

Woodland Owner Notes

Developing Wildlife-Friendly Pine Plantations

Wildlife benefit landowners in many ways. Some people enjoy luring deer, rabbits, turkey, and bobwhite quail to their property. Some like to hunt game. Others simply enjoy watching the animals in their natural habitats.

When it comes to attracting wildlife, the owners of pine plantations have a special challenge. Without proper management, most plantations lose much of their plant and animal diversity as they age.

However, increasing landowner interest in wildlife management has prompted natural resource professionals to seek ways to improve pine plantations as wildlife habitat. This publication details strategies that can provide a suitable habitat for many wildlife species without significantly reducing timber production or cash flow.

Develop a Management Plan

Before beginning wildlife habitat improvement, develop a management plan. This helps define the steps needed to ensure that your original land management objectives are met. The plan should include maps and descriptions that provide a record of the original status of a property and enable assisting professionals to target areas for improvement.

Because each action taken to manage a pine plantation has an associated impact on the stand's potential to attract wildlife and produce forest products, you should answer certain questions and specify objectives before creating a management plan. Each property is unique and requires specific recommendations. A registered forester or professional wildlife biologist can help find the right combination for you and your property. Below are some important questions to answer.

Where does wildlife management rank in your list of objectives? If you rank timber production above wildlife management, then you must consider the loss of timber production resulting from wildlife management. Creating grassy food plots or disked openings within a pine plantation may enhance the value of the stand for deer, turkeys, and rabbits; however, these openings are made and maintained at the expense of pine trees and future timber production.

How complete is your property as a wildlife resource? North Carolina landowners should be aware of the limitations and shortcomings of their properties. For example, some properties contain poor soils unsuitable for certain wildlife species. On properties adjacent to metropolitan areas, management of pine plantations for large game, such as deer and turkey, may be difficult and may conflict with adjacent landowners' objectives. Pine plantations on converted agricultural lands contain fewer plant species than plantations on previously forested

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sites and may require remedial measures to provide sufficient food and shelter for wildlife.

Which wildlife species are you targeting? No pine plantation, or any other forest type, can provide quality habitat for all wildlife species. Therefore, you should identify selected wildlife species before management recommendations can be made. For example, burning every 3 to 5 years will benefit white-tailed deer by promoting nutritious browse. However, bobwhite quail management requires burning more frequently.

How much will this cost? Management for wildlife is not free. Disking openings, planting food plots, prescribed burning, and applying herbicides cost money. Although these activities may improve timber production, their costs typically will not be justifiable for timber production alone. Consultation with a professional and planning, however, will help minimize these costs.

Plant Variety and Structure

Intensively managed pine plantations generally lack the plant variety and structure of natural pine stands. Therefore, activities that increase plant variety and structure will most benefit wildlife. The presence of a variety of plant species will provide a variety of wildlife foods that are available throughout the year. A forest stand with vertical and horizontal plant diversity (structure) yields a diverse and abundant animal community in a pine

plantation. Having plants in all vertical layers allows ground-, shrub-, and treetop-dwelling wildlife to exist in the same horizontal space (See Figure 1). Having different tree heights and ages on your property provides alternative food and cover sources. Grasses, forbs, shrubs, and vines growing on or near the ground are especially important because many animals are confined to the forest floor. Low-growing plants provide fruits and seeds as food, cover for nesting and protection, and leaves for browsing. Taller, older trees provide nesting sites for treetop songbirds and produce acorns and fruits eaten by many animals.

Site Preparation and Early Management

The number of wildlife species is greatest in stands less than 10 years old. Young pine plantations provide dense protective cover low to the ground where most wildlife live. Wildlife-friendly stands of this age are rich with fruiting plants, such as blackberry, and provide nutritious browse for white-tailed deer and rabbits. To increase plant variety, structure, and food in young pine plantations, use these management strategies:

- ▶ Do not prepare the site as intensively.
- ▶ Leave woody debris on the ground or pile it into windrows to provide cover and food for a variety of wildlife species (See Figure 2).

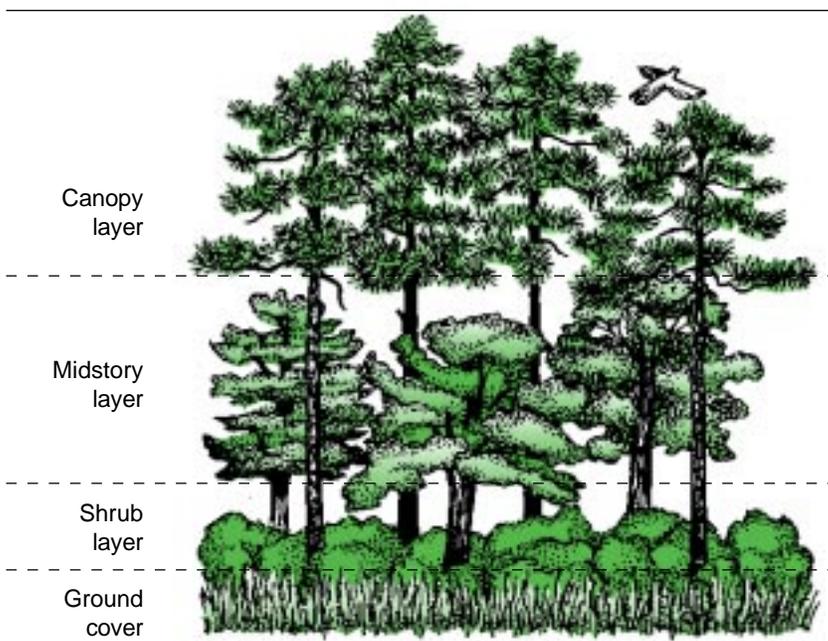


Figure 1. A forest with well-developed vertical structure (left) generally supports a greater diversity of wildlife than a forest with most vegetation in one stratum.

Figure 2. Windrows (below) and brushpiles provide food and cover for a variety of wildlife species.



- ▶ Reduce control of non-pine plants during early-growth periods by applying herbicides along the planted rows of trees and not in the areas between rows (banded application).
- ▶ Plant pines at wider spacing, usually at least 10 feet by 10 feet apart or wide enough to accommodate management activities like disking in rows. If bedding, use wider bed spacing, leaving vegetation undisturbed between beds.
- ▶ Intersperse slower-growing tree species, such as oaks, among pines OR underplant native grasses, forbs, or legumes, especially on plantation margins, roads, and ditches.
- ▶ On appropriate sites, plant longleaf pine because its growth form allows herbaceous plants to germinate in the understory and it tolerates burning better and earlier than other pine species.
- ▶ Plan for prescribed burns by installing and maintaining wide firebreaks around the plantation.

Mid-rotation Management

As densely stocked plantations mature and the canopy closes, shaded understory vegetation dies, food production decreases, cover is reduced, and overall habitat quality declines. That is why many people use the phrase “biological desert” to describe mid-rotation pine stands (See Figure 3). At this stage, management activities that increase sunlight in the forest understory benefit wildlife the most. Increased sunlight on the forest floor promotes herbaceous plant and shrub growth, which provide fruits and browse beneficial to animals, such as songbirds, deer, turkey, bobwhite quail, and rabbits. Before the canopy of a plantation closes and the stand becomes overstocked:

- ▶ Thin early and often; consider precommercial thinning.
- ▶ Thin to allow sunlight to penetrate the canopy (use basal area of 60 to 80 feet² per acre or lower if managing for bobwhite quail).
- ▶ Leave better-formed oaks because they provide acorns and withstand light understory burning.
- ▶ Create openings of 1 to 5 acres and disk or burn them once every 2 to 3 years if your pine plantation is larger than 50 acres.
- ▶ Thin areas adjacent to wildlife openings more heavily to give wildlife cover from predators.
- ▶ Prescribe burn every 3 to 5 years once planted pines are 15 feet tall (earlier for longleaf pines), or burn every 1 to 3 years if you favor bobwhite quail.
- ▶ Disk firebreaks and mow between widely spaced rows every 2 to 3 years.
- ▶ Apply herbicides and prescribe burn after mid-rotation thinning to promote herbaceous ground cover and remove undesirable hardwoods like sweetgum and red maple.



Figure 3. An unthinned pine plantation (above left) can shade out understory vegetation, reducing food and cover for wildlife. Thinning allows sunlight to reach the forest floor, which promotes the growth of understory shrubs and herbs valuable to many animals (above right).

Late-rotation Management

Plantations that are more than 30 years old can become too dense. In older pine stands, understory vegetation becomes sparse, and wildlife foods are absent. To attract wildlife:

- ▶ Continue thinning to allow sunlight to reach the forest floor (using basal area of 60 to 80 feet² per acre or lower if managing for bobwhite quail).
- ▶ If thinning to low basal areas conflicts with timber management objectives, limit heavier thinning to the first 50 to 100 feet from the edges of haul roads, wildlife openings, and fields.
- ▶ Continue burning every 3 to 5 years, making sure to intersperse the stands that are burned in any year.
 - Fire increases production of fruit by shrubs and vines beginning 3 years after the burn and ending 5 years after the burn.
 - Fire makes leafy browse more nutritious for 1 to 2 years after the burn.
 - Fire promotes growth of legumes, grasses, and forbs favored by wildlife.
- ▶ Where safe, leave dead trees (snags) for cavity-nesting birds and squirrels.
- ▶ Maintain 1- to 5-acre, irregularly shaped grassy openings or leave wide strips within stands, especially if there is little or no open habitat.
- ▶ Align strip openings with management roads, creating a wider area for sunlight to enter adjacent plantations and to allow easy access for maintenance.

Harvest Techniques

The final harvest gives you the opportunity to make improvements for wildlife in the next rotation. Consider these harvest strategies:

- ▶ Leave residual snags or large-diameter live stems as wildlife trees for the next rotation.
- ▶ Leave hollow and non-commercial logs, treetops, and logging debris on site after harvesting. As remnant logs and slash decay, they promote growth of fungi, which are an important phosphorus source for white-tailed deer; attract insects, which serve as food for other wildlife; provide cover for small mammals, salamanders, and snakes; and help return nutrients to the soil.
- ▶ Leave hardwood stands along streams and in low-lying areas to increase acorn and fruit production and to provide travel corridors for mature woodland species like wild turkeys and gray squirrels.
- ▶ Use irregularly shaped harvest boundaries to maximize the edge.

- ▶ Use shelterwood harvests, which leave some mature trees in the overstory, to be harvested 5 years after the initial harvest or during the late stages of the next rotation.
- ▶ Limit clearcuts to less than 50 acres, especially where a high percentage of the landscape is in intensive pine timber production.

Landscape Considerations

In the past, wildlife biologists and foresters made management recommendations one stand at a time. However, the distribution of certain wildlife species is affected by the arrangement (interspersed) of stand types and ages on the surrounding land. Some animals need more than one type of habitat to survive. For example, a young forest opening without hardwoods nearby may not attract turkeys because the birds need both mature hardwood stands and young forest openings when raising young. Understanding the relationship between your target species and the surrounding landscape will help improve the effectiveness of your wildlife habitat improvements.

To determine the composition of the surrounding lands, review aerial photographs or a U.S. Geological Survey quadrangle map. The best option is to develop a partnership with neighboring property owners. As partners, the group could set goals and plan how to provide the greatest benefit to wildlife. For example, each landowner could plan to create a unique habitat (e.g., duck impoundment, grassy field, or oak stand). Landscape management requires planning and consideration of the following strategies (See Figure 4):

- ▶ Consider your property as a part of the larger surrounding landscape when developing a wildlife management plan.
- ▶ Vary your management intensity in landscapes where pine plantations are plentiful.
- ▶ Mix stands of different ages and forest types.
- ▶ Maximize the number of coverts (areas where three habitat types meet), which attract an abundance of wildlife.
- ▶ Maintain buffers that are more than 100 feet wide on each side of streams as travel corridors for wildlife, and plant pines to link hardwood stands isolated by development or agriculture.
- ▶ Use longer rotations for pine plantations along creeks, streams, or rivers.
- ▶ Plant young pines to link older, isolated pine stands.
- ▶ Minimize timber management on special sites like home sites, cemeteries, or historical areas.
- ▶ Leave buffer strips that are at least 50 feet wide along roads to screen the view of timber harvests, or harvest these zones 5 to 10 years after the initial harvest.

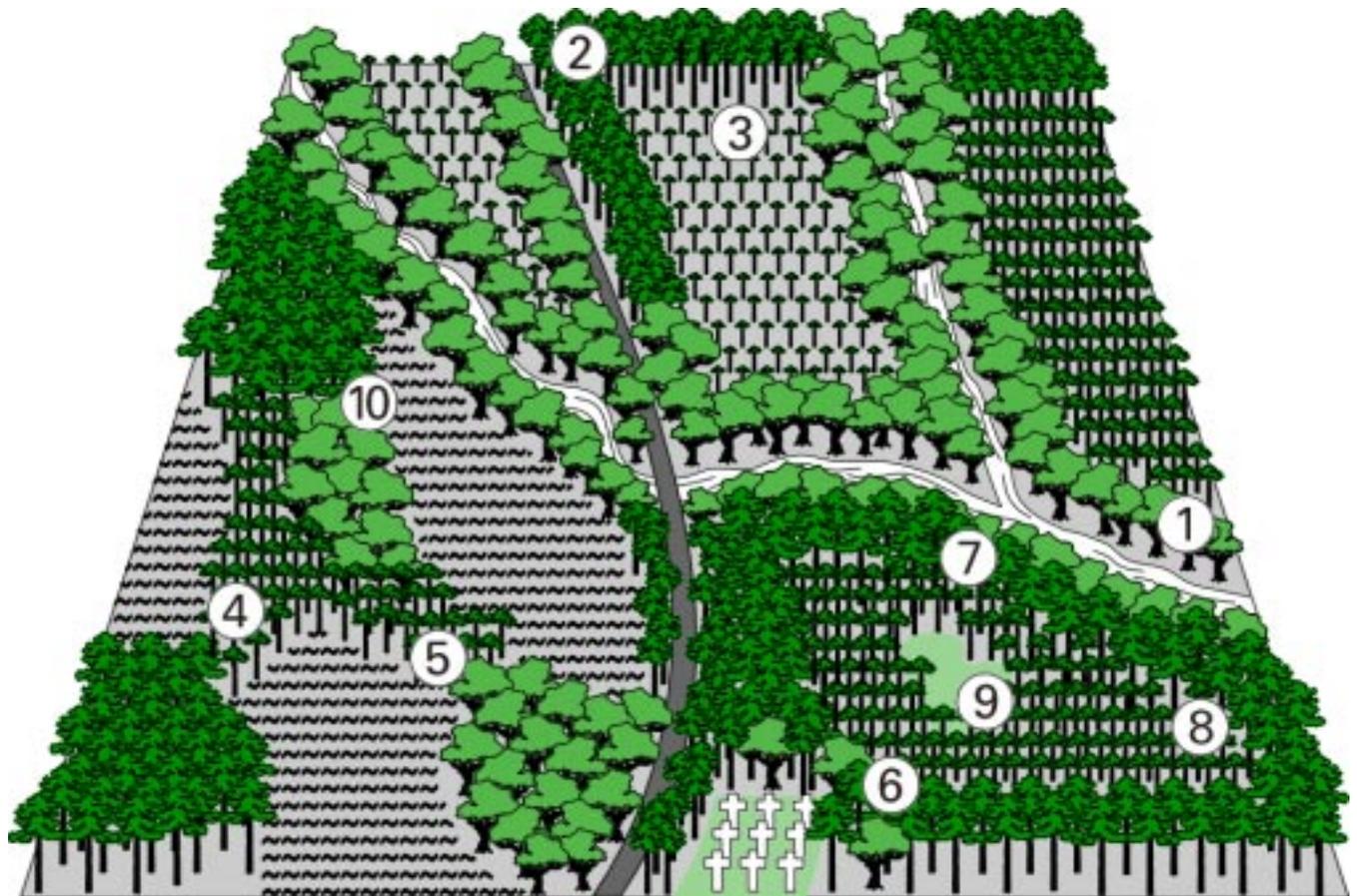
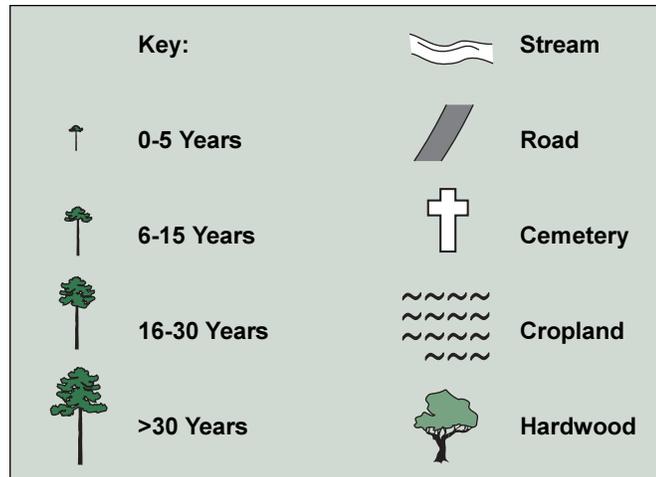


Figure 4. Consider the landscape surrounding each pine plantation when making management decisions.

- 1) Leave hardwoods standing along ditches, streams, and rivers.
- 2) Leave a 50-foot forested buffer adjacent to roads to help screen the view of harvesting.
- 3) Limit clearcuts to less than 50 acres.
- 4) Plant pines to link older, isolated pine stands.
- 5) Plant pines to link isolated stands of hardwood.
- 6) Leave mature stands around special sites like cemeteries.
- 7) Manage pines adjacent to streamside buffers on longer rotations.
- 8) Intersperse pines of different ages as much as possible.
- 9) Maintain irregularly shaped, 1- to 5-acre grassy openings within plantations.
- 10) Maximize the number of coverts (areas where three habitat types meet).

Edge Maintenance and Consideration

Edges usually are home for a greater variety and number of plants and animals than interior areas. Edges have dense plant growth, and animals spending time there have simultaneous access to two habitat types. Because edges are linear, many predators travel along them while searching for prey. Normally, prey are abundant along edges because of the dense cover and variety of food sources. However, edges vary in quality as wildlife habitat, and wildlife abundance varies with edge quality. To improve edges for wildlife:

- ▶ Skip 30 to 50 feet (3 to 5 rows of trees) at the margin of old fields or clearcuts when planting pines.
- ▶ Manage these unplanted borders or any edge between a plantation and an adjacent stand by disking every 2 to 3 years OR by planting *native* wildlife foods (See Figure 5).
- ▶ Maintain firebreaks and roads within and along the edge of plantations in grassy cover by disking or mowing in late winter or early spring.
- ▶ Time harvests to maximize the age difference between adjacent stands. The greater the difference in age between adjacent stands (edge contrast), the greater the diversity and abundance of wildlife likely to be present.
- ▶ Thin more heavily along edges adjacent to fields, food plots, or permanent openings to create dense escape cover for prey.

Herbicides and Fertilization

Increasing demands for forest products and rising land prices have forced many North Carolina landowners to grow trees more efficiently. Two methods that improve growth in pine plantations are fertilization and herbicide use. Herbicides, which control vegetation, are tested extensively before being registered by the U.S. Environmental Protection Agency and are relatively nontoxic to wildlife when used according to label directions. Applying single herbicides at very high rates or applying tank mixes of several different herbicides normally kills most non-pine plants, reducing plant diversity and structure for a period of time. The most obvious visual impacts on wildlife habitat generally last for only 1 year after herbicide treatment. If properly applied, both fertilizers and herbicides can be used to enhance habitat quality.

Fertilization

- ▶ Fertilize to help pines grow faster and to improve the quality of deer browse, especially where soils are poor.
- ▶ Do not apply too much nitrogen, which may prohibit legume germination.
- ▶ Fertilize early in the rotation or after thinning to maximize the benefits to understory plants browsed upon by deer and rabbits.

Herbicides

- ▶ To prevent total control of competing vegetation, avoid herbicide tank mixtures that kill *all* non-pine plant species (See Table 1).
- ▶ Use herbicides that do not injure or kill preferred wildlife plants like legumes and blackberry.
- ▶ Use herbicide release treatments as soon after planting as possible because many wildlife species depend on the plant variety and structure that develop before crown closure.
- ▶ Hand apply herbicides around individual trees or use band or spot application techniques.
- ▶ Make aerial herbicide applications in combination with prescribed fire after several thinnings to kill midstory hardwoods and shrubs and to increase forest floor herbs and legumes valuable to wildlife.
- ▶ Do not apply herbicides to low-lying hardwoods, ditches and streambeds, or standing water within or adjacent to plantations.

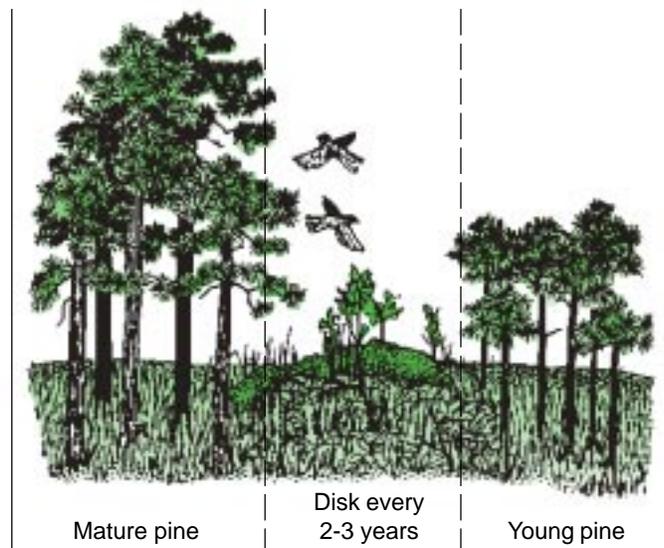


Figure 5. Disk or mow firebreaks, roads, or edges between adjacent stands every 2 to 3 years.

Table 1. Herbicides commonly broadcast over large areas at once have the greatest impact on wildlife habitat. Although individual or groups of plant species often can tolerate single herbicide applications, tank mixes of the following herbicides can eliminate all non-pine species for a period of time.

Active Ingredient	Soil Activity	Product Name and Application Rate/Acre	Tolerant Non-pine Species	Labeled Tank Mixes*
Imazapyr	Medium	Arsenal (12-24 oz) Chopper (24-48 oz)	Legumes, blackberry, redbud, wax myrtle, buckeye, and elm	Glyphosate, Triclopyr, Metsulfuron methyl, Sulfometuron methyl
Hexazinone	High	Pronone (10-40 lb) Velpar (1-3 gal)	Some grasses and woody vines, poplar, hollies, blackgum, sassafras, eastern redcedar, and American beautyberry	Glyphosate, Picloram, Imazapyr, Triclopyr, Metsulfuron methyl, Sulfometuron methyl
Sulfometuron methyl	High	Oust (2-6 oz)	Some grasses and woody vines	Glyphosate, Imazapyr, Hexazinone, Atrazine
Triclopyr	Low	Garlon (1-8 qts)	Grasses, black cherry, eastern redcedar	Glyphosate, Imazapyr, Picloram, Hexazinone
Metsulfuron methyl	High	Escort (0.5-2 oz)	Most hardwoods	Glyphosate, Imazapyr, Hexazinone
Glyphosate	None	Accord (2-5 qts)	Woody vines, black cherry, hickory, and dogwood	Metsulfuron methyl, Triclopyr, Imazapyr

*Commonly recommended tank mixes used to control the tolerant non-pine species. Several three-herbicide combinations also are approved for use.

Conclusion

Management of pine plantations for both profit and wildlife habitat requires substantial planning and investment. However, these efforts can be surprisingly successful and rewarding. Left unattended, pine plantations become extremely poor wildlife habitat after crown closure. Management techniques that increase the diversity of plants, especially along the ground or in the understory, benefit wildlife. Ask a professional forester or wildlife biologist to help you develop a management plan and to improve wildlife habitat in your pine plantations. The financial costs associated with improving wildlife habitat in plantations may be partially or fully covered by state and federal cost-share programs. For more information, contact the North Carolina Wildlife Resources Commission, the North Carolina Division of Forest Resources, the Natural Resources Conservation Service, your county Cooperative Extension agent, or a consulting forester.

Additional Resource Materials

For more information, request the following Woodland Owner Notes (WON) or agricultural (AG) publications from your local Cooperative Extension Service Center. Some Woodland Owner Notes publications are on the Internet at:

<http://www.ces.ncsu.edu/nreos/forest/woodland/catalog.html>

For more information about agricultural publications, visit the Internet at:

<http://intra.ces.ncsu.edu/EdResources/Publications/>

- ▶ *Thinning Pine Stands*, WON-13
- ▶ *Site Preparation Methods and Contracts*, WON-15
- ▶ *Steps to Successful Pine Plantings*, WON-16
- ▶ *Enrolling in North Carolina's Forest Stewardship Program*, WON-23
- ▶ *Wildlife and Forest Stewardship*, WON-27
- ▶ *Management by Objectives: Successful Forest Planning*, WON-32
- ▶ *Planting Your New Stewardship Forest*, WON 37
- ▶ *Wildlife and Prescribed Burning*, AG-457
- ▶ *Accomplishing Forest Stewardship with Hand-applied Herbicides*, AG-530

Recommendations for the use of chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services in this publication does not imply endorsement by North Carolina State University, North Carolina A&T State University, or North Carolina Cooperative Extension nor discrimination against similar products or services not mentioned. Individuals who use chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain current information about usage regulations and examine a current product label before applying any chemical. For assistance, contact an agent of North Carolina Cooperative Extension.

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