seek to establish themselves. Controlling early competition is more important when attempting to establish longleaf, but is still very important for loblolly and slash.

A prescribed fire is the most common way to remove woody debris left from a harvest. On more productive sites, herbicide may be necessary to sufficiently decrease competition from vegetation. Intensive mechanical site preparation should be avoided unless attempting to plant in pastures or problematic grass turf because it damages the soil layer and disrupts the distribution of nutrients.



## PLANTING DENSITY

A forest has finite resources – water, light, and nutrients. The number of trees per acre and their size determine each tree's allotment for space and resources. Tree density determines the amount of sunlight that reaches the forest floor and affects the health of understory plants as well as the health of the trees themselves.

When a forest stand is planted, the density of trees is measured by the number of stems (or seedlings) planted per acre. As trees mature and grow larger, it is more useful to measure tree density in terms of basal area (BA).

In making your decision to plant, it's worth noting that using quality seedlings is a worthwhile investment that minimizes mortality. The planting, or stocking, density of a forest stand is a critical decision. The stocking density plays a major role in deciding when you will need to thin the stand.

A stocking density between 350 and 550 stems/acre is recommended to maximize sawtimber production and benefits to songbirds and other wildlife. On the lower end of the range, growth per tree is greater, time until first thinning is longer and wildlife habitat structure persists for a longer period. On the upper end of the range, growth per tree is less, time until the first thinning is shorter, and potential pole production is greater. Ask your forester what stocking density range is practical for your site. This will depend on survival conditions based on past management, soils and drainage, and weather patterns (past, present and predicted) for each site at any given point in time.

In making your decision on planting density, consider when you will first need to thin. For a chip-n-saw thinning, consider also that most mills state trees should be at least 18 years old. However, they often accept them at 14-15 years, and a target date of 15 years from planting is usually feasible.

The trees in a stand will grow vigorously until the canopy formed by the tree tops keeps sunlight from reaching the ground. A closed canopy in a stand provides minimal wildlife habitat value, and at this stage tree growth is also reduced due to intense resource competition. Once the stand is thinned, both wildlife and trees benefit.



*Longleaf shelterwood cut with 15-20 trees per acre.  
Photo by David J. Moorhead, University of Georgia,  
[www.forestryimages.org](http://www.forestryimages.org)*

# Management Strategies

## **EVEN-AGE MANAGEMENT**

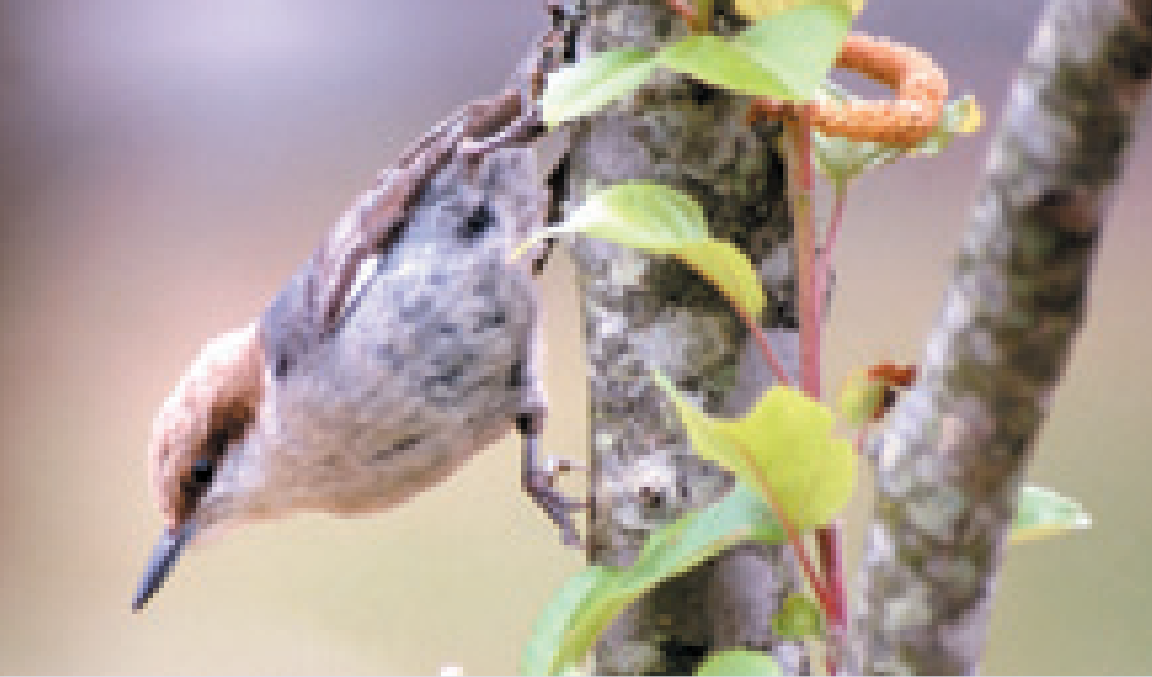
Forest management that creates stands of trees with only one or two distinctive age classes is referred to as even-age management. All three species are equally suited for even-age management. Stand establishment is the biggest investment most landowners make when using even-age management. Site preparation for longleaf is more complex than that for loblolly or slash.

Most commonly, even-age management involves site preparation and planting trees after the harvest of an existing stand, but natural regeneration is another option with longleaf pine. A shelterwood harvest gradually removes trees in two or more heavy cuts and seedlings establish themselves naturally while some adult

trees are still standing. A prescribed fire less than one year before anticipated seedfall will prepare the seedbed. For longleaf, the last harvest should be planned in anticipation of good seed crops within the next two seasons.

Under shelterwood management, remaining mature trees are especially vulnerable to strong winds. Fewer standing trees means less pine needles for fuel and a reduced ability to use prescribed fire. When conducting a final shelterwood harvest, some landowners choose to leave a few mature trees on every acre to create structural diversity while still replanting trees. If mature trees are left over repeated rotations, eventually an uneven-age stand will be created.

*The diminutive Brown-headed Nuthatch forms small family groups that flit through all manner of Southeastern pines. They are permanent residents that forage on branches and leaves high in these forests. Photo by Todd Schneider, Georgia DNR*



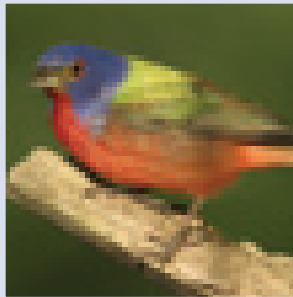
For loblolly, natural regeneration can result in dense young stands (>1500 trees/acre) that greatly limit the quality of early successional habitat. Precommercial thinning is usually required to improve pine growth and habitat. Better early successional habitat in loblolly stands can often be achieved by thorough site preparation, low stocking densities (<500 trees/acre), and wide (>14 ft.) row spacing.

## EVEN-AGE MANAGEMENT AND WILDLIFE

Even-age management creates stands of uniform habitat with less planning and effort than uneven age management. If the stands are of sufficient size (between 20 and 100 acres) and shaped so that the edge or perimeter is minimized, they provide critical early successional habitat until the stand starts to mature. If the ratio of perimeter to area is too large, birds that benefit from habitat created will suffer increased predation by raptors (birds that eat meat). Even-age management mimics natural disturbances like wind throw and catastrophic fire. Birds like the Prairie Warbler, Northern Bobwhite, and Yellow-breasted Chat require early-successional habitat found in abandoned fields, pastures and young forests. As urban sprawl and second home development consume more and more land that once provided early-successional habitat, young forests become more important homes for birds of this type.



*Littleleaf sensitivebriar*  
Photo by Larry Allain,  
USGS



*Painted Bunting*  
Photo by Ty Ivey



*Grass-leaved golden aster*  
Photo by Thomas Barnes,  
USDA-NRCS

## UNEVEN-AGE MANAGEMENT

Uneven-age management is a more hands-on style of management that creates a stand with more than three distinctive age classes of trees. In the past half-century, uneven-age management has been considerably less common than even-age management. Successful uneven-age management requires that the landowner and forester monitor forest conditions more closely than under even-age management. The costs associated with increased involvement by a forester are offset by eliminating planting costs and often by reduced management costs due to less intensive operations and more frequent lower volume harvests that provide income. As landowners learn that uneven-age management provides greater aesthetic and recreation opportunities its use will increase.



Capturing regeneration, or ensuring that pine seedlings succeed in replacing trees that are harvested, is a major challenge of uneven-age management. Longer rotations provide more opportunities to capture regeneration. Obstacles to successful regeneration include prescribed fire which can kill seedlings and sporadic seedling production. All three pine species have an early stage when fire can damage or kill trees, but young longleaf pine are much more tolerant of fire than the other species.

A well-developed standard of uneven-age management for conservation objectives is the Stoddard-Neel method. It is best suited for larger ownerships where generating forest income is not the primary goal. The approach differs from more commonly practiced systems of uneven-age forest management as only a portion of growth is removed and no specific residual structure or volume-based target is specified when harvesting. The Joseph W. Jones Ecological Research Center, located in southwest Georgia, is an excellent source for more information on this system.

*Swallow-tailed Kite*  
Photo by Jim Flynn



*Uneven-age longleaf stand.*  
Photo by William D. Boyer, USDA Forest Service, [www.forestryimages.org](http://www.forestryimages.org)



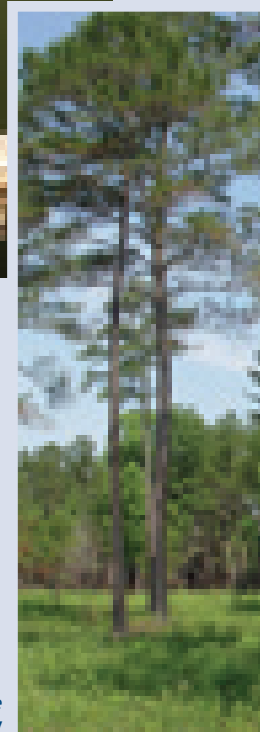
In uneven-age approaches, harvesting removes either single trees (single tree selection), small groups of trees (3-10), or small patches of trees in spots or strips (group selection). In most cases group selection is the most realistic approach for family forest owners. Removing trees without damaging remaining timber requires patience and near surgical precision by the logger. A logger with such skill will likely have higher fees, but this is a sound investment in future timber. The selection is designed to maximize stand diversity and to maintain forest health. Each cutting operation removes trees from all age and size classes. Landowners should beware of the detrimental practice called high-grading where only trees above a certain diameter are removed or harvested.



*The Pine Warbler is one of the more common breeding birds in all manner of Georgia pine habitats. Its trilled song is easy to recognize from high in the tops of pines.*  
**Photo by Phillip Jordan**

If an existing stand is a mixture of pine species and some mature hardwoods, uneven-age management can be used to create a pine stand of predominantly longleaf by removing the less desirable pines and hardwoods in stages. This is not uncommon for stands that have received limited management and insufficient use of prescribed fire.

*Regularly burned stand managed for Northern Bobwhite*  
**Photo by Drue DeBerry**



## UNEVEN-AGE MANAGEMENT AND WILDLIFE

Uneven-age management mimics small-scale natural disturbances. It conserves the range of microhabitats from an early forest to an older forest while providing timber income every five to ten years. When group selection is used microhabitats are created that are very beneficial to wildlife. However, some bird species fare better when there are large contiguous areas of young or old forest habitat and some fare better under even-age management.

## MANAGEMENT AND ROTATION LENGTH

How many years after planting should you harvest? Under even-age management, at 35 years (longer for sites with poor soil conditions) you should have the potential for a healthy economic return from poles and sawtimber. This is especially true if at least one thinning has occurred which in itself could potentially provide income from pulpwood and chip-n-saw. Ideally harvest will occur when sawtimber prices are high. Under uneven-age management the stand is perpetual, but length of time until a tree is harvested for poles or sawtimber is also a consideration. If a stand consists of loblolly or slash it should be harvested around 80 years of age.

Much beyond that, the trees start to suffer from aging and good timber may be lost. On the other hand, longleaf pine timber improves with age (as much as 200 to 300 years) and could conceivably be harvested by your grandchildren or great grandchildren around the time they are considering retirement options.

Uneven-age management is considered to be better practice for a healthy, more complete forest ecosystem (i.e. the community of plants, animals and bacteria). However, when rotation length is extended for even-age management, the resulting benefits to the ecosystem are comparable to those achieved under uneven-age management. As rotation length is extended, periodic thinning will be necessary to allow sun to penetrate the shading canopy to maintain beneficial understory vegetation.





*Prescribed fire and a drip torch*  
Photos by Randy Browning, MFWF/USFWS

## Prescribed Fire

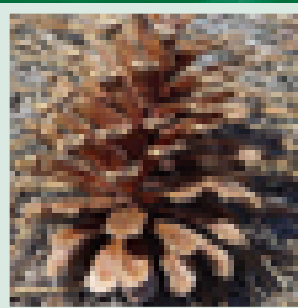
One of the most important forest management tools you can use in a pine forest is fire. Many of the plants and animals unique to Georgia pines require regular fire to provide conditions necessary for their survival. Fire changes the physical structure of the forest and also frees up nutrients in the process. Use of prescribed fire in stands with young trees that can tolerate the heat actually improves timber quality by pruning lower branches.

It is critical to first assess prescribed fire management options based on current conditions and management history of a stand. Prescribed fire should only occur when there is a plan in place and your objectives are known. Post-fire evaluation will help you adapt your fire strategy in the future to better meet your objectives.

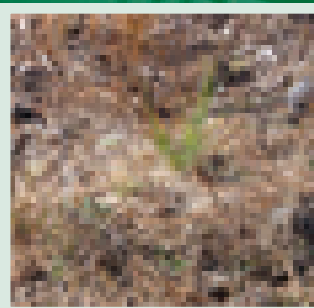




*Growing season burn that killed loblolly and helped longleaf seedlings*  
**Photo by Drue DeBerry**



*Longleaf pine cone*  
**Photo by Drue DeBerry**



*Longleaf after prescribed fire*  
**Photo by Drue DeBerry**

Prescribed fires should be planned and carried out by certified professionals. Your local Georgia Forestry Commission forester, trained land managers, and professional consulting foresters can help you write a fire plan and recommend a certified professional to conduct a prescribed fire. You should use fire with great care in the beginning – gaining experience with cool season fires. As you become more confident using fire, growing season fires will reap great benefits to understory plant species.

A few situations that require special care are worth mentioning. Large trees can be damaged if a stand has not had a fire for many years because leaf litter under the trees encourages fine roots to grow within the litter, making them susceptible to fire. Raking litter out from under trees and a conservative prescribed fire plan will restore the ability of large trees to withstand fire. Anytime a significant fuel load (amount of flammable biomass) has built up, a conservative approach to the reintroduction of fire is essential and will decrease the likelihood of fire becoming a foe instead of a friend.

## **FREQUENCY OF PRESCRIBED FIRE**

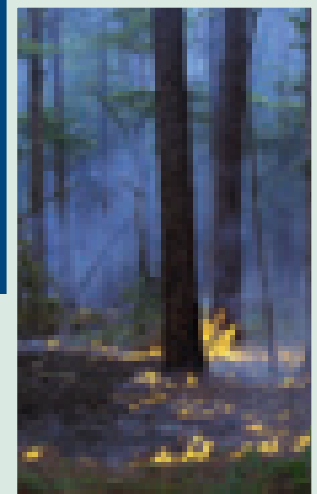
The most important thing about a fire plan is that you burn frequently. If prescribed fire occurs infrequently, hardwoods will stump sprout and undo previous gains by creating an undesirable midstory. The frequency at which prescribed fire is applied depends on timber and wildlife management objectives and site conditions. Generally, prescribed fire should be used in the Coastal Plain of Georgia every two to three years on more productive sites and every four to six years on drier, less productive sites. Depending on conditions, other sites may require longer intervals between fires. More frequent fire (annual or every two years) will severely limit soft mast production (e.g., blackberries, dewberries, American beautyberry), thus removing an important food source for many species.

## GEORGIA PRESCRIBED BURNING ACT

Georgia law recognizes prescribed burning (referred to as prescribed fire in this handbook) as a valuable and beneficial forest management tool and spells out the rights and responsibilities of forest owners. In Georgia, use of prescribed fire is considered a property right of a landowner. Landowners must obtain a permit and are recommended to use a certified prescribed fire professional when conducting a prescribed fire.

The Georgia Prescribed Burning Act also provides important liability protection for landowners. Georgia Code Section 12-6-148 4b states: "No property owner or owner's agent conducting an authorized prescribed burn under this part shall be liable for damages or injury caused by fire or resulting smoke unless it is proven that there was gross negligence in starting, controlling, or completing the burn."

Varying the time of year and frequency of prescribed fire gives understory plants different windows of opportunity when they can flourish, flower, and set fruit. Blackberries, for example, require two or three years (depending on the time of year prescribed fire is used) without burning to produce fruit. The first full year allows the shrub to develop canes and the second allows flowers and fruits to develop. Other species, particularly legumes, will flower and set fruit the first season after burning.



*Prescribed fire*  
Photo by Phillip Jordan

## TIMING OF PRESCRIBED FIRES

There are two seasons when prescribed fires are used - cool season and growing season.

Cool season fires are conducted in the fall or winter when temperatures are cooler, plants are dormant, and the weather is stable compared to the growing season. Cool season fires are easier to control and reach lower maximum temperatures than growing season fires, thus potential for pine damage is less. Improper use of fire can kill trees even during the cool season. Cool season fires are best for reducing fuel loads.

Growing season fires are conducted in the spring or summer when temperatures are warmer, plants and trees are active, and the weather is less stable. Growing season fires should only be used where cool season fires have already reduced fuel levels. Although growing season fires may destroy some bird nests, most species will renest and their reproductive success will usually be greater in subsequent years due to improved habitat conditions. Growing season fires have greater potential to improve understory conditions and decrease hardwood competition. At the same time, growing season fires are more complicated and have a higher risk of damaging pines.

If only cool season fires are used, some understory plants will be favored while others are excluded. As a rule of thumb, growing season fires are only possible if they have been preceded in previous years by regular cool season fires that have lowered fuel loads to a safe level. While growing season fires are more challenging than cool season fires, most biologists will agree that they should be incorporated into management plans if a landowner wants to maximize the health and diversity of the forest understory. However, it is often difficult to conduct growing season fires on forestlands that were previously in

## PRESCRIBED FIRE AND RIPARIAN AREAS

When conditions are appropriate, allowing fire to stop naturally in riparian zones (areas near a stream or marsh) creates a transition area that is highly beneficial to many wildlife species. Under normal weather conditions, as a fire gets nearer to the riparian zone it will decrease in intensity and eventually stop, due to increased moisture of the litter layer and humidity and lower temperatures. If very dry conditions exist, or the amount of forest fuel is high because fire has been excluded from an area, a high intensity fire could burn all the way through the riparian zone and significantly change the habitat.

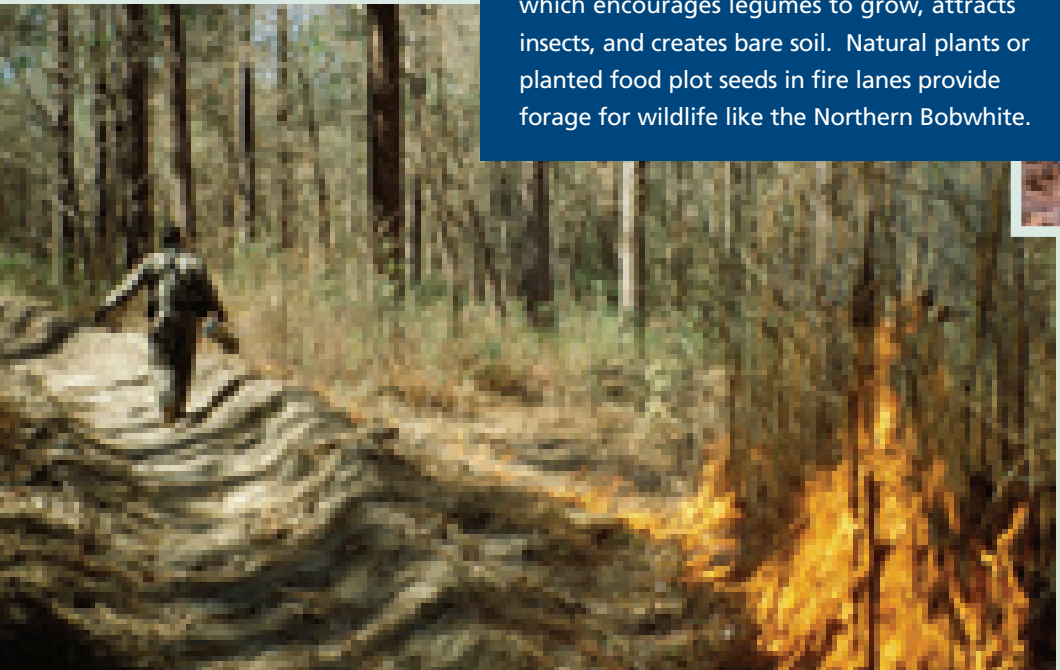
agriculture due to the absence of adequate fuel to carry the fire. In these situations, cool season burns may be the only option until fuel loads increase.

Other factors also influence the intensity of a prescribed fire. The degree to which trees in a stand form a closed canopy is one. Openings in a canopy allow heat generated from a prescribed fire to escape. If the trees in the overstory create a closed canopy, heat will be trapped and reach higher maximum temperatures, potentially causing unwanted damage.

## FIREBREAKS

Firebreaks are natural or constructed barriers that are kept free of woody fuel to stop or check fires. Small, temporary firebreaks can be used to protect seedlings under uneven-age management. Permanent firebreaks such as roads or trails are safe to strip disk without risk of damaging trees. Disking disturbs the soil which encourages legumes to grow, attracts insects, and creates bare soil. Natural plants or planted food plot seeds in fire lanes provide forage for wildlife like the Northern Bobwhite.

*Setting a backing fire along a firebreak.*  
Photo by James H. Miller, USDA Forest Service,  
[www.forestryimages.org](http://www.forestryimages.org)



*Wild Turkey*  
Photo by Phillip Jordan



## **PRESCRIBED FIRE AND YOUNG PINES**

Pines vary in their adaptation to fire. Each species has a young age when fire can kill a sapling. Loblolly, slash, and shortleaf pine are vulnerable to fire until they reach eight years of age (or when trees reach 10-15 feet high). Longleaf in the grass stage tolerates and actually benefits from fire. But, from the time longleaf jumps out of the grass stage until it reaches three feet (known as the bottlebrush stage), it is vulnerable to fire. Between three and six feet it is possible to use a cool season fire as long as it is of low intensity. Once longleaf grow above six feet it is safe to resume use of prescribed fire. To protect young pines, only low intensity fires should be prescribed.

## **PRESCRIBED FIRE AND HERBICIDES**

If fire has been excluded from a stand for many years, it may not be possible to control hardwoods using prescribed fire. Hardwoods in the midstory may be so large that they are not impacted by cool season fires. A thick midstory also creates dangerous fuel conditions.

It may be possible to safely use a cool season prescribed fire, but that will have little effect on hardwoods greater than three inches in diameter at the ground line. An intense growing season fire could potentially reduce the hardwood component, but it might also generate enough heat to kill desired pine trees and potentially turn into a destructive out-of-control fire.

In a situation like this, the most prudent way to restore understory health is to selectively apply herbicide. Using a herbicide that targets hardwoods will reduce the hardwood midstory component without harming valuable pines or beneficial wildlife plants such as grasses, forbs and some vines, and it will reduce fuel conditions to a level where fire can be safely incorporated into future management plans.

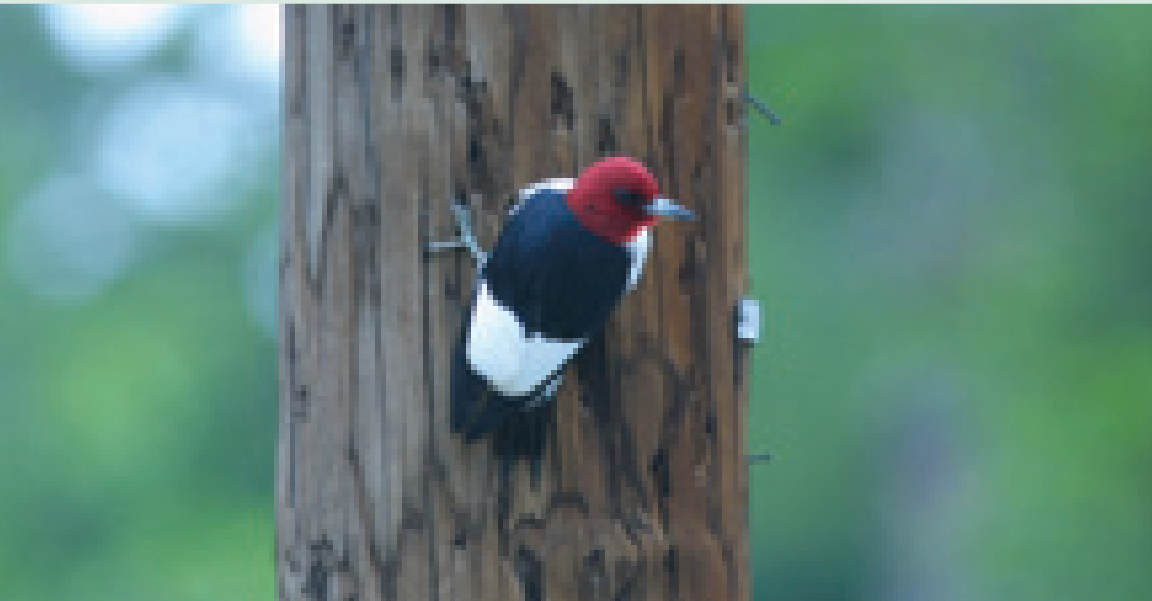
## **ALTERNATIVES TO PRESCRIBED FIRE**

In areas where prescribed fire is not possible due to safety issues, the alternatives are using herbicide alone or mechanical means. Neither alternative has the same ecological benefits burning provides (such as seed scarification, nutrient release, and removal of litter layer) but both will help maintain forest structure and understory health.

Many of today's herbicides are safe and effective when used appropriately. Most herbicides now work systemically on target species, quickly breakdown into non-volatile compounds that won't harm the environment, do not affect water quality, and do not have direct toxicity for wildlife species. Herbicide treatment is expensive – chemicals and their application can run \$100/acre. Fortunately, one treatment will provide benefits for several years, and sometimes only one treatment is needed to regain control of the site to the point where prescribed fire is sufficient.

After treating a stand with herbicide you may be concerned by the dead vegetation, but remember this is only the first step. One year after application, the diversity and abundance of plants will likely still be lower than prior to application. However, after the third year the abundance and diversity should be greater than prior to treatment. Results are greatly improved when it is possible to use prescribed fire after application of herbicide. Also, the dead midstory hardwoods will provide temporary foraging, and possibly nesting sites, for bird species such as woodpeckers.

Mechanical treatment of a forest stand can reduce the hardwood component, but it is quite labor intensive. This makes it an expensive proposition unless the wood can be sold for pulp, low-grade hardwood for pallets and engineered wood products, or for fuel wood operations. In cases where a hardwood sale is not possible, chipping and broadcasting the hardwoods will keep nutrients on site. However, mechanical methods can increase stem density of some hardwood species, such as sweetgum, which are prolific root-sprouters. This may cause a worsening of stand conditions rather than making things better.



*The Red-headed Woodpecker is a bird of hardwood savannahs – grasslands with a low density of interspersed oaks. These savannahs are naturally fire-maintained, but can be created through aggressive forest management. Photo by Jim Flynn*



*Coring a tree is a simple way to determine its age.*  
Photo by Randy Browning, MFWF/USFWS

## *Thinning a Forest Stand*

*“A conservationist is one who is humbly aware that with each (axe) stroke he is writing his signature on the face of the land.”*

Aldo Leopold, 1949

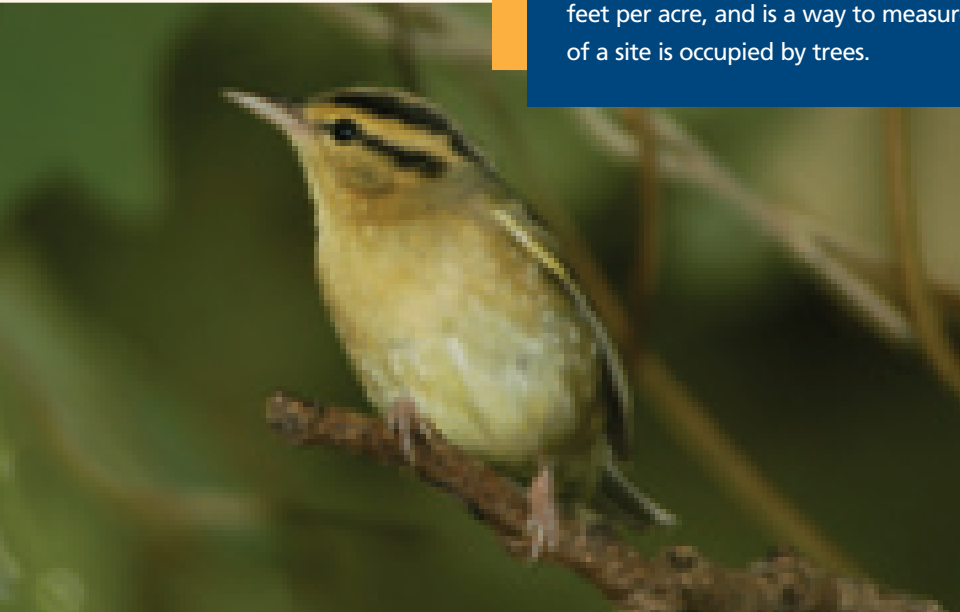
A forest stand is a never ending cycle of life and death. Succession progresses in a stand regardless of what management actions are taken. In terms of providing habitat for birds and other wildlife, structure is the most important feature of a stand at any point in the cycle. Thinning is one of the most important ways you can control forest structure.



## BASAL AREA(BA)

Basal area is the area of the cross section of a tree trunk at breast height, 4 and 1/2 feet above the ground. Basal area can refer to a single tree, a group of trees, or all of the trees in a stand.

It is most often used to describe the collective area of trees per acre, usually expressed in square feet per acre, and is a way to measure how much of a site is occupied by trees.



*The Worm-eating Warbler nests on the floor of dry eastern deciduous forests. Its affinity for worms is questionable, but it does have a foraging peculiarity on its winter grounds, where it picks insects from clusters of dead leaves hanging from branches and vines of tropical forests.*

**Photo by Giff Beaton**

## WHEN TO THIN?

Ideally, the forest canopy in a stand should be thinned before the canopy “closes” and sunlight no longer reaches the forest floor. Hardwoods are controlled with prescribed fire when possible and with herbicides when not. More productive sites (with fertile ground and plentiful precipitation) can support higher basal area (BA) levels and still be productive for timber and wildlife before needing to be thinned. Less productive sites need to be planted and thinned at lower BA levels as competition for resources (nutrients and water) is more intense. Longleaf will support higher BA levels than loblolly and slash and still support a healthy understory.

Generally, where wildlife is an objective, stands should be thinned when BA exceeds somewhere above 90 ft<sup>2</sup>/acre depending on the site, pine species, and wildlife objectives. If the goal of the harvest is to improve timber quality and habitat for most songbirds, a stand will be thinned to 60-80 ft<sup>2</sup>/acre BA. If the goal is to heavily favor species like the Northern Bobwhite that flourish under very open conditions, a stand will be thinned more heavily to 40-60 ft<sup>2</sup>/acre BA.

To really appreciate the impact that thinning has on the understory, you should compare how much sunlight reaches the forest floor at midday before, and then after, a thinning operation.

How do you know if you've thinned enough?

A year after you thin you should see considerable new understory plant growth. If you don't, you didn't thin enough.

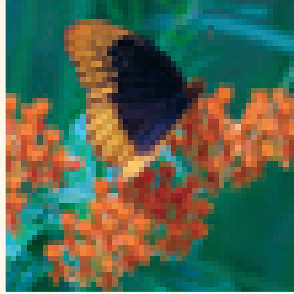
On the other hand, if a stand is thinned too much (below 30 ft<sup>2</sup>/acre BA) you risk losing your source of fine fuels (pine needles) that allows you to maintain a healthy understory. Newly thinned pines are also prone to wind and ice

damage until they strengthen their stems. Higher thinning rates can lead to damaged trees if severe weather occurs within a few years of thinning.



*The Prairie Warbler commonly breeds in early successional habitats and very low density forests throughout Georgia. Virtually all Prairie Warblers spend their winters on the larger islands of the Caribbean.*  
**Photo by Ty Ivey**

*Diana butterfly on butterfly weed*  
**Photo by Jim Flynn**



*Prairie Warbler*  
**Photo by Jerry Amerson**



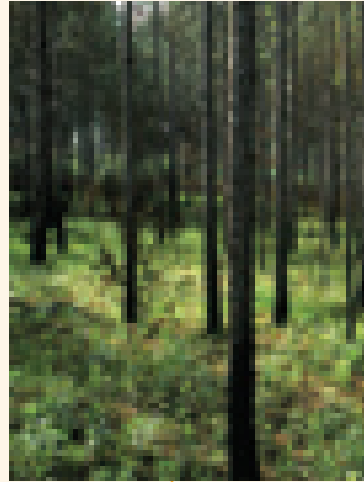
*Unlike all of the other birds featured in this handbook, the Henslow's Sparrow only winters in the Southeast, breeding farther north in Midwestern grasslands. In winter, it depends on open, fire-maintained pine habitat.*  
**Photo by Todd Schneider, Georgia DNR**

The sum of cross-sectional areas of all of the trees at a site, measured at breast height (4.5 feet above the ground), is called basal area. Different basal area conditions, expressed in terms of square feet per acre, are demonstrated in these photos. Each bird species in this system tolerates

BA60-Juvenile



BA80-Juvenile



Henslow's Sparrow



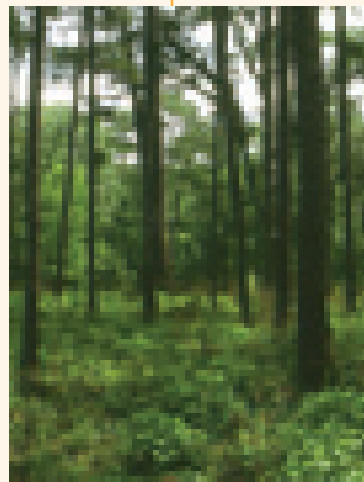
Prairie Warbler



Bachman's Sparrow



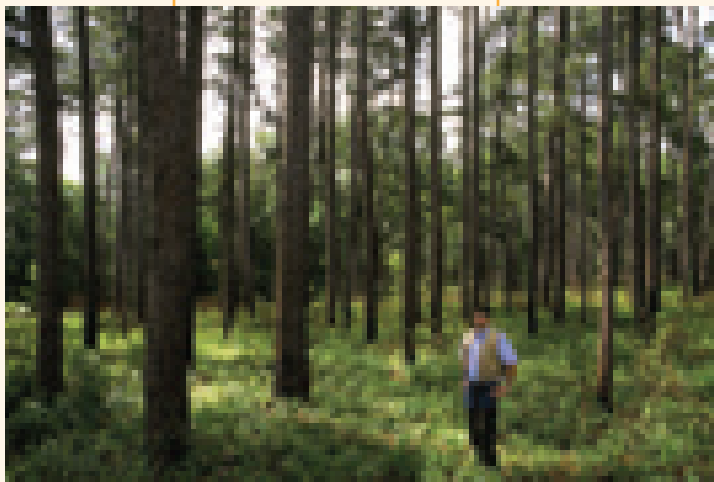
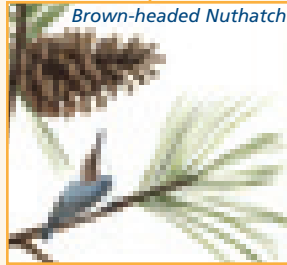
BA60-Mature



BA80-Mature

a particular range of basal areas, although most prefer lower basal areas in which tree density is low. The illustrated birds are placed next to conditions that are near the upper limit of basal area in which they tend to occur. Photos by Ron Masters, Tall Timbers Research Station; Illustrations by Marsha Poling

BA100-Juvenile



BA100-Mature



*Aerial photos provide context of the landscape which helps greatly when planning management activities.*

## *Forest Ecosystem Management and Stand Size*

Two physical characteristics of an upland pine stand – its size and shape – determine the degree to which management will benefit habitat conservation. Larger ownerships provide more opportunities to meet multiple management goals for wildlife and habitat conservation. However, as forested habitat becomes rarer, smaller ownerships are becoming more and more critical.

Many species have minimum habitat size requirements below which they cannot survive. Smaller forest stands support smaller populations, which are more susceptible to eradication due to random events, such as catastrophic weather.

Yet, ten-acre forests can provide critical habitat for many bird species migrating through an area in spring or fall. Even the smallest forest holding may offer critical resting and feeding stopover habitat for migratory birds.

While management of an individual stand can affect the well-being of birds and animals, many of these species also respond to conditions over much larger areas. For this reason, neighboring lands are important for conservation at a landscape level. Although a small forest holding alone may not be able to meet all the needs of a species, the cumulative affect of many small ownerships can have a definite impact at the landscape level. If you encourage your neighbors to undertake beneficial management, you will be multiplying the benefits of your management on your forestland.

## COOPERATION AMONG LANDOWNERS

The Georgia Piedmont Natural Resources Cooperative (GPNRC) was established to promote stewardship of natural resources across a broad landscape and reduce loss of forest and farm land from unmanaged urban growth. The cooperative provides opportunities for landowners with different management objectives to work together for the benefit of natural resources. This cooperation among landowners increases benefits to wildlife species needing large chunks of habitat in areas that have small forest holdings.

The GPNRC is a multidisciplinary partnership between federal, state, and private land owners. It was developed in 1996 as part of a bird conservation initiative of Partners in Flight (a large, diverse cooperative partnership dedicated to conserving bird populations; for more information visit [www.partnersinflight.org](http://www.partnersinflight.org)). GPNRC's goal has been to cooperatively manage habitats at a landscape level to benefit native plant and wildlife communities through sustainable land use practices. Ongoing and proposed activities include establishment of working relations between public and private landowners, mapping and evaluation of existing habitat conditions and land ownership patterns, incorporation of current research into natural resource decisions, development of watershed level management plans, and monitoring and research in the focus area.

To simplify the planning and decision making process, initial GPNRC activities have focused primarily upon birds, but GPNRC's intention is to cover all native plants and animals. It is hoped that this partnership can serve as a model program for other land stewardship partnerships. For more information on the GPNRC call Georgia DNR - Nongame Endangered Wildlife Program at 478-994-1438.

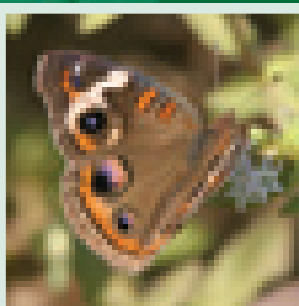


*Eastern whitetail deer.*  
Photo by Phillip Jordan

## *Forest Ecosystem Management and Economics*

Most families cannot afford to sustain a forested property for long without generating some income from the land. Even if the land is fully paid for, annual tax and upkeep expenses can make offers to parcel and sell some land attractive, unless such expenditures can be offset by occasional income. This handbook encourages ecosystem management that improves habitat for birds and at the same time generates income for forest owners, thereby ensuring long-term economic as well as ecological sustainability.





*Common Buckeye*  
Photo by Jim Flynn

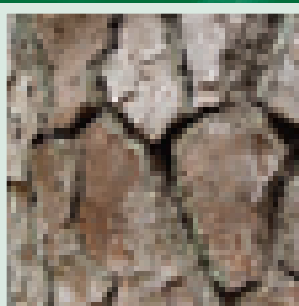


Photo by Drue DeBerry

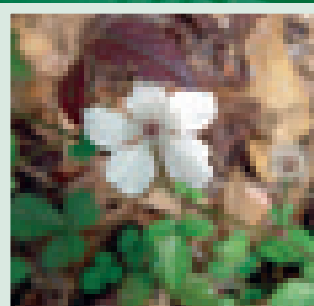


Photo by Drue DeBerry

To help plan a future for wildlife and family forests, this handbook focuses on management with sawtimber and pole production as the primary objective. It used to be that a typical landowner who managed on short even-age rotations to maximize returns from pulp production earned pulses of income from the first thinning at around 15 years (when demand for pulp was higher), from the second thinning at 22 to 25 years, then from a final sawtimber harvest at 30 to 35 years. The income potential from this style of short even-age management has decreased as pulpwood and chip-n-saw prices have fallen and will likely not increase in the future. If a landowner shifts production focus to sawtimber and pole production, overall income does not decrease, but the bulk is realized later in an even-age rotation. If a landowner employs a skilled forester and logger, uneven-age management focused on sawtimber production can also provide income on a par with shorter pulpwood rotations, although on an extended time frame. A sawtimber management regime grows a smaller volume of timber than a pulp management regime, but the timber is far more valuable on a per volume basis than pulp.

## **ECONOMICS OF EVEN-AGE MANAGEMENT VS. UNEVEN-AGE MANAGEMENT**

An even-age management strategy typically follows a simple repeating cycle of plant, thin, and total harvest. The greatest expenses are linked to establishment of new stands of trees (site preparation, planting) and revenue is generated from early thinning (chip-n-saw and potentially pulpwood) and final harvest (sawtimber and poles). Initial stocking density and seedling success rates determine at what age a stand needs to be thinned to encourage growth and maintain wildlife habitat.

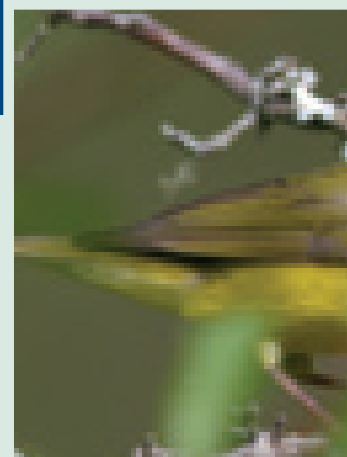
## COST-SHARE PROGRAMS FOR FOREST OWNERS

Forests provide many invisible public commodities. They provide both the greatest quantity and source of highest quality water. Two-thirds of the drinking water supply east of the Mississippi River originates on private forestlands. Forests provide many other environmental benefits including clean air, carbon sequestration, and green space. These “unseen” benefits to the public are supported and encouraged by government cost-share and technical assistance programs.

To learn more visit the Georgia Forestry Commission web site at [www.gfc.state.ga.us](http://www.gfc.state.ga.us) or call 1-800-GATREES. The “Landowner’s Guide to Conservation Incentives” published by Georgia DNR is also an excellent source of information. To obtain their 2nd edition copy (May 2004), call Georgia DNR at 478-994-1438.

An uneven-age stand lacks a definitive beginning or end as there are always a lot of standing trees. An uneven-age stand is one with at least three distinct age classes with seedlings, young trees, and larger old trees. Harvests are smaller than even-age management, but they occur every five to ten years providing regular income. If done properly, uneven-age management is more complicated and requires more frequent guidance and assistance from a forester than even-age management.

Until the transition from even-age management to uneven-age management is complete, both the forest owner and the forester have to adjust their financial planning for each stand. It can take years before a stand reaches the stage where sawtimber can be harvested on a regular basis during which time both parties may receive less income than they would have under an even-age management regime. However, once uneven-age management is in place both the landowner and the forester benefit from steady income.



A number of studies have been done comparing the economic return of even-age versus uneven-age management. Some studies suggest that even-age management maximizes timber production while others highlight that timber quality and growth under uneven-age management is always increasing. Many forest owners who change a stand from even-age to uneven-age management find that, even if there is a reduction in income, the maintenance of aesthetics and wildlife habitat more than compensate for this.

## ALTERNATIVE SOURCES OF INCOME

Timber sales are the most common way to generate forest income, but there are a number of alternative sources as well. Raking pine straw can prove to be lucrative for landowners with longleaf pine. The long needles are in high demand for landscaping. Often a private contractor will pay landowners for the right to collect

needles. Contractors collect needles using hand crews or mechanical rakes. A common raking cycle is to rake one year, use prescribed fire the next and rest the site during the third year. It is important to maintain sufficient pine needle biomass to support the prescribed fires that create favorable conditions for raking. Raking can also decrease ground cover, disturb nesting sites, and eliminate important seed and fruit producing plants. An area that is raked too frequently will provide decreasing returns until it is no longer a viable activity.



*One of the most attractive birds of bottomland hardwoods and other deciduous forests is the Hooded Warbler. These birds tend to be associated with treefall gaps, both on their Southeastern breeding grounds and their winter range in lowland rainforests in Mexico and Central America.*  
**Photo by Jerry Amerson**

As recreation pressures increase on public lands in Georgia, opportunities grow for forest owners. Wildlife leases allow lessees the right to hunt on your land and assist you in keeping poachers off of your land. Some landowners ask lessees for a certain amount of labor like assistance with prescribed fires (supervised by a qualified professional) in lieu of payment. Other landowners generate between \$2-\$25 per acre per year on leases, depending on the quality of hunting and distance to major urban areas. All lessees should be required to have liability insurance.

A forest with a healthy, open understory provides quality recreation and more creative landowners may choose to market to other outdoor recreation groups like birders or horse riders.



*One of the rarest birds of the Southeast is currently the Red-cockaded Woodpecker; it is the only bird in Southern pines listed under the Endangered Species Act. Its rarity is based on its need for mature longleaf pine forests maintained by regular fires. Photo by Phillip Jordan*

## Regulatory Assurances for Forest Owners

The U.S. Department of Agriculture ranked Georgia second in the nation for the amount of farmland and woodland being converted to subdivisions, malls and other development in 2000. The increasing loss of rural lands to urban sprawl makes every remaining acre of forestland more important to wildlife.

The most practical long-term means to keep the greatest amount of forestland in trees is through the practice of sustainable forestry. Fire-maintained, southern pine forests produce both ample wildlife populations and income from timber harvests.

Some landowners worry, however, that managing southern pine forests in ways that benefit rare wildlife can also result in increased regulation under the federal Endangered Species Act if, as a result of good land stewardship, endangered species take up residence on their property. Since the Act prohibits destruction of occupied habitat, many landowners fear that doing good by endangered species may cost them the flexibility to manage their property as they wish. For this reason, the U.S. Fish & Wildlife Service (USFWS) provides some regulatory assurances that encourage forest owners to conserve wildlife habitat while still producing timber products.



*One of the biggest challenges for birdwatchers is identifying the species in the group that includes the Acadian Flycatcher. Fortunately for birds in the Southeast, the Acadian is the only member of this group that stays beyond spring migration to breed in the region.*  
**Photo by Jim Flynn**

## SAFE HARBOR AGREEMENT

A Safe Harbor Agreement is an excellent tool for landowners when federally threatened or endangered species are present. It was first developed in the North Carolina Sandhills for the Red-cockaded Woodpecker and is now available in Georgia as well. Under the program, landowners agree to protect existing populations of endangered species and to undertake proactive conservation measures to benefit those species. In the Sandhills, landowners might agree to use prescribed fire, plant longleaf pine, protect mature trees as possible nest sites, drill artificial cavities, or conduct other activities that benefit the woodpecker. In exchange, the landowner receives an assurance from USFWS that if the population of woodpeckers on the property increases, the landowner will not be subject to additional regulation under the Endangered Species Act.



Photo by Drue DeBerry

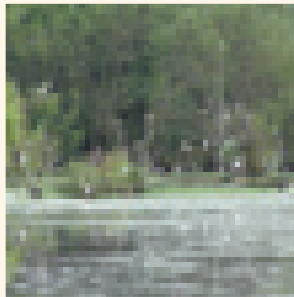


Photo by Drue DeBerry



Photo by Drue DeBerry



Safe Harbor has been well received by landowners. Over 600,000 acres of southern pineland in Georgia, North Carolina, South Carolina, Texas, and Virginia are enrolled in the program. This collective area contains more than a quarter of all Red-cockaded Woodpeckers found on private lands. Nationwide, well over 3 million acres are enrolled in over a dozen states for a variety of endangered species. Safe Harbor is benefiting 36 endangered and threatened species because landowners are able to roll out the welcome mat for rare animals and plants while continuing to manage their lands for timber, crops and/or livestock.

## CANDIDATE CONSERVATION AGREEMENT WITH ASSURANCES

A Candidate Conservation Agreement with Assurances (CCAA) is the tool of choice when a landowner wants to address the conservation needs of a species that is at risk, but is not federally listed as endangered or threatened. The agreement

## ATTAINING A REGULATORY ASSURANCE AGREEMENT FOR SPECIES AT RISK

For a current list of species at risk in Georgia, or for information on setting up a Safe Harbor or Candidate Conservation Agreement, contact the Georgia Department of Natural Resources (GA DNR), Nongame-Endangered Wildlife Program, 116 Rum Creek Drive, Forsyth, GA 31029, phone 478-994-1438.

The GA DNR Landowner Incentive Program (LIP) has technical and cost-share resources available to help landowners develop agreements for at-risk species.

The GA DNR currently focuses these funds on riparian areas in the Conasauga and Etowah river basins, the Lower Flint River Basin, and in south Georgia for Red-cockaded Woodpeckers.



*Atlantic pigeonwings*  
Photo by Thomas Barnes,  
USDA-NRCS

details management activities (e.g. prescribed fire) that will significantly benefit a particular species and therefore eliminate the need to list the species as at risk. Landowners entering into CCAAs receive assurances that their conservation efforts will not result in future regulatory obligations beyond those they agree to at the time they enter into the Agreement.

In almost every case a single landowner's activities will not create sufficient habitat to ensure the future of a species, so the rule of thumb USFWS asks with regard to CCAA is: "What if a number of landowners throughout the range of the species engaged in the same management activities?" If the collective conservation benefit across the landscape will significantly contribute to the elimination of the need to list the target species, then USFWS decides that a CCAA is worth pursuing. In effect, this provides landowners an opportunity to demonstrate that their collective conservation efforts can keep a species from becoming endangered.

Landowner tools like Safe Harbor and Candidate Conservation Agreements with Assurances are, of course, entirely voluntary. Many landowners find they provide a useful insurance policy that allows them to be good stewards of their land without having to worry that they might run afoul of the Endangered Species Act.



*Bottomland hardwoods*  
Photo by Drue DeBerry

## *Other Management Considerations for Wildlife*

### **SNAG CAVITIES AND DEN TREES**

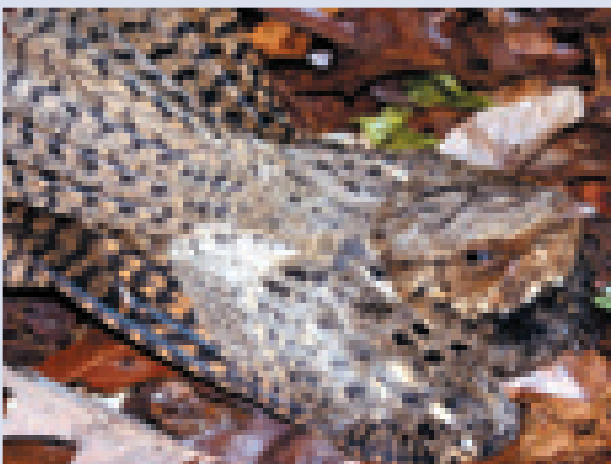
Snags are standing dead trees that are used by many species of insects, birds, and mammals for feeding and nesting. In fact, over 47 species of vertebrates have been found associated with snags in the Southeastern U.S. Snags are especially important to cavity-nesting birds for breeding and foraging habitat. A snag that has fallen continues to contribute to ecosystem health as a log by providing food and shelter for different wildlife. To maintain diversity, try to maintain one to two snags per acre. Some landowners choose to clump snags together so that they are easier to operate around. You will find that larger snags deteriorate, and therefore



fall, more slowly than smaller snags. If you need to create a snag, the easiest way is to girdle the tree by cutting through the bark and cambium all the way around the tree. This prevents the passage of nutrients, killing the tree. Be aware that snags near firebreaks can pose a danger because they are quite flammable. Future snags, or “green trees”, can be created by leaving several trees, preferably hardwoods as they last longer than pine, after harvest. Over time, these trees will die and provide valuable habitat. A general rule of thumb is that hardwood snags are better than pine snags and bigger snags are better than smaller snags, as they last longer and provide homes for a wider diversity of species.



*Eastern fox squirrel.*  
Photo by Phillip Jordan



*The call upon which the name “Chuck-will’s Widow” is based is a haunting characteristic of summer evenings in Southeastern forests. In Georgia, this species is more common in open pine forests while its relative, the Whip-poor-will, is more typical of deciduous forests.*  
Photo by Todd Schneider,  
Georgia DNR

## HARDWOODS

A healthy pine forest in the Atlantic Coastal Plain consists of pine uplands with fire-maintained ground cover and few hardwoods. However, hardwood trees can increase the diversity of a forest and benefit a variety of wildlife species. For example, oak, beech, hickory, dogwood, and black gum trees are all mast-producing species whose nuts and berries provide a valuable food source to numerous songbirds, fox squirrels, deer, turkey, and other wildlife. Maintaining one mast-producing hardwood per five acres of upland habitat will benefit wildlife without significantly decreasing pine productivity.

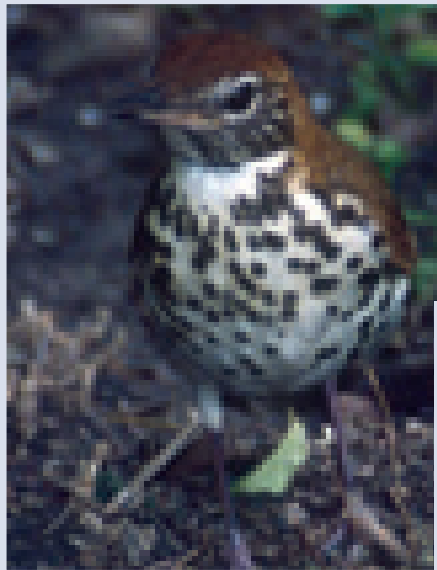
Many properties include riparian areas and bottomlands where hardwoods can and should thrive. These areas have significant wildlife value and contribute to the habitat diversity of a property.

## STREAM BUFFERS AND BIRDS

Stream buffers conserve water quality and unique forest habitat adjacent to flowing water. This riparian habitat is unique and needed by a whole host of species adapted to this type of environment. In Georgia, birds like the Hooded Warbler, Kentucky Warbler, Wood Thrush, Acadian Flycatcher, Louisiana Water Thrush, and Wild Turkey all benefit from healthy riparian habitats.

The health of a riparian habitat is protected by establishing a buffer area around the water source. The larger the stream, the larger the buffer area should be. In Georgia, the state recommends Best Management Practices (BMPs) to protect water quality and riparian habitat. Georgia BMPs suggest that buffers be protected by designating Stream Management Zones (SMZs) that are marked and in place prior to timber harvesting near riparian areas. Some harvesting may be desirable

*Steady declines in Wood Thrush populations were among the early causes for general concern about the status of birds that breed in eastern deciduous forests and winter in the Neotropics. It has been learned recently that although adults breed in mature forest, young fledged birds do best in thick early successional patches. Photo by Giff Beaton*



in the SMZ, but the tree canopy should be fairly closed with little direct sunlight reaching the forest floor. This maintains the moist, cool environment that riparian species need.

## BOTTOMLAND FORESTS

Swallow-tailed Kites breed in the southeastern U.S. and spend their winters in South America. They require bottomland forests (low-lying forests along a watercourse) for nesting, roosting and foraging habitat. This small hawk is quite distinctive with a V-shaped tail. Swallow-tailed Kites capture and eat insects in midair, as well as plucking insects and lizards from treetops.

Mature forest habitat in riparian areas is critical for the Swallow-tailed Kite. The bigger the trees, the better. "Bull" pines (very large, old loblolly) are thought to be the preferred nesting sites for the kites.

The Georgia DNR is working to locate and monitor nests, establish habitat associations, and determine the nesting success of the Swallow-tailed Kite. For more information on the Georgia Swallow-tailed Kite initiative, contact Georgia DNR Wildlife Resources Division at 912-265-9336.

*No bird requires greater expanses of forest habitat in the Southeast than the Swallow-tailed Kite. They forage for snakes and lizards over bottomland hardwoods, but tend to nest high in pine trees on adjacent uplands. Photo by Todd Schneider, Georgia DNR*





Photo by Chris Evans, University of Georgia,  
[www.forestryimages.org](http://www.forestryimages.org)

# The American Forest Foundation

This handbook was produced by *Forested Flyways*, part of the American Forest Foundation's (AFF) national habitat conservation program – Forests for Watersheds & Wildlife™ (F<sup>2</sup>W<sup>2</sup>).



Chartered in 1982, AFF ([www.forestfoundation.org](http://www.forestfoundation.org)) began with the purpose of developing and administering programs that encourage the long-term stewardship of the environment and our natural resources. AFF is a 501(c)(3) nonprofit education and conservation organization working for healthy forests, quality environmental education and helping people make informed decisions about our communities and our world. AFF is supported by individual contributions and by grants from foundations,

government agencies and corporations. Strong and diverse partnerships, and committed volunteers in every state drive its programs. AFF depends on their energy, insight and spirit to fulfill its goals.

AFF's programs are: American Tree Farm System® – a national network of more than 53,000 family forest owners and 5,000 volunteer foresters ([www.treefarmssystem.org](http://www.treefarmssystem.org)); Forests for Watersheds & Wildlife™ (F<sup>2</sup>W<sup>2</sup>) – a national habitat conservation program ([www.forestedflyways.org](http://www.forestedflyways.org)); and Project Learning Tree® – an international environmental education program for teachers working with grades K-12 ([www.plt.org](http://www.plt.org)).

Half of the forest in the United States is owned by families and private individuals. Small, family-owned properties make up 72% or 17 million acres of Georgia's total forestland. One of the goals of the American Forest Foundation is to stop the loss of healthy and productive forests – forests that provide clean air and water, green space and critical wildlife habitat; that ensure a sustainable supply of wood and paper products; that support rural economies; and enrich our quality of life. AFF's outreach and education programs nurture and promote the power of private stewardship on family forestlands and prepare citizens to make thoughtful, reasoned decisions about the future of forests, and related natural resources.

The habitat conservation program of AFF – Forests for Watersheds & Wildlife – works with partners and family forest owners to conserve and create critical habitat for imperiled wildlife species. Through *Shared Streams* and *Forested Flyways* initiatives, F<sup>2</sup>W<sup>2</sup> generates and coordinates wildlife and watershed conservation efforts on family forestlands and leverages their impact through a variety of outreach methods, for example, landowner hosted field workshops, family forest owner handbooks, self-guided conservation trails, and conservation awareness and recognition signs.



AFF's American Tree Farm System (ATFS) is the oldest and largest conservation, education, certification and advocacy program for family forest owners in the United States. Since its founding in 1941, ATFS has recognized and encouraged sustainable forest management on private forestland. These thought-leaders of the family forest owner community help F<sup>2</sup>W<sup>2</sup> reach out to the greater family forest owner community, raising awareness and spurring other landowners to action. In Georgia, ATFS has 1,978 Certified Tree Farms that make up 2.6 million acres. For more information about the American Tree Farm System in Georgia, call 478.992.8110 or visit the ATFS website at [www.treefarmssystem.org](http://www.treefarmssystem.org).

# Partners and Sponsors

This handbook was made possible with grant support from Georgia Power, Home Depot Foundation, and the National Fish & Wildlife Foundation. The handbook is one part of a far-reaching *Forested Flyways* conservation initiative for birds in Georgia that brings together the following conservation partners with family forest owners to conserve forest habitat for birds.



The American Bird Conservancy's mission is to conserve wild birds and their habitats throughout the Americas. It is the only U.S.-based group dedicated solely to overcoming the greatest threats facing birds in the Western Hemisphere. [www.abcbirds.org](http://www.abcbirds.org)

The American Tree Farm System is a program of the American Forest Foundation that promotes the growing of renewable forest resources on family forest lands while protecting environmental benefits and increasing public understanding of all benefits of productive forestry. [www.treefarmssystem.org](http://www.treefarmssystem.org)



*Forested Flyways* is part of Forests for Watersheds & Wildlife, the habitat conservation program of the American Forest Foundation. *Forested Flyways* works with conservation partners and family forest owners to conserve and create critical habitat for imperiled wildlife species. [www.forestedflyways.org](http://www.forestedflyways.org)

The Georgia Department of Natural Resources works to sustain, enhance, protect and conserve Georgia's natural, historic and cultural resources for present and future generations, while recognizing the importance of promoting the development of commerce and industry that utilize sound environmental practices. [www.gadnr.org](http://www.gadnr.org)



The Georgia Forestry Association is the leading advocate for forestry in the State of Georgia. We are an issues oriented organization that provides leadership, environmental education, information, forums, and other support to promote the responsible use of Georgia's forests. [www.growgfa.org](http://www.growgfa.org)

The Georgia Forestry Commission provides leadership, service, and education in the protection and stewardship of Georgia's forest resources. [www.gfc.state.ga.us](http://www.gfc.state.ga.us)



The Power of Flight program supports bird conservation efforts in Georgia, Alabama, Florida, and Mississippi -- one of the many ways Georgia Power and Southern Company work to ensure the Southeast remains a great and environmentally healthy place to live, now and for the future. [www.southernco.com/planetpower](http://www.southernco.com/planetpower)

The Home Depot Foundation supports organizations building strong, healthy communities through responsible forest management, which helps ensure a healthy environment as well as a sustainable supply of resources to produce affordable and efficient housing. [www.homedepotfoundation.org](http://www.homedepotfoundation.org)



The Joseph W. Jones Ecological Research Center at Ichaaway seeks to understand, to demonstrate, and to promote excellence in natural resource management and conservation on the landscape of the southeastern coastal plain of the U.S. [www.jonesctr.org](http://www.jonesctr.org)

The National Fish and Wildlife Foundation conserves healthy populations of fish, wildlife and plants, on land and in the sea, through creative and respectful partnerships, sustainable solutions, and better education. [www.nfwf.org](http://www.nfwf.org)



The U.S. Fish & Wildlife Service works with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. [www.fws.gov](http://www.fws.gov)

The USDA Forest Service is the federal leader in providing technical and financial assistance to landowners and resource managers to help sustain the nation's forests and protect communities and the environment from wildland fires. [www.fs.fed.us](http://www.fs.fed.us)





# Glossary of Terms

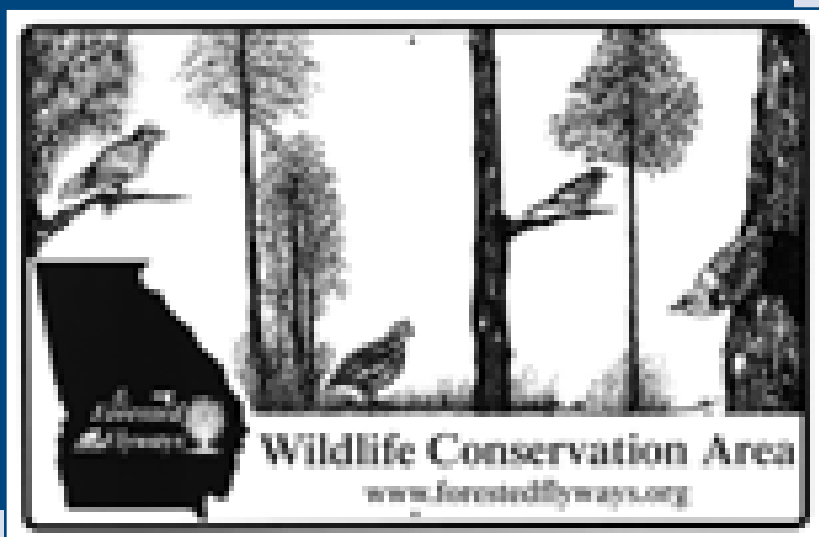
- Basal area:** The area in square feet of the cross section at breast height of a single tree, a group of trees, or all of the trees in a stand, usually expressed in square feet per acre.
- Best Management Practices (BMPs):** Forest management measures designed to protect surface and ground waters.
- Chip-n-saw:** Harvest of medium size (8-10") trees capable of supplying logs (suitable for the production of dimension lumber) and chips (for pulp, papermaking and certain engineered wood products).
- Chipping:** Reducing the amount of woody debris or slash by using a portable chipping machine. Chips decompose faster than woody debris.
- Cool season fire:** Fires that occur during cooler winter season or early spring. They are useful for reducing fuel levels, but are usually not intense enough to thoroughly control hardwoods.
- Disking:** The vertical slicing of plowed soil using a tractor attachment of sharply-edged disks.
- Ecosystem:** The interaction of a community of organisms (plants, animals, bacteria, fungi, etc.) with their physical environment.
- Even-age management:** Forest management that results in stands with less than three age classes of trees.
- Firebreak:** A strip of land maintained clear of trees and woody fuel used to stop or control the spread of fire.
- Forbs:** Plants that are not grass-like and have a soft stem, rather than a permanent, woody one.
- Ground cover:** Small plants other than trees that grow on the forest floor.
- Growing season fire:** Fires that occur during warmer spring and summer months.
- Hardwoods:** Trees that are deciduous (lose leaves at the end of growing season). They tend to have broad leaves.
- Legume:** Any plant from the pea family. They are best known for fixing nitrogen and provide a good source of vegetable protein for wildlife.
- Mast:** Fruits or nuts that are eaten by wildlife.
- Poles:** Straight trees that are used for telephone poles.
- Pulpwood:** Wood used in the manufacture of paper, fiberboard or other wood fiber products.
- Sawtimber:** Trees, or logs cut from trees, suitable for conversion to lumber.
- Scarification:** When a seed surface is scratched or abraded, water and oxygen enter the seed and it starts to germinate.
- Shelterwood harvest:** A method of harvesting that gradually removes trees in two or more heavy cuts. This allows seedlings to establish themselves while some adult trees are still standing.
- Site preparation:** The treatment of an area to prepare the soil surface as a seedbed for trees. Mechanical, chemical, and fire treatments may be used.
- Successional habitat:** Early-successional habitat is composed primarily of young, small trees. Late-successional habitat consists primarily of larger, mature trees. Mid-successional habitat falls between the two.
- Thinning:** Selectively cutting trees reduces tree density, removes trees of poor form and low vigor, and improves the remaining forest stand.
- Understory:** Small trees, bushes and plants that grow under the canopy of a forest
- Uneven-age management:** Forest management that results in stands with at least three distinct age classes of trees.

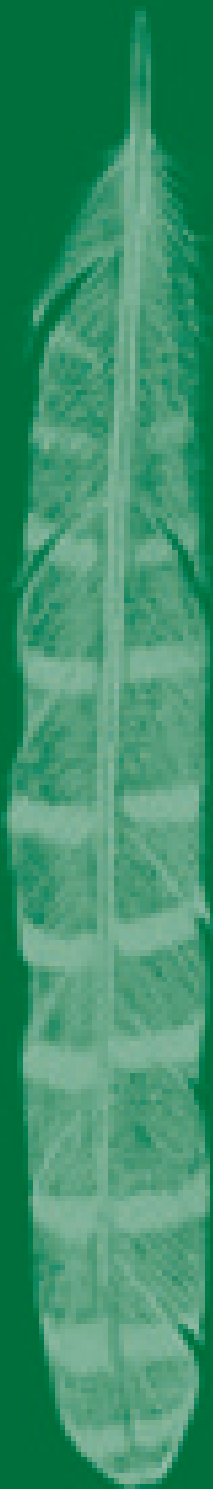
# Bird Conservation in Georgia Awareness Sign

This handbook aims to encourage and motivate landowners to engage in forest ecosystem conservation for birds in Georgia. If you are following the conservation practices described in this handbook, please let us know. We will send you a 12" by 18" aluminum sign that you can post on your property to raise public awareness and provide recognition of your efforts.

Management information provided by you for individual properties will be kept confidential. Such information will only be reported and promoted collectively. It is used solely for grant reporting purposes and to promote the collective impact of the *Forested Flyways* conservation program on the ground. Providing such information will help us find financial and in-kind support for future efforts that help family forest owners.

Let your neighbors know that you are making a difference and helping wildlife. To receive a Bird Conservation in Georgia awareness sign apply online at [www.forestedflyways.org](http://www.forestedflyways.org) or call 202-463-2462.

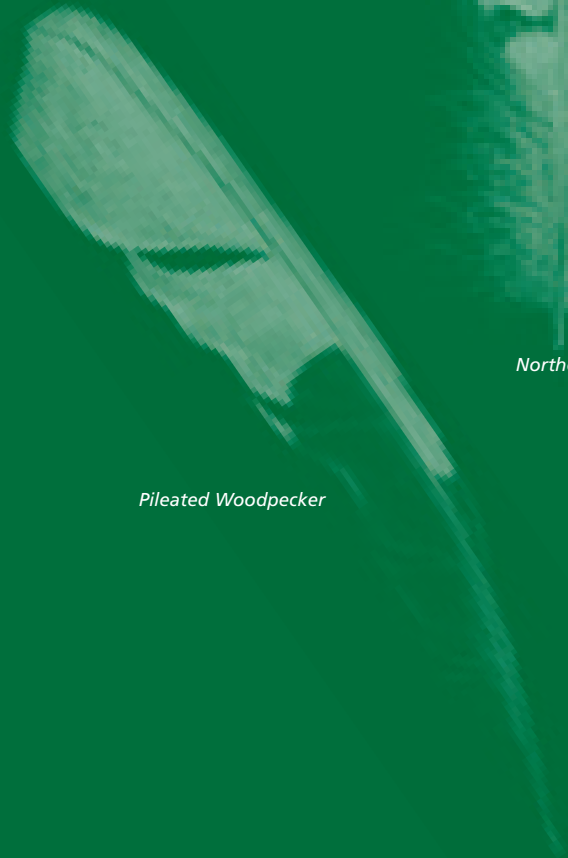




*Blue Jay*



*Northern Bobwhite*



*Pileated Woodpecker*



*Northern Flicker*



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[www.forestedflyways.org](http://www.forestedflyways.org)

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