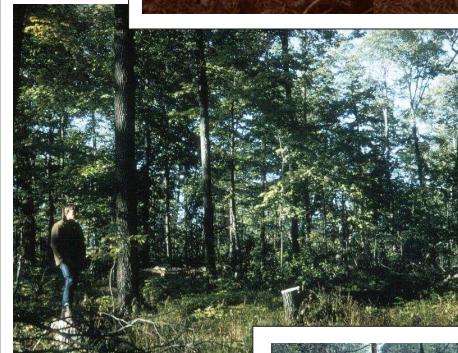


A Family Forest

**A planning guide to protect, enhance
and manage private forestland.**





"Landowners care deeply for the forests that make up and surround their homes and properties. How we collectively treat the forest will shape the future beauty, diversity, air, and water quality that we all receive from our forest. Our forests face increasing pressure to provide public benefits while producing clean air, beautiful countryside, wildlife habitat and the forest products that make North Carolina unique. This guide helps you review the protection and management options available for your forest. A series of questions and comments will help you set goals and select the best course of action for your property.

The strength and resiliency of North Carolina's forests depends upon the diversity and objectives of the 700,000 private

individuals like you! A FAMILY FOREST guide is a tool, ideal for sharing with family and friends. Once you settle on the course you'd like to take, contact one of the many resource professionals who can guide you toward your goals."

Stan Adams, Director, Division of Forest Resources

"Civilization is a state of mutual and interdependent cooperation between human animals, other animals, plants, and soils, which may be disrupted at any moment by the failure of any of them."

Aldo Leopold (1933)

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A Family Forest
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What can A *FAMILY FOREST* do for me?

It can help you:

- ◆ Evaluate the environmental benefits of your forestry choices;
- ◆ Focus your goals;
- ◆ Review sound stewardship practices;
- ◆ Protect clean water and the environment;
- ◆ Begin to create a plan that works for you!

Getting Started:

READY ... Contemplate your options.

SET... Review your constraints / Redirect your options.

GO... Contact a professional for assistance and a plan.

A Forest is More than Just Trees

A forest is made up of many natural resources. Forests include trees and other plants, wildlife, water resources, and soil. All of these resources are inter-related. Each species existence is influenced and modified by the others. Trees take a long time to grow, so today's decisions have long-term impacts on wildlife, water quality, and other resources. A FAMILY FOREST helps you envision what your forest can be, and directs you to the professional(s) who can help you get there.

Your decisions are influenced by many things, including your family situation, income needs, philosophy about land ownership and the environment. You have to consider your resources, skills, time constraints and applicable regulations in your location. It's also important to consider the characteristics of neighboring forests, especially as they relate to wildlife, water and beauty. Once you have considered these factors, talk with a resource professional to create a flexible plan for you and your heirs to follow. A plan can protect and enhance your forest with minimal input and impact.

A healthy forest isn't always untouched. Changes in land use, vegetation structure and composition, and wildlife populations; infestations by insects or disease; and changes caused by weather or catastrophic events all can lead to forest decline. To maintain a healthy forest that meets your needs, some management is usually required.

Where to begin?

The first step is to evaluate your property's physical attributes, your management objectives, and the steps you can take to safeguard the environment (we do this by following **Best Management Practices**). This evaluation helps you determine your starting point. A resource professional can help you with this process. Some questions you need to answer are:

What are your goals? (Check all that apply)

- | | |
|---|---|
| <input type="checkbox"/> Clean Water | <input type="checkbox"/> Income |
| <input type="checkbox"/> Hunt / Fish | <input type="checkbox"/> Timber Production |
| <input type="checkbox"/> Firewood | <input type="checkbox"/> Soil Protection |
| <input type="checkbox"/> Reduced Tax Burden | |
| <input type="checkbox"/> Protection from Development | |

What are your resource priorities?

This will assist you in making choices to balance your desires for managing your forest. Wanting income through timber production need not be in conflict with environmental concerns. It is possible to maintain wildlife habitat and clean water while managing for timber using a flexible plan.

Rank your preferences in order of importance (1 being the most important and 5 being the least):

Wildlife	_____
Water Protection	_____
Recreation	_____
Beauty (Aesthetics)	_____
Soil Protection	_____
Timber Production	_____
Other: _____	_____

After you read through this guide, fill out the questions on the back inside cover.



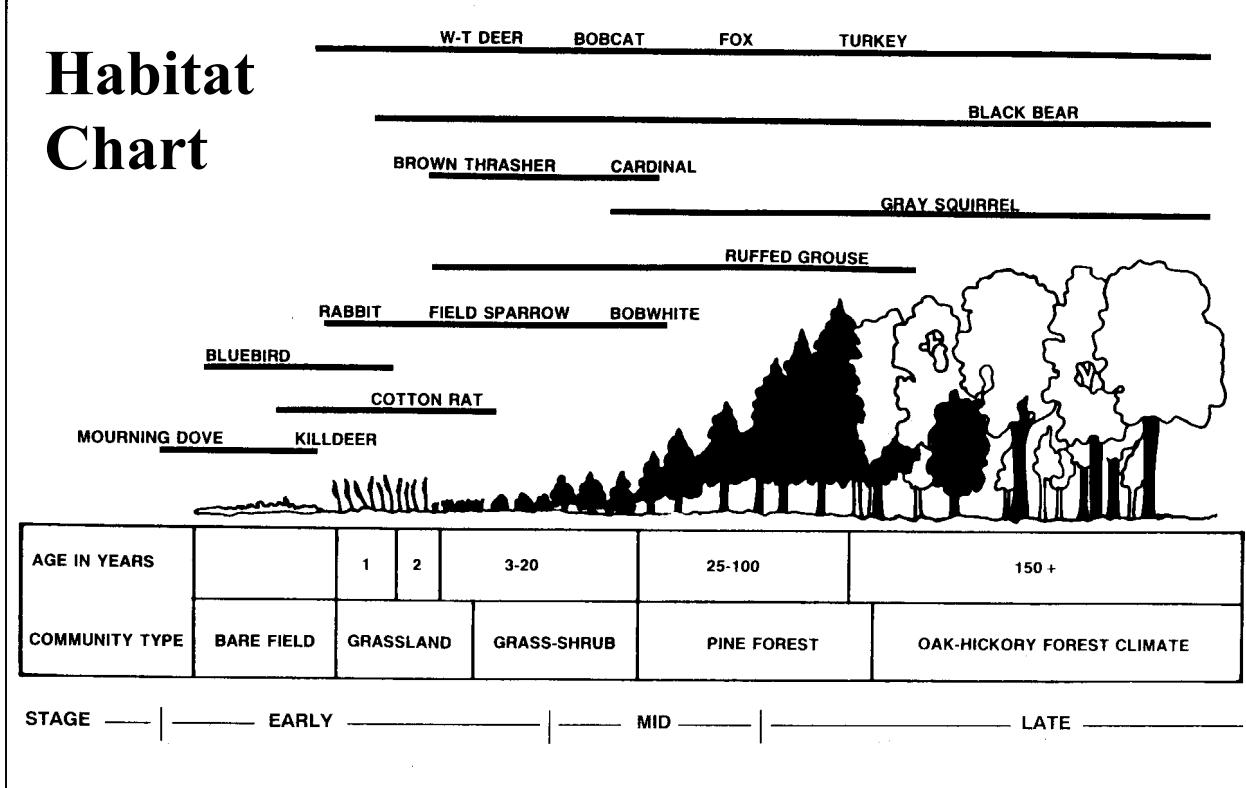
WILDLIFE

Linking the forest and wildlife

Having trees doesn't necessarily mean that you will have wildlife. Wildlife has five basic requirements: food, cover, water, reproduction and space. The arrangement and ratio of habitat types, plant cover, water resources, topography, geology, human activity and presence of other wildlife species all dictate the number and kinds of wildlife that can live on your land.

The relationship between plant management and wildlife habitat is well established. Different wildlife species require different stages of forest growth to meet their needs. For example, many birds and mammals feed on seeds of annual and perennial weeds and grasses that occur in young forests, where sunlight reaches the forest floor. This is ***early successional habitat*** (grasses, shrubs and forbs). Pileated woodpeckers depend on dead and rotting trees found in mature forests. This is ***late successional habitat*** (mature forests). Still other wildlife species prefer ***mid-successional habitat***. Many species require more than one type of habitat. For example, a woodcock requires a forest opening (called singing grounds) for its courtship display, but it also requires a dense bottomland forest for nesting and feeding.

Habitat Chart



When managing for wildlife it's important to consider your property in relation to all of the other properties around yours. One must consider landscape or large-scale management as well as small-scale management. Species such as white-tailed deer, black bears, and wild turkeys require several hundred acres to several square miles of habitat. Most landowners do not have that much land; you must then provide the limiting factor - that one habitat requirement that limits your management species from becoming more wide-spread on your property.

It is impossible to manage for ALL species of wildlife on one plot of land. A management practice that is beneficial to one species can be detrimental to others. Creating a lot of openings and managing for edge can benefit early and mid-successional stage wildlife, but it is detrimental to species that require large contiguous stands of mature forests. Your goal may be to manage for as many wildlife species as your land can attract. The key to wildlife diversity is habitat diversity.



Young Forests for Wildlife

Young forests benefit early successional wildlife species by encouraging *forbs*, grasses, and brush. The size and shape of harvest areas are important. However, the size is not as important as the shape and the distance to cover. There are several ways to manage or create open fields and young forests for wildlife.

Field borders and forest edges

Many landowners use their property for agriculture as well as for forestry. Field borders and forest edges are the transition between a field or opening and the forest. These areas can be managed as described in the "Establishing Ground Cover or Wildlife Food Plots" section.

One management option for field borders, wildlife openings, and food plots is to plant or preserve a few soft mast producing trees and shrubs, rather than managing an area that is completely open. The trees and shrubs will not only provide an additional food source, but they will also provide nesting and cover habitat for several species of wildlife. Some species of soft mast producing trees and shrubs include blackberry, blueberry, hackberry, persimmon, wild cherry, wild plum, serviceberry, dogwood, elderberry, hawthorn, crabapple, gallberry, and mulberry, just to name a few.

Establishing ground cover, wildlife food plots and openings

Food and ground cover vegetation controls erosion, improves water quality, and enhances wildlife food and cover along roads, forest edges, logging decks, and in forest openings. Permanent wildlife openings are important in the annual life cycles of many wildlife species. Wildlife openings, by definition, are areas composed primarily of low, grassy, herbaceous vegetation. These openings may be maintained in early successional, native vegetation by periodic prescribed burning, disking, mowing, or by use of herbicides.

Seeding and establishment recommendations vary widely depending on geographic region, soil type, moisture, availability, and fertility. Successful plantings require soil testing, fertilization, liming, adequate seedbed preparation, and planting at the appropriate time. Wildlife plantings require maintenance by mowing disking, burning, fertilization, or liming. When choosing species to plant or manage for wildlife, some good choices may include white clover, kobe or korean lespedeza, partridge pea, shrub lespedeza, or warm season grasses. Warm season grasses include switchgrass, indiangrass, big bluestem, sideoats grama, Eastern gamagrass, Coastal panicgrass, dallisgrass, sudan grass, and other species of panicgrass and paspalum grass. Many of these species have several different varieties. Contact your local natural resources professional to help choose the variety of vegetation that is best suited to your soil.

It is best to manage several openings in different mixtures of grasses, legumes, and other forbs to enhance habitat diversity. Occasionally, some agricultural crops planted in wildlife openings can enhance the wildlife value of your property.

Diverse multi-resource forests share some common features:

- ◆ Small harvest areas (up to 50 acres for large tracts) scattered over the landscape provide more edge and landscape diversity.
- ◆ Irregular shaped areas provide more edge than square or round areas.
- ◆ Low density stocking rates (500 trees per acre or less) allow sunlight to reach the forest floor for a longer period of time.
- ◆ Areas of uncut timber enhance diversity of habitats and provide travel corridors between fragmented habitats.
- ◆ Buffer strips on streams not only protect water quality but also serve as wildlife corridors.

Middle-Aged Forests for Wildlife

Middle-aged forests provide more shaded habitat than young forests. Many activities reflect the need to open up the stand to mirror some of the habitat components of younger forests. Activities conducted on middle-aged forests revolve around selecting the trees that will dominate the mature stand. Activities include:

Thinning

Thinning stands allows more sunlight to reach the forest floor resulting in more vigorous understory growth. This practice encourages regeneration of understory vegetation and growth, yet leaves some mid successional and late successional trees in the overstory. The effects of thinning are only temporary. As the canopy closes again, the growth in the understory is inhibited.

Slash (limbs, branches and tree tops) that is produced during the thinning operations can be piled near clearings or where understory vegetation is scarce to provide additional feeding and cover habitat for several species of wildlife. Creating brush piles near feeding areas or water sources provides cover to escape from predators. Brush piles can serve as corridors for wildlife to travel from one cover to another.



Controlled or prescribed burning

Burning controls woody vegetation, releases nutrients, and enhances seed germination and growth of soft mast (seeds and berries) producing shrubs and herbaceous vegetation. It makes wildlife browse (leaves, shoots and vines) more digestible, palatable, and nutritious by increasing the protein content and decreasing the fiber content. Prescribed burning in stands of fire resistant tree species sets back succession just as a raging wildfire would do, but without the damage to potential timber crop trees. However, burning cannot be used in many regions and in certain types of forests. Topography, soil types, the presence of standing water, tree species, and other factors dictate whether or not prescribed burning can be used as a tool in your forest. Before conducting any burn, consult a professional forester.

Most wildlife habitat improvement burns are low intensity, conducted during the winter months. These burns are now being used in hardwood forests, particularly to favor oaks, which produce hard mast (nuts and acorns). It may be necessary to conduct a growing season burn to more aggressively control vegetation. Burning should be avoided during the primary nesting/denning seasons of desired wildlife species. Contact a professional wildlife biologist to determine the nesting seasons of the desired species on your land.

Before burning, firebreaks must be constructed to keep the flames from spreading to areas where burning is not appropriate. Often plowed firelines are used; however, plowed firelines cannot be used indefinitely. Firebreaks can be used instead of plowed firelines. Well-maintained firebreaks can be used indefinitely. These breaks also can be managed as linear openings or food plots to benefit certain species of wildlife. Firebreaks can be planted to provide wildlife food and cover. You will want to keep the vegetation low so that if a fire should start, the firebreak can be easily accessed, and it does not contribute a lot of fuel for the fire. The type of vegetation that you manage will depend on the wildlife species that you're trying to benefit, the soil characteristics, and the amount of sunlight that will reach the ground.

A good burn does not necessarily remove all of the understory vegetation. A patchy burn that creates a mosaic pattern of unburned area is often best. It creates variety in the vegetation types and structure, adding to the diversity of the habitat.

Mature Forest for Wildlife

Creating den trees, mast trees, snags and downed logs

Certain trees are critically important for food and cover. Den trees have one or more cavities that are used by birds, reptiles, and mammals for roosting, nesting, or denning. As a general rule, 2 to 4 den trees per acre should be left in any thinned or harvested area. Rather than harvesting all seed trees after establishment of your new stand, consider leaving a few behind to create den trees or snags.

Scheduling a portion of your land on a rotation of 80-100 years often produces large diameter den trees. Small den trees might house chickadees, woodpeckers, screech owl, kestrels, or flying squirrels. Squirrels, raccoons, wood ducks, hooded mergansers and bears use large den trees.

If suitable den/nest trees are not available, nest boxes can be erected to help attract birds for viewing and for insect control. Bluebird nest boxes and other nest boxes can be purchased from various stores, or you can obtain plans to build your own. Many bird species have specific nest cavity requirements; therefore, boxes are normally built to accommodate a select species. However, many bird species are not particular in selecting a nest site. For example, screech owls, prothonotary warblers, great-crested flycatchers, and wrens may use a wood duck nest box. They may also be used by a variety of mammals such as squirrels, mice, and bats. Snakes often can be found using these boxes. That is why a “predator guard” should be installed with your nest box, if you intend to use it for nesting birds. Contact a professional wildlife biologist for advice on building and installing nest boxes.

Mast trees produce fruits (soft mast) and nuts (hard mast) that are used by countless numbers of wildlife species. Hickory, oak, beech, persimmon, serviceberry, blackgum, holly, hawthorn, dogwood, grapevines, and many other species are valuable to wildlife. Some species of wildlife obtain most of the water that they require from the mast.

Snags are dying or dead trees that are still standing. They provide perch sites for birds of prey; serve as a food source for insect-eating birds, reptiles, amphibians, and mammals; and serve as den trees for various wildlife species. As some trees die the bark becomes loose. Bats, small reptiles, amphibians, and insects may crawl under the bark to protect themselves from predators and adverse weather conditions, or they may use these areas to roost. Snags and potential snags should be left during harvest and site preparation of forest stands if they are not a hazard. Girdling live trees can also create snags. This is a good way to use some of the non-marketable trees. The best time to mark den trees, mast trees, and snags is before you thin or harvest your timber.

Downed logs offer a source of food and cover for insects, amphibians, reptiles, and mammals. Often habitats such as these go unnoticed, but provide a valuable resource for wildlife. Hollow logs may be used as den sites for opossums, foxes, or raccoons. Larger mammals also benefit from downed logs. It is not uncommon to find a log that has been torn apart by a bear looking for a high-protein meal of insects.

Road construction and maintenance

Access to your property is essential and can provide multiple benefits. Proper location, design, and construction increase the value and enjoyment of your forest. One practice that benefits wildlife is “*daylighting*”. In this process, trees shading the road surface are removed. Sunlight on the road surface enhances the growth of grasses and weeds, which are food plants for wildlife. Insects attracted to the vegetation are also an important food source for many wildlife species.

Restricting vehicle traffic also increases wildlife use, particularly during nesting season. Caution should be used when attracting wildlife to areas that are adjacent to high-traffic roadways. Vehicle collisions can be a major cause of death for wildlife.

Protect special habitat areas – first

There are many exciting management techniques to improve existing habitat, but don't neglect the priority areas like water, riparian corridors and wetlands. Large undisturbed areas, remnant vegetation, and patches that are linked to larger habitats can be extremely important habitat components. Identify these areas and make improvements that increase the use and value of these areas to wildlife. Wise management starts with prudent protection of unique habitat – Don't let your excitement to improve habitat result in degradation of critical habitat components. Likewise, multiply the value of your improvements by making sure that your efforts link wildlife habitat across the landscape.

Streamside Management Zones and upland corridors



Corridors, both streamside and upland, serve many valuable wildlife functions. They provide safe travel, food, nesting, denning, and foraging sites, as well as cool refuges during the hot summer months. These corridors also protect your property from soil erosion and help maintain water quality in streams, by keeping them cooler and reducing evaporation. Corridors should connect similar habitats together to help offset the effects of forest fragmentation. Integrity of the canopy is very important in managing corridors, especially streamside management zones. The key to successfully managing these sites is to provide an open understory to facilitate travel by wildlife and maintain a condition similar to interior forest habitat.

RECREATION AND AESTHETICS

Many landowners do not realize that they can simultaneously manage their forest for profit, wildlife habitat, investment, recreation and beauty. In fact, properly planned forestry activities can enhance visual appearance, improve recreational opportunities and sustain or increase wildlife populations.

What are your recreation and aesthetics goals?

- Horseback riding**
- Bike or hike on trails**
- Camping**
- Fishing**
- Boating**
- Harvest berries/fruit**
- Promote flowering trees/plants**
- Park-like appearance**
- Observe fall colors**
- Protect historic/unique areas**
- Allow others to use your forest**
- Nature study/photography**
- Bird watching**
- Wildflower enhancement**



Enhancing visual appearance

Integrating forest management for scenic beauty and diversity can be viewed as landscaping on a grand scale. Landscaping is the arrangement of sizes, colors, textures, and forms across your forest.

Protecting, shaping, and creating open spaces

It is preferable to protect and manage existing openings rather than to create new openings from scratch. However, large tracts of similar age or species can be made more diverse by creating openings. They can enhance views, improve wildlife habitat, and increase plant diversity.

Maintenance activities include:

- ◆ Mechanical clearing: periodically mowing or disking strips on an alternating 2-3 year cycle keeps woody vegetation in check. However, mowing should be restricted in the spring to allow ground nesting wildlife to rear their young without disturbance.
- ◆ Herbicide control: using selective herbicides to maintain the species composition of the opening. A legally labeled, safe and effective herbicide that is known to control the targeted species should be selected. Contact your extension agent for more details.
- ◆ Prescribed burning: prescribed or controlled burning should be conducted at 2-7 year intervals, based on a cycle compatible with wildlife, aesthetics, and timber objectives. Be sure to consult with an experienced burner.
- ◆ Farming: while farming techniques maintain fields and open spaces, edge treatments can be modified or intensified to meet wildlife, aesthetic, and timber objectives.
- ◆ Timber harvesting: thinning young trees or harvesting mature trees creates openings and dramatically changes the forest landscaping. Your plan should layout the timber sale, log decks, skid trails, roads, and accumulation areas to match your aesthetic objectives. Use a professional forester to minimize problems and insure regulatory compliance.
- ◆ Strategic grazing: using livestock to create specific habitat types for wildlife. Controlled livestock grazing should only be used to control growth in pastures and fenced clearings.

Managing the forest edge

Minimizing the contrast between the opening and the forest is the primary goal in managing aesthetics on the forest edge. It defines the shape and texture of the forest setting. A soft transition from the low vegetation of the opening to shrubs and then to taller trees is desired. Considerations include:

- ◆ Create or maintain wavy edges with indentations to improve visual diversity.
- ◆ Introduce irregularity to straight forest edges.
- ◆ Establish or maintain irregular outlying clumps of trees to create a natural appearance of the forest edge.
- ◆ Favor a mixture of hardwood and conifer species for diversity.
- ◆ Retain or establish trees and shrubs of varied shape, form, flower, or foliage color.

Controlled or prescribed burning

Burning is an inexpensive tool to manage some thick-barked, fire-tolerant tree species. It is often an overlooked opportunity to impact the visual diversity of the landscape. Controlled burning creates an open, park-like stand and stimulates the growth of many fire-enhanced flowers and legumes. With aesthetics as a consideration:

- ◆ Leave unburned islands around critical habitat or highly valued areas.
- ◆ Level and re-seed plowed firelines with scenic and wildlife-friendly plant mixtures.
- ◆ Mimic natural transition or edge around the burned area by curving the firelines

Improving recreational opportunities

Many people enjoy hiking, bird watching, hunting, camping, picnicking, picking berries, and just being in the great outdoors, but the majority of land suitable for outdoor recreation is privately owned. Some owners open their land up to the public, while others restrict the use of their land.

Controlling public access

Open access for public. Preferably, you should require recreationists receive verbal or written permission from you, but this is difficult to enforce. Uncontrolled public use often decreases the quality of recreational opportunities available to you or your friends.

Restrict access* to family, friends, neighbors, and responsible recreationists who ask permission. This requires that the land be posted and/or that you issue guests permits. The obvious advantages of posting and granting written permission are better control of activities on your land and reduced abuse of your property.

Lease your land for recreational access. Landowners who lease recreational rights usually charge at least enough to pay their property taxes. Often the lessee posts the land, polices trespassers, maintains roads, trails and gates, and picks up litter.

Permit daily use for a fee. The owner issues daily written permits. Owners of hunting or fishing preserves, campgrounds, and waterfowl impoundment's often use this.

Form a cooperative with neighbors. Landowner cooperatives build a sense of community among neighbors with similar recreational goals. The acres entered into the cooperative can be for personal enjoyment or made available to the public through one of the methods above.

North Carolina offers a **land registration program in which the landowner can request assistance from the Wildlife Resources Commission Division of Law Enforcement to patrol their land. The land must be properly posted and proper permits must be issued to those people that are allowed to be on your land. Contact the Wildlife Resources Commission for more information.*

PROTECTING SOIL & WATER QUALITY

The role of forests in stabilizing soils and protecting watersheds is universally recognized. Best Management Practices (BMPs) are practical and efficient techniques used to protect water quality. When a forest is disturbed the potential for erosion and degradation of water quality increases. Sediment levels, water temperature, streamflow, nutrient levels and dissolved oxygen levels affect water quality. BMPs can minimize, eliminate or reverse water quality impacts.

The following forest management practices require BMPs regardless of whether the purpose is for timber, wildlife, recreation, aesthetics, or other reasons:

- ◆ Road and trail construction, maintenance, and use;
- ◆ Timber harvesting and skidding logs to loading areas;
- ◆ Mechanical equipment operation;
- ◆ Controlled burning, particularly fireline construction;
- ◆ Site preparation by hand, chemical, or mechanical methods;
- ◆ Fertilizer application, particularly near water bodies;
- ◆ Minor drainage alterations;
- ◆ Pesticide applications.



What's your level of water quality protection?

	Always	Often	Unsure
Stabilize roads and trails	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plan and select BMPs before site disturbance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leave buffer strips next to streams and water bodies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Re-vegetate bare areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Restrict cattle from woodlots and streamside areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Test soil to determine fertilizer and lime rates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Construct proper stream crossings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Planning Phase

The BMPs you select to manage your property will be a unique mix. Prior to beginning any activities, you need to walk your property and identify such things as restrictive/sensitive zones around water bodies and streams, soil types, areas of steep slopes, unique natural areas, and wildlife habitats. Be sure to seek professional advice before you begin any of these best management practices!

- **Pre-harvest planning**

Roads, trails, and log decks should be kept at the minimum number to allow efficient timber harvesting while protecting water quality. Determine what type of logging equipment will have the least environmental impact on your forest.

- **Site preparation and regeneration planning**

Select the practice(s) accomplishes the required vegetation control and seedbed preparation with the minimum soil/site impact.

- **Fertilizer or pesticide application planning**

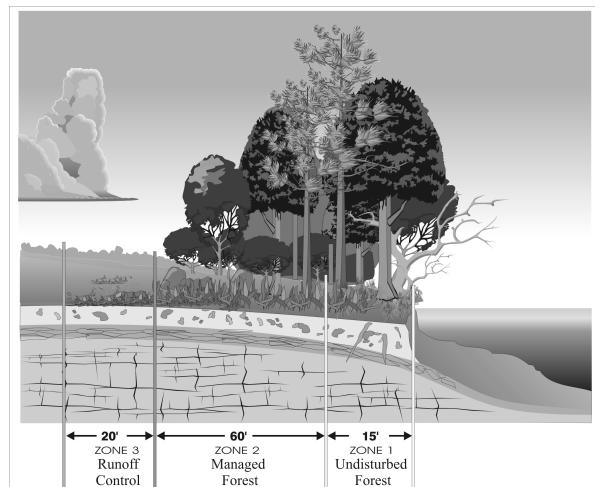
Prior to applying fertilizer or pesticide, learn the chemical characteristics, topography, soils, drainage and other factors that might be important for preventing water pollution during application.

- **Roads, trails, and firelines planning**

Roads, trails, and firelines are the major source of **sediment** from forestry operations. A well-planned road, trail, and fireline system minimizes the number of stream crossings; fits the topography of the site; locates the roads, trails, and firelines outside of critical streamside areas; and uses appropriate drainage and water control structures. Hand constructed firelines should be used on steep terrain.

Operational BMPs: Streamside Management Zones (SMZs)

An SMZ is an area or zone along an intermittent or perennial stream (which flows more than 30% of the year) where extra precaution is used during activity. Its purpose is to slow and spread surface water flow, and trap and filter **suspended sediments** before they reach the stream channel. SMZs also provide stream shade and function as buffers to filter and capture fertilizers, pesticides and other potential pollutants.



The recommended width of an SMZ will vary from 50 to 200 feet depending on the stream, the soils, the topography, and amount of ground cover. Limited tree harvesting is allowed in the SMZ if trees can be felled away from the stream channel and removed with extreme care, leaving the forest floor and ground cover vegetation largely undisturbed. Heavy equipment use is discouraged in the SMZ.

Effective SMZs have the following characteristics:

- ◆ Wide enough to capture and filter soil and other pollutants before they reach the stream or water body;
- ◆ Ground cover with no more than 40% bare ground, evenly distributed;
- ◆ Retain stream shade and temperature, normally 75% of the pre-harvest level;
- ◆ Broadcast pesticide or fertilizer application is prohibited;
- ◆ Prescribed burning is not allowed;
- ◆ Roads and trails are located outside of the SMZ, except where stream crossings are essential, or where physical or topographic restrictions require the placement of a road in the SMZ;
- ◆ Bare soil areas are promptly re-planted or mulched;
- ◆ Sawmills, log storage areas, and log decks are not located inside the SMZ.

Go Gently on the Land: Roads, Trails and Firelines

A road system, temporary or permanent, provides access for timber harvesting and management activities, recreation, or wildlife enjoyment. Improper road construction and maintenance is the major cause of erosion and sediment from forestry activities. Consider these proven methods to minimize adverse impacts on the land.

To create well-designed road and trail systems:

- ◆ Stabilize or allow time for new roads to settle before using them.
- ◆ Keep roads as narrow as possible.
- ◆ Place roads on gentle slopes, avoid flood plains (outside of SMZs).
- ◆ Cross streams at right angles using bridges, *culverts* (pipes), or constructed *fords* (solid bed stream crossings).
- ◆ Daylight roads to maximize drying and promote vegetation.
- ◆ Divert, drain, and control water before it does damage.
- ◆ Inspect and maintain roads often.

Constructing roads and trails

Roads and trails provide access for harvesting timber, wildfire control, monitoring the growth and health of your forest, exercising, recreation, education and observing nature. Well-planned roads or trails provide low-cost access and require minimal maintenance. Correct construction of roads and trails is essential for forest protection, resource management, and recreation. Roads should be built with proper drainage and adequate slope and grade to minimize erosion and maintenance. Roads and trails should be posted and gated to deter trespassing.



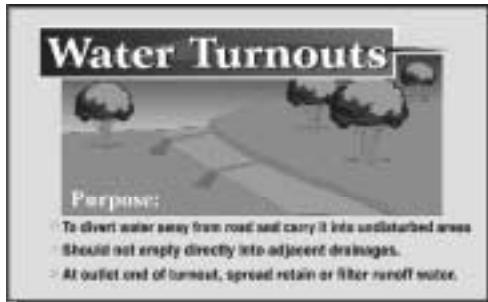
The first step is to pre-plan the road or trail using aerial photographs, topographic maps, field maps, and personal knowledge of the property. The N.C. Division of Forest Resources or private consultants can assist with roads or pre-harvest planning. Try to avoid areas with wet soils, frequent flooding, unstable or highly erosive soils, steep slopes, hazards such as cliffs and ledges, locations requiring expensive bridges and culverts, environmentally sensitive areas, and high maintenance areas such as heavily vegetated areas requiring constant mowing or pruning.

For best results:

- ◆ Manage roadsides with perennial vegetation to enhance wildlife, visual quality, and erosion prevention.
- ◆ Plan road placement to minimize the number and extent of roads and *skid trails* (secondary logging trails).
- ◆ Keep slopes below 10% grade to minimize erosion and maintenance.
- ◆ Expand openings adjacent to roads (day lighting) to enhance plant diversity and for rapid drying of the road surface.
- ◆ Place roads and trails on the contour, taking advantage of natural curves within the landscape.

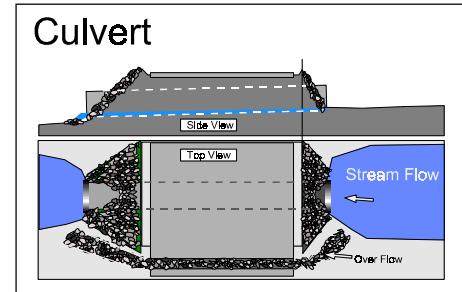
- ◆ Develop narrow paths into environmentally sensitive areas, instead of roads or major trails.
- ◆ Surface heavily used roads with low-cost native or natural materials, such as wood chips, bark, or **mulch** (shredded bark, limbs or wood).
- ◆ Vary the direction of the road or trail for variety, points of interpretive interest, and to maximize user's exposure to natural features, water bodies, and vegetative changes.
- ◆ Trails should begin and end in the same general area, forming a loop.
- ◆ Provide trail markers, benches, and picnic tables to increase the enjoyment of recreational trails and roads.
- ◆ Scenic beauty and recreational opportunities can be enhanced by good forest management. Providing a well designed road and trail system can control public access to your property.

Several Simple, Proven Water Control Techniques:

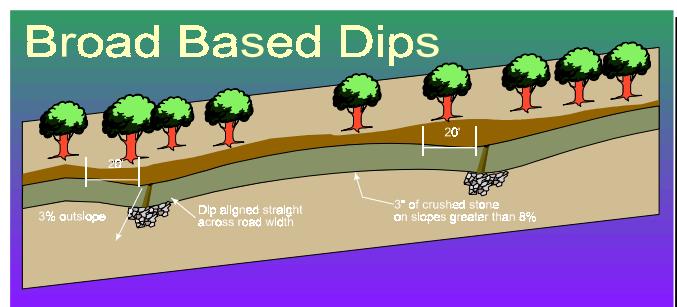


Water Turnouts

Water **turnouts** are ditches, trenches, or waterways that divert water away from the road surface. They carry water into an undisturbed area where the flow slows and the sediments are filtered and trapped.



Cross-road drainage by culvert
Cross-road drainage is the transfer of water across or under the road, usually by a round culvert. It is used on any road or trail where storm water runoff, ditch-to-ditch transfer, slope, or overland seepage might cause erosion. Pipe culverts 14 inches or larger are normally installed on permanent roads and trails.

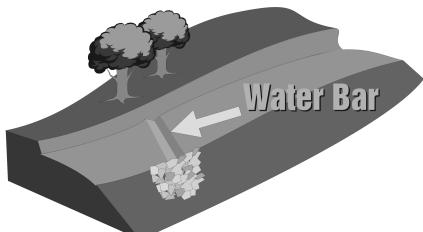


Broad-based drainage dips

Broad-based dips create a reverse uphill slope on a road surface, effectively slowing and moving water off the road surface into an undisturbed adjacent area.

Rolling dips

Rolling dips are rounded humps, which create a reverse slope and turnout. They are often used in skid trails where logs are skidded (dragged) to a log loading area (deck). The rolling dip provides cross drainage and slows water flow and holds up better under heavy traffic.



Water bars

Water bars are a combination mound/trench built into a road or trail and sloped slightly downslope to move water off the road surface into an undisturbed, adjacent area. Water bars are usually installed after the road is no longer used.

Stream-crossing BMPs

Forest harvesting and management activities often require crossing intermittent or perennial streams. Plan to use as few crossings as possible. Road and trail approaches to stream crossings must have good surface drainage that turns water into undisturbed areas and away from the stream course. Always consult an experienced professional before installing a stream crossing structure. Streams may be crossed in several acceptable ways:

Pipe culverts

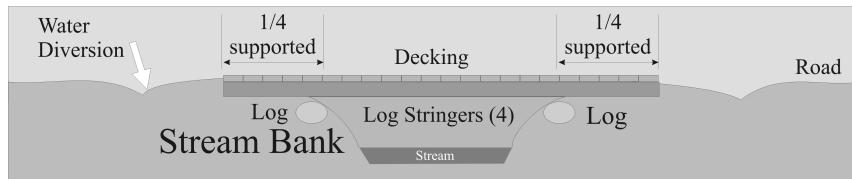
Considered expensive, they are usually used on permanent roads. However, following use on temporary roads and trails, they can be carefully removed to minimize soil disturbance. It is important that culverts be of adequate diameter to handle above-normal water flows, long enough to extend slightly upstream and downstream from the crossing, and be installed with a two to four percent downstream angle to aid in flushing out debris. A single culvert, sized to handle the water flow, is less likely to clog than several smaller stacked culverts.

Backfill material should be free of debris and the culvert should be covered with fill to a depth of one-half the diameter of the culvert, or a minimum of one foot.

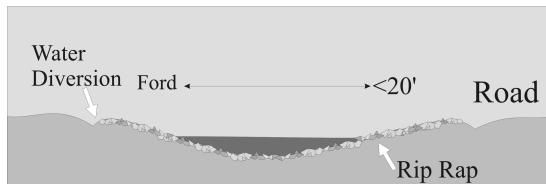
Bridges

Temporary or permanent, numerous styles of bridges are used to cross-streams where culverts won't handle the

stream flow. Bridges should be built to handle heavy loads using the proper type, size, and materials. Professionals should help design your bridge. Stream channel and stream banks should be protected from erosion during construction by continual mulching or vegetated ground cover. Abutments and headwalls may be needed to handle flood conditions and stabilize the approaches to the crossing area. Use vegetation or ground cover to stabilize road approaches and road banks.



Fords



Fords

For temporary or minimum-use crossings, fords should only be used where the stream has an applied or existing firm base. Riprap stone, brush, poles, or other materials stabilize the road or trail approach to a ford and the streambed to protect the stream channel. Stone is usually not removed after road use ceases, but poles, brush, and other materials are.

Site preparation and regeneration BMPs

The condition of the tract, the desired species you wish to regenerate, and environmental concerns, including water quality, need to be addressed. SMZs, road layout and design, equipment limitations, and management options should be planned in detail and documented on the ground and/or on a map. Numerous options for site preparation include bulldozers (*chopping, disking, rake and pile, bedding, furrowing, and scalping*), hand tools, herbicides, and fire. Avoid site preparation techniques that create bare soil conditions or increase the risk of erosion.

Site prep and regeneration BMPs include:

- ◆ Use the least site disturbing activity to accomplish the planned result.
- ◆ Maintained an SMZ on all perennial and intermittent streams.
- ◆ Minimize or avoid soil disturbance in ephemeral stream channels (flows less than 30% of the year).
- ◆ On steep terrain and/or fragile soils, herbicides, controlled fire, or manual (by hand) site preparation is preferred over heavy equipment.
- ◆ Place no debris, oil, or other waste in or close to streams.
- ◆ Machine plant trees on the contour; hand plant on steep slopes.

Permanent stabilization

At the conclusion of any *silvicultural activity*:

- ◆ Carefully remove, stabilize and revegetate all temporary stream crossings.
- ◆ Inspect roads, trails and firelines to be certain that all water control structures are in place and functional.
- ◆ Remove and properly dispose of all toxic waste, tires, oil, and trash.
- ◆ Provide mulch, brush, or vegetative cover on bare soil areas to stabilize the area and reduce the potential for surface runoff and accelerated erosion.

Managing a Forest for Timber

Many lands managed primarily for wildlife, recreation, or water protection can produce timber. Often the revenues from timber finance the improvement of other valued resources. Ideally, forest management can be environmentally friendly *and* profitable.

Well-managed forests generally have several common features:

- ◆ Tree species that are suited to the local climate, soils, and markets;
- ◆ Healthy *Crop trees* with adequate room to grow;
- ◆ Minimal numbers of damaged, diseased, or insect-infested trees;
- ◆ Protection from fire and destructive grazing;
- ◆ Easy, controlled access;
- ◆ Best Management Practices are used to protect water quality;
- ◆ Boundaries and corners are clearly marked and maintained;
- ◆ A written forest management plan to govern activities.

Successful forestry will require that you carefully assess:

- 1) your goals;
- 2) your financial and physical limitations;
- 3) the size, condition, and capabilities of your forest;
- 4) the availability of technical and contractual services in your area; and
- 5) existing and expected markets.

Establishing and Managing Timber Stands

Although you can devise your own management plan, it is recommended that you seek the assistance of a professional forester. Generally, management practices fall into three categories depending on the age and condition of the forest: 1) forest establishment or regeneration; 2) intermediate stand management practices; and 3) regeneration or harvest systems.

The range of practices used over the life of a forest is called the “silvicultural system.” It is the linking of timber harvesting, regeneration and intermediate stand management treatments in a logical sequence to meet your goals and objectives.

The young stand

Establishing or regenerating a forest can be achieved by either artificial means (primarily by planting trees) or by natural methods (which rely on seeds, sprouts, and/or naturally occurring seedlings). These practices are used to re-stock the forest with desirable trees.

Site Preparation

Removing undesirable vegetation or preparing a seedbed may not be needed if the site is clean enough.

Site preparation can be the most intensive, disturbing activity and must be done using BMPs to protect water and soil quality. Depending on the



soil type, soil moisture, geographic region, and the type and density of the weed population of the site, different methods can be used to clear the site. These methods include prescribed or controlled burning, herbicides, manual labor or heavy mechanical equipment.

Natural regeneration

This is the cheapest method to reproduce a stand. It relies on available seed, stump sprouts and existing seedlings to produce a new stand. Success depends on whether there is adequate seed, seedling or sprout supply; adequate moisture; a well-prepared seedbed; and control of competing vegetation. Careful planning is required to ensure success. Although the monetary investment with this method is very low, the time investment to ensure a manageable stand can be considerably greater.

Tree planting

Tree planting lets you pick the tree species, the spacing and the genetic characteristics of the seedlings. Success will result if seedlings are well adapted to the site, are of high quality, healthy and carefully planted. In rare instances, seedlings may need to be treated with insecticides, fungicides or repellants (to prevent deer damage) to protect them from early death. Tree planting may be done by hand or machine. Planting on the contour is advised to minimize erosion.



The middle-age stand

Your forest will be healthier and more productive if it is managed properly. Managing established young trees includes manipulating the stocking (number of trees per acre), species composition and competition levels. In general, trees or weeds that don't contribute to your objectives for timber production, wildlife, aesthetic or recreational goals can be eliminated in favor of more desirable plants.

Thinning

Enough space is needed for the development of selected crop trees. Pre-commercial thinning removes small trees, which are not yet marketable. In older stands, thinning may produce some income from the removed trees.

Thinning is usually done in stands when the tree crowns become so dense that the trees start to shade each other. Failure to thin will cause the growth rate and vigor of the crop trees to diminish. Also, unthinned stands are more vulnerable to disease and insect infestations, and they will take longer to reach marketable size.

Thinning not only allows more sunlight to reach the crown of selected crop trees, but also allows sunlight to reach the forest floor. This promotes growth of early successional vegetation, which provides food and cover for several wildlife species.

Improvement Cutting and Timber Stand Improvement

Timber stand improvement (TSI) is a cutting or culling of undesirable species, usually in a sapling stand of less than four inches in diameter. By removing undesirable species and poorly formed, diseased, or insect-infested trees, TSI improves the species composition and stand quality.

Trees may be **girdled** or killed in place by herbicides, or removed for use as firewood. Improvement cuttings are done in older stands to accomplish the same results, but the stems that are removed are usually sold.

Prescribed Burning

Prescribed burning lowers the risk of **wildfire** by reducing buildups of leaves, needles, and other fuels that can ignite and cause a major wildfire. Many species, such as loblolly pines and longleaf pines are tolerant of “cool” fires under controlled conditions; others are not. Therefore, prescribed burning can be used to remove less fire-tolerant tree and brush species. The timing and intensity of the burn is important for regulating growth in the understory. Because some plants are more tolerant of fire, a more intense fire such as a growing season burn may be required. The intensity at which the fire burns can be controlled to a certain extent by conducting burns under specific environmental conditions (e.g., humidity, ground moisture, wind, temperature, etc.).

An added benefit to prescribed burning is that it stimulates regeneration of many herbaceous plant species that provide food and cover for many wildlife species.

Creating a New, Healthy Forest with a Harvest

Forests are often harvested when all or many of the crop trees reach financial or biological maturity. Harvests create significant changes in appearance and the landscape. Many harvests create diverse wildlife habitat while producing income for the owner. The key is to plan and receive professional assistance before the harvest.

Pre-harvest planning must address the objectives of the owner for the new forest to develop properly following the harvest. A light and frequent harvest (selection and group selection systems) regenerates forests with trees of many ages and sizes – typically shade-loving tree species. More complete harvests (shelterwood, seed tree and clearcutting) create more sunlight. Therefore, faster growing sun-loving trees flourish under these systems. Major or complete harvests tend to give rise to stands of a fairly uniform age. A more detailed description of harvest/regeneration options follows.

Complete Harvest

This harvest type removes the entire marketable portion of the stand in one cutting. It is the most efficient and easiest to administer and is appropriate for mature stands or where the stand is of poor quality and even-age regeneration is desired.

Although complete harvests create drastic vegetation change that some may object to, it mimics many natural disturbances, which commonly regenerate forests. Like hurricanes, wildfire, and windthrow, complete harvests regenerate many valuable species that must have full sunlight to flourish. Yet, like any tool, it must be used judiciously and should not be done immediately next to streams or water bodies

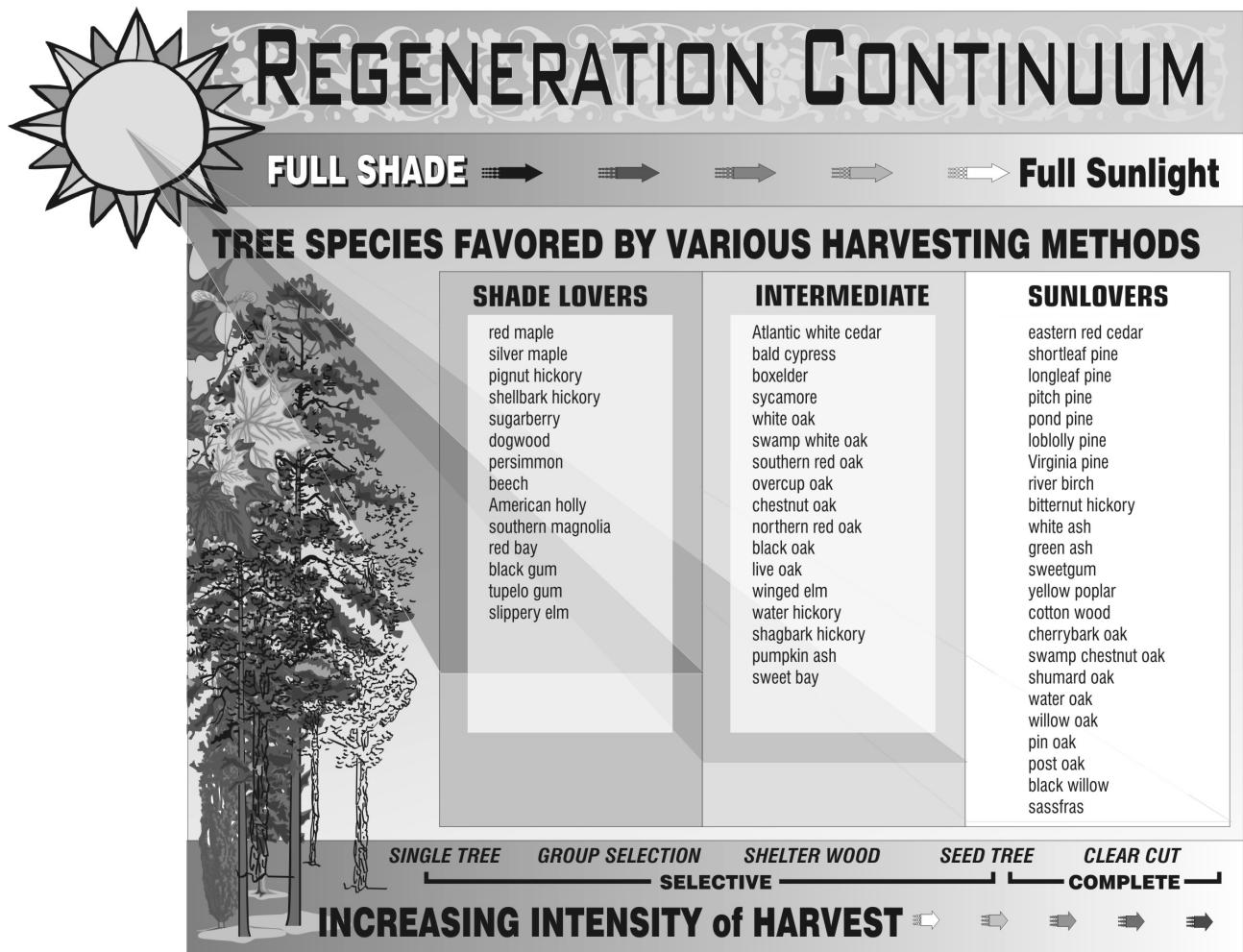
Selective Harvest

Selective harvesting will regenerate uneven-aged stands of shade tolerant tree species. Single tree selection removes scattered individual trees, whereas group selection removes scattered groups of trees to create openings of $\frac{1}{4}$ to $\frac{1}{2}$ acre in size.

Selective harvests often fail to generate enough sunlight for many pines and quality hardwoods. Although this method removes financially mature and high-risk trees, care must be taken not to remove only the biggest and best trees, leaving the poor quality trees. This practice, called “**high grading**,” results in a badly degraded forest with little timber value and diminished wildlife benefits.

Other considerations

Wildfire, insects, diseases and overgrazing are destructive to your forest. Frequent visits by you and a professional forester are recommended to ensure firebreaks are maintained, to provide evaluation of your forest’s health and vigor, and to protect your investment.



Your Family Forest Plan

A forest management plan is a key to successful long-term management of your forest. Just like a road map, a plan offers a direct way to reach your goals. Natural resource professionals can help you determine the best route to take for your forest.

Planning is not a single event, but a series of continuous steps leading to a desired goal. Forest Management Plans are, by necessity, long-term. The plan can guide activities for decades, some provide continuity through successive generations of owners. The plan can be as detailed (short-term recommendations) or as general (long-term recommendations) as you desire. The first step is to determine your priorities, set goals, and identify the management activities to reach those goals.

Forest resource management plans traditionally follow a common format. Plans should include goals and objectives for all natural resources, such as wildlife, aesthetics, recreation, and soil and water protection. Seek the assistance of professional foresters, wildlife biologists, soil and water specialists, recreation specialists and others as you develop your plan. They should be revised periodically to update or change according to your wishes and to changes in new environmental laws and regulations.

Elements of a Management Plan

(1) Your goals and objectives

A well-written plan should begin with a statement of your specific interests and goals. Long-term (more than 10 years) goals are usually general. Short-term goals are targeted, with specific practices and timetables.

(2) Map

Your plan should have a legible map and/or aerial photograph showing the location of the property and how the property can be accessed. Boundaries should be clearly marked and described. You can obtain aerial photographs from the North Carolina Center for Geographic Information and Analysis.

(3) Description

Each stand and distinct forest area, should be described and correctly marked on the property map and/or the aerial photograph. Essential information can include:

- ◆ soil types;
- ◆ stand age
- ◆ average tree height;
- ◆ tree species;
- ◆ type(s) of water supply (e.g., ponds, creeks, ephemeral pools, etc.);
- ◆ site productivity;
- ◆ stocking (trees per acre);
- ◆ standing timber volume;
- ◆ topography, slope, and aspect;
- ◆ number of acres;
- ◆ range of tree diameters;
- ◆ tree condition and health;
- ◆ unique water quality or drainage;
- ◆ other unique features.

(4) Prescribed forest management activities

The “real meat” of a forest management plan is applying your objectives and goals and creating a timetable of planned activities. Management activities can be included in the previous *Description* section, or they can be in a separate section linked to each timber stand. Typical prescribed activities include:

- ◆ Establishing and maintaining wildlife management practices;
- ◆ Installing and maintaining water quality protection practices (BMPs);
- ◆ Marking and maintaining property lines and corners;
- ◆ Road and trail design;
- ◆ Replanting (regeneration) practices;
- ◆ Enhancing the stand’s aesthetics, recreational use and diversity of plants and wildlife species.

(5) Protection, maintenance, and modification

When preparing your plan, seek the assistance of a professional forester or resource specialist. Several key points about all plans:

- ◆ Plans are unique to each owner and forest.
- ◆ A plan outlines what to do.
- ◆ No plan is set in stone and can be modified at any time.
- ◆ Plans should be reviewed and updated at least every five years or as conditions change or the objectives of the owner(s) change.
- ◆ All owners and heirs, if possible, should be included in developing and modifying the plan to ensure continuity of forest management activities.

(6) Record of activities

A record of the activities performed should be kept. This will help you remember when activities were performed so that you can better evaluate those practices. This can be included in the “Prescribed Forest Management Activities” section or attached as a separate section.

Which forest management approach appeals to you?

- | | | |
|---|--|--|
| <input type="checkbox"/> Improve your forest's health | <input type="checkbox"/> Provide periodic income | <input type="checkbox"/> Timber production & recreation |
| <input type="checkbox"/> Timber production and wildlife | <input type="checkbox"/> Future timber income | <input type="checkbox"/> Water Quality & Soil Protection |
| <input type="checkbox"/> Healthy forest and wildlife | <input type="checkbox"/> Healthy forest and recreation | <input type="checkbox"/> Other combinations |

Please list: _____

PARTING ADVICE

Whether you are managing for timber, wildlife, aesthetics, recreation or all of these, BMPs are common sense practices that apply to any site-disturbing activity.

The use of BMPs will prevent erosion and sedimentation, and protect water quality when building roads and trails, establishing food plots or conducting timber activities.

*The key is to plan for the protection of water quality **BEFORE** the activity begins and follow through with the use of appropriate Best Management Practices.*

Many management activities to improve forest resources can be cost-shared through a variety of state and federal programs. Contact your local natural resources agency to find out if any funds are available for your management goals.

A well-managed forest is a legacy

Whether you want your forest to produce income from timber harvesting or from recreational activity; provide wildlife habitat for hunting or merely viewing; for biking, hiking, or camping; or for sheltering rare, native plants or wildlife; your goals can go hand-in-hand with protecting water quality. In fact, for some goals, high water quality is essential.

Now that you are aware of many of the key ingredients it takes to manage a forest while protecting water quality. Map out your plan, follow it, and then

ENJOY!!

Getting Help and More Information

Advice from a natural resource management professional will enhance your forest's potential productivity, beauty, variety, and environmental quality. Now that you've taken the step of determining what type of forest you'd like, the following sources or organizations can help you get there:

N.C. Cooperative Extension Service provides educational programs, materials and local assistance.

Web Address: <http://www.ces.ncsu.edu/>

Extension Forestry – Educational programs, publications and electronic outreach.

North Carolina State University
Campus Box 8003
3028 Biltmore Hall
Raleigh, NC 27695-8003
Phone: 919-515-5638
Fax: 919-515-6883

Web Address: <http://www.ces.ncsu.edu/nreos/forest/index.htm>

N.C Division of Forest Resources provides personalized planning, advice, assistance and cost share.

1616 Mail Service Center
Raleigh, NC 27699-1616
Telephone: 919-733-2162
Fax: 919-715-5247

Web Address: <http://www.dfr.state.nc.us/>

North Carolina Wildlife Resources Commission wildlife biologists provide planning advice.

Division of Wildlife Management
1722 Mail Service Center
Raleigh, NC 27699-1722
Phone 919-733-7291

Web address: <http://www.ncwildlife.org/>

Natural Resources Conservation Service provides on-site planning, advice, assistance and cost share.

USDA Natural Resources Conservation Service
4405 Bland Rd., Suite 205
Raleigh, NC 27609
919-873-2100

Web address: <http://www.nc.nrcs.usda.gov/>

NC Division of Soil and Water Conservation

1614 Mail Service Center
Raleigh, NC 27699-1614
Telephone: 919-733-2302
Fax: 919-715-3559

Web address: <http://www.enr.state.nc.us/DSWC/>

NC Board of Registration for Foresters

PO Box 27393
Raleigh, NC 27611
Telephone: 919-772-5883
Fax: 919-772-5883

Web Address: <http://members.aol.com/ncbrf/>

NC Chapter – Association of Consulting Foresters Private foresters provide planning, advice and assistance.

Web Address: <http://www.acf-foresters.com/>

Your Copy

Date _____

Planning Your Family Forest – (Fill out this questionnaire and share with family and your resource professional to develop a plan that is unique to your property)

1. What are your goals? (Please check all that apply)

- Clean Water
- Income
- Hunt / Fish
- Timber Production
- Firewood
- Soil Protection
- Reduced Tax Burden
- Protection from Development

2. What are your resource priorities?

Please Rank your preferences in order of importance (1 being the most important and 5 being the least):

- | | |
|---------------------|-------|
| Wildlife | _____ |
| Water Protection | _____ |
| Recreation | _____ |
| Beauty (Aesthetics) | _____ |
| Soil Protection | _____ |
| Timber Production | _____ |
| Other: | _____ |

3. What are your recreation and aesthetics goals? (Please, check all that apply)

- Horseback Riding
- Bike or hike on trails
- Camping
- Fishing
- Boating
- Harvest berries/ Fruit
- Promote Flowering Trees/Plants
- Park-like appearance
- Observe fall colors
- Protect Historic / Unique Areas

Recreation and aesthetics goals (continued)

- Allow others to use your forest
- Nature study / photography
- Bird watching
- Wildflower enhancement

4. Which water quality protection actions would you undertake?

- Stabilize roads and trails
- Plan and select BMPs before site disturbance
- Leave buffer strips next to streams and water bodies
- Re-vegetate bare roads and trails where erosion is likely
- Restrict cattle from woodlots and streamside areas
- Test soil to determine fertilizer and lime rates
- Construct proper stream crossings

5. Which forest management approach appeals to you?

- Improve the forest's health
- Provide periodic income
- Have recreation and timber
- Produce wildlife and timber
- Produce future timber income
- Have wildlife and healthy forests
- Have recreation and healthy forests
- Other combinations

Please list: _____

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- Water Protection _____
- Recreation _____
- Beauty (Aesthetics) _____
- Soil Protection _____
- Timber Production _____
- Other: _____

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Please list: _____

Agency Partners



<http://www.ces.ncsu.edu>

512 N. Salisbury St.
Raleigh, N.C. 27604-1185
(919)733-3591



<http://www.ncwildlife.org>



<http://www.dfr.state.nc.us/>



<http://www.nc.nrcs.usda.gov/>

Cooperators:



NC Farm Bureau
<http://www.ncfb.com/>



Forest Landowners Association
<http://www.forestland.org/>



Division of Water Resources
<http://www.dwr.ehnr.state.nc.us/home.htm>



Association of Consulting Foresters of America
<http://www.acf-foresters.com/>



The Conservation Fund
<http://www.conservationfund.org/>



William G. Ross Jr. Mike Easley
Secretary Governor

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