

Georgia's

Best Management Practices



For Forestry



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Management
Practices**

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Foreword

Georgia's Best Management Practices for Forestry

The purpose of this manual is to inform landowners, foresters, timber buyers, loggers, *site preparation* and reforestation contractors, and others involved with *silvicultural* operations about commonsense, economical, and effective practices to minimize *nonpoint source pollution* (soil *erosion* and stream sedimentation) and thermal pollution. These minimum practices are called **Best Management Practices** and are commonly referred to as **BMPs**. They were initially developed in 1981 by a *Forestry Nonpoint Source Pollution* Technical Task Force as required by the Federal Water Pollution Control Act. That act mandated states to develop a program to protect and improve the physical, chemical, and biological integrity of the nation's waters so they remain "fishable" and "swimmable" for today's and future generations.

Due to changes in technology and the rules and regulations governing land disturbing activities, the forestry community and regulators encouraged a revision of the BMPs. A task force was convened in 1997 to revise the original BMPs and combine them with the 1989 wetland BMPs into one comprehensive document. This manual represents the collective best efforts to establish sound, responsible, guiding principles for *silvicultural* operations in the State of Georgia.

Note: Words in *Italics* are found in the glossary.



Legal justice scale denotes mandated law or requirement.



A "no" symbol indicates practices to avoid.

ACKNOWLEDGMENTS

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JANUARY 1999



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Section 1: Introduction

Georgia's 23.6 million acres of *commercial forests* provide a variety of benefits for the people of the state and region. In addition to forest products, forests provide clean water, clean air, soil conservation, wildlife habitat, *flora* and *fauna*, and opportunities for recreation, *aesthetics*, education, and research. These forests are managed by landowners with varying objectives and their individual management decisions may be designed to support a broad variety of specific focused benefits related to the list above and others from Section 7.0, pg 44. Figure 1-A shows the percentage of land in the state. Figure 1-B indicates commercial ownership of that land.

Figure 1-A. Georgia's Land Use

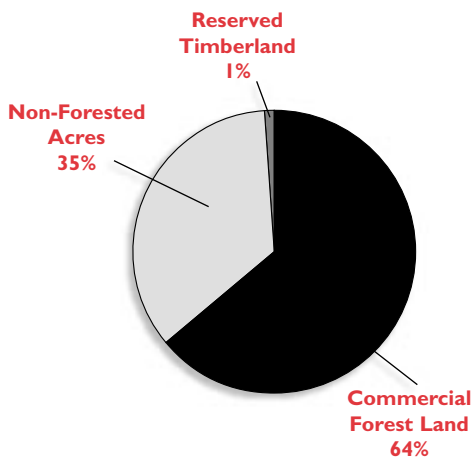
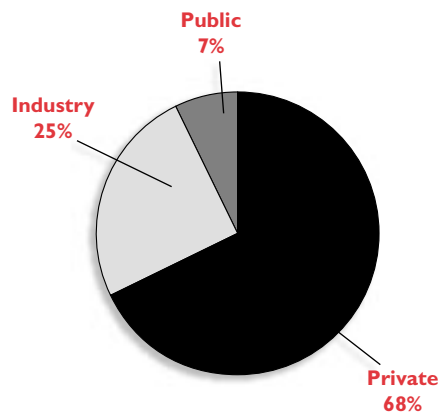


Figure 1-B. Georgia's Commercial Forest Ownership



BMPs are the most appropriate or applicable forest practices or activities to attain a silvicultural goal while protecting the chemical, physical, and biological integrity of the state's waters. Therefore, this document emphasizes the protection of water resources. Georgia has 44,056 miles of *perennial streams* (approximately 4,000 miles of which are designated as *mountain trout waters*), 23,906 miles of *intermittent streams* and 603 miles of *ditches and canals*. The state also has 425,382 acres of public lakes and reservoirs, 4.8 million acres of *wetlands* (9% tidally affected), 854 square miles of *estuaries* and 100 miles of coastline.

This document emphasizes the protection of water resources when conducting forestry operations, through BMPs in controlling or minimizing soil erosion and stream sedimentation.

By using proper forest management and sound conservation practices and techniques, including BMPs, forests can continue to provide benefits for future generations. Failure to follow BMPs may result in civil and criminal fines and penalties. Some counties already require plan reviews, permits, fees, performance bonds and compliance audits (See Section 8.0, pg 46). Therefore, it is in the best interest of everyone involved in *silvicultural* operations to properly plan and supervise their operations by consistently following BMPs to prevent any potential water quality problems. Unanticipated problems should be corrected as soon as possible.

Since 1978, the Georgia Forestry Commission (GFC) has been designated by the Georgia Environmental Protection Division (GAEPD) as the lead agency to coordinate the forest water quality program. A statewide coordinator and district coordinators in each of the twelve GFC districts conduct their program. The program's primary responsibilities include: educating the forestry community on BMPs through training and demonstrations; conducting BMP use and effectiveness monitoring surveys; and investigating and mediating forestry water quality complaints.

“It is in the best interest of everyone involved in silvicultural operations to properly plan and supervise their operations by consistently following BMPs to prevent any potential water quality problems.”

For more information about BMPs, contact the Georgia Forestry Commission, P.O. Box 819, Macon, Ga. 31202, 1-800-GA-TREES or visit our web site at www.gfc.state.ga.us



Section 2: Planning for Water Quality

Any forest management activity, regardless of potential impact on water quality, should be thoroughly planned. Whether the activity involves landowners selling timber for the first time or seasoned timber buyers, the planning process should consider the objectives of the proposed activity and potential impacts of all actions that disturb the soil surface or impact water quality. The planning process should help identify sensitive areas and applicable BMPs to be used during timber sales, road construction, stream crossings, harvesting, *site preparation*, reforestation, and *herbicide* applications. The planning process should help identify terms and conditions of a written contract for any forestry practice. While BMPs do not specifically require written plans, it is generally a sound practice to maintain written records of any forest management activity on the land.

Plans should consider:

- history of the site including past land use;
- sensitive areas such as *perennial* and *intermittent streams*, *ephemeral areas*, lakes, ponds, *wetlands*, steep slopes, highly erosive or hydric soils, active *gully* systems, etc.;
- regulations and/or permitting requirements; and,
- location, type, timing and logistics of each activity.

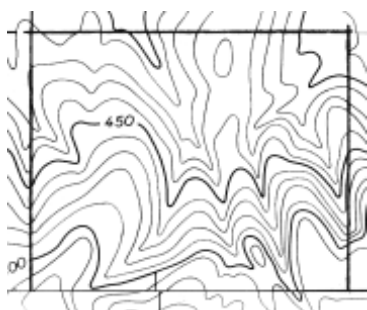
Useful resources for planning forest operations include United States Geologic Survey (USGS) topographic maps, Natural Resource Conservation Service (NRCS) county soil survey maps with interpretations, aerial photographs, and tax maps. They can help locate tract boundaries and sensitive areas. Because no map is 100 percent accurate, they should be used as a reference to identify potentially sensitive areas that must then be verified and plotted during field reconnaissance to minimize impacts on them before *silvicultural* operations begin. Except for tax maps, the GFC maintains these documents at all District Offices. The NRCS maintains soil and topographic maps at local field offices where field personnel can assist in map and resource information interpretation.

Water quality protection begins with recognizing watercourses and water bodies. According to the federal Clean Water Act, “waters of the U.S.” include lakes, rivers, *perennial* and *intermittent streams*, *wetlands*, *sloughs* or natural ponds. Georgia law (OCGA 12-7-3.13) defines “waters of the state” to mean all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, *springs*, wells, and other bodies of surface

or subsurface water, natural or artificial, lying within or forming part of the boundaries of the state that are not entirely confined and retained completely upon the property of a single individual, partnership or corporation.

Identifying stream types (*perennial*, *intermittent*, or *ephemeral*) is important in prescribing the level of protection through the implementation of BMPs listed in this manual. USGS topographic maps and NRCS county soil maps can be used as a reference to identify stream types. Where available they should be cross-referenced and field verified (See Figure 2-A).

Figure 2-A. Comparison of Topo Map and Soils Map of Same Tract



Topo map showing no streams



Soils map showing streams

Stream Types

Perennial streams flow in a well-defined *channel* throughout most of the year under normal climatic conditions. Some may dry up during drought periods or due to excessive upstream uses. They are usually identified as solid blue lines on USGS topographic maps and as either solid black or black lines separated by one dot on NRCS soil maps. Aquatic organisms are normally present and easily found in these streams.

Intermittent streams flow in a well-defined *channel* during wet seasons of the year but not for the entire year. They generally exhibit signs of water velocity sufficient to move soil material, litter and fine debris. They are usually identified as blue lines separated by three dots on USGS topographic maps and as black lines separated by two or more dots on NRCS soil maps. Aquatic organisms often are difficult to find or not present at all in these streams.

Ephemeral areas, commonly referred to as drains, draws, or *dry washes*, typically have no well-defined *channels* and flow only during and for short periods following *precipitation*. They typically flow into *intermittent* or *perennial streams*. Leaf, straw, and other forest litter is typically present in the *ephemeral* area. They are usually not identified on topographic maps or NRCS soil maps. Aquatic organisms are not present in these areas.



Section 2: Planning for Water Quality

The landowner or manager may be familiar with a stream's flow characteristics and make the determination of stream type. In some cases there may be uncertainty. For example, *ephemeral areas* may be difficult to locate when they are not actively flowing. In such situations, consult a *qualified professional*.

Other Sensitive Areas

Some water bodies and upland areas have particular characteristics or regulatory requirements that require different management approaches. These include, but are not limited to *mountain trout streams, protected river corridors, water supply reservoirs/watersheds, ditches, canals, sloughs, wetlands, braided streams, gullied areas, and protected mountain tops*. In such situations, consult a *qualified professional*. Forest health issues such as fire management, *integrated pest management* and disease control may also require a *qualified professional* to prescribe appropriate actions. Forest managers, landowners, foresters, timber buyers, loggers, *site preparation*, and reforestation contractors should clearly identify water bodies, sensitive areas and *streamside management zones (SMZs)* in the field and then decide which BMPs apply, when and where to apply them to carefully design *access roads, log decks, and stream crossings*. They should supervise these operations to make sure BMPs are followed where necessary so that water quality is not compromised.

Benefits of Planning

The benefits of a well written plan and or written contract include: better communications of expectations between the landowner and forestry professionals; maximum return from the harvest; potential long term benefits in terms of productivity; better infrastructure; economic efficiency; minimal environmental impacts; compliance with Federal, State and local laws; and avoidance of fines or penalties. For information regarding sample contracts and management planning, contact the GFC. Planning for the protection of water quality makes good sense.

2.1 STREAMSIDE MANAGEMENT ZONES (SMZs)

Streamside Management Zones (SMZs) are *buffer strips* adjacent to *perennial or intermittent streams* or other bodies of water (lakes, ponds, reservoirs, etc.) that should be managed with special considerations to protect water quality. Trees and other vegetation in the SMZ provide shade that buffers water temperatures,

woody debris vital to the aquatic ecosystem, natural filtration of *sediment* and other *pollutants* (nutrients and pesticides), and travel corridors and habitat for wildlife. SMZs also provide some flood protection by dissipating the velocity of moving water.

Note: Words in italics are found in the glossary.

When planning and laying out harvest or treatment areas, SMZs should be identified on maps or aerial photos and clearly designated in the field with paint or flagging. Identify local, state or federal regulations that may supersede or mandate the use of BMPs, such as those for protected *water-supply reservoirs/watersheds* or *protected river corridors*.

2.1.1 Perennial and Intermittent Stream SMZ Width Recommendations

There is no uniform formula to determine the appropriate width of an SMZ. In general, however, the steeper the slope and more erosive the soil, the wider the SMZ. Slopes should be determined from a point 100 feet perpendicular to the streambank. Therefore, SMZ widths may vary along a stream's course and on opposite sides of the same stream. SMZs should be measured along the ground from the stream bank on each side of the stream and not from the centerline of the stream (See Figure 2-B and Table 2-A).

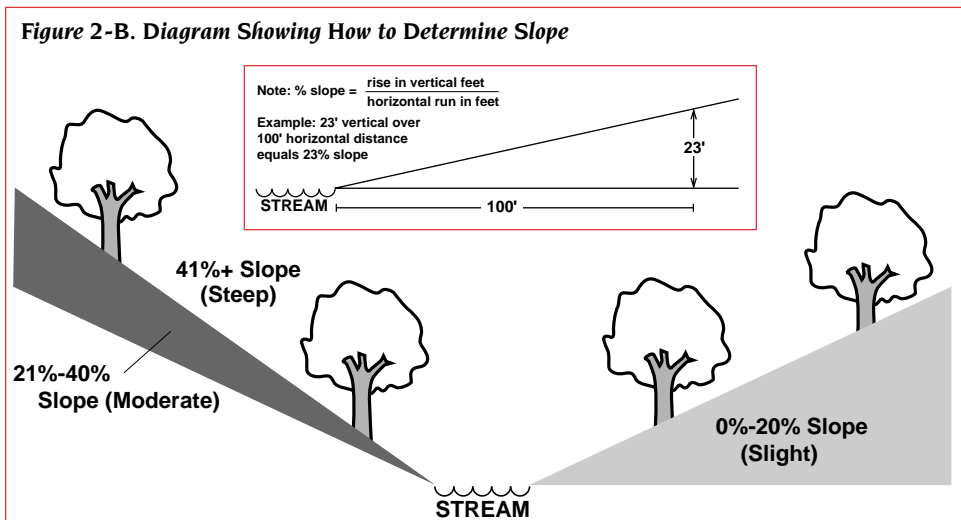


Table 2-A. SMZ Widths by Slope Class and Stream Type

Slope Class	Minimum Width (ft) of SMZ on Each Side		
	Perennial (feet)	Intermittent (feet)	Trout (feet)
Slight (<20%)	40	20	100
Moderate (21-40%)	70	35	100
Steep (>40%)	100	50	100



Section 2: Planning for Water Quality

Remember that these are recommended minimum widths, and conditions such as unstable or erosive soils or lack of ground cover may warrant a wider SMZ for adequate water quality protection. Also SMZs have a limited filtering capacity and are not intended to correct problems created by poor upslope or adjacent practices.

2.1.1.1 BMPs for Perennial and Intermittent Stream SMZs

(Does NOT include trout streams. Trout stream BMPs are discussed in Section 2.1.2)

Management activities may occur within an SMZ provided that the disturbance to soil or ground cover is minimized. Water quality objectives should prevent movement of soil or other potential *pollutants* from within the SMZ into the watercourse and protect stream bank integrity. The BMPs associated with typical *silvicultural* activities are listed below.

- Identify any local, State, or Federal regulations that may supersede or mandate the use of BMPs.
- Determine and designate the appropriate SMZ widths on site prior to conducting any timber sale or forest practice.
- Along *perennial streams*, leave an average of 50 square feet of *basal area* per acre evenly distributed throughout the zone or at least 50% *canopy cover* after a harvest to provide shade.
- Along *intermittent streams*, leave an average of 25 square feet of *basal area* per acre evenly distributed throughout the zone or at least 25% *canopy cover* after a harvest to provide shade.
- Minimize stream crossings (See Section 3.3, pg 18 and 4.3, pg 28).
- Except at planned stream crossings, locate new access roads outside the SMZ.
- Maintain existing roads within SMZs with adequate *water control structures* and stabilization measures as needed (See Section 3.2, pg 15). If not possible, consider relocating road.
- Locate *log decks*, *staging areas*, and *skid trails* outside the SMZ, preferably on well-drained, stable soils.
- Where used, firebreaks should be installed parallel to streams and outside SMZs (See Section 5.5, pg 37).
- Minimize the intensity of a prescribed fire in the SMZ to maintain forest floor cover and protect the soil surface.
- Periodically inspect the SMZ, evaluate the effectiveness of the BMPs, and adjust practices when necessary.

2.1.1.2 Practices to Avoid Within SMZs of Perennial and Intermittent Streams

- Cutting stream bank trees.
- Unnecessary *access roads* and main *skid trails*.
- *Log decks*.
- Portable sawmills.
- Significant soil compaction and rutting by harvesting equipment.
- Removal of ground cover or understory vegetation.
- *Felling* trees into the streambed or leaving *logging debris* in the stream.
- Servicing or refueling equipment.
- Mechanical *site preparation* and *site preparation* burning.
- Mechanical tree planting.
- Broadcast application of *pesticides* or *fertilizers*.
- Handling, mixing, or storing toxic or hazardous materials (fuels, lubricants, solvents, *pesticides*, or *fertilizers*).



Trout are extremely sensitive to sediment and thermal pollution.

2.1.2 Trout Streams

Trout require cool (less than 70° F), high-quality water. They, and the insects they eat, are extremely sensitive to *sediment* and *thermal pollution* (elevated water temperatures). Therefore, *trout streams* require additional protection. Waters designated as *Primary Trout Streams* support a self-sustaining population of rainbow, brown, or brook trout. Streams designated as *Secondary Trout Streams* are those where trout can survive, but there is no evidence of natural trout reproduction. See Section 8, pg 48-53, for a county listing of *trout streams* or refer to GFC's brochure, "Georgia's Best Management Practices for Forestry: Trout Streams of Georgia."

2.1.2.1 SMZ Width Recommendations and BMPs For Trout Streams

- Establish 100 foot SMZs on both sides of designated streams and tributaries according to the following options:

Option A:

A minimum 100 foot SMZ that includes a no-harvest zone within the first 25 feet of primary or secondary *trout streams*. Timber harvests within the remaining 75 feet of the SMZ should leave an average of 50 square feet of *basal area* per acre or at least 50% *canopy cover*.

Option B:

Within the 100 foot SMZ, leave an average of 50 square feet of basal area per acre evenly distributed throughout the zone to provide shade. Option B may be selected if a *qualified professional* is consulted.

- Follow all other BMPs for perennial and intermittent streams noting the 100 foot zone.



Section 2: Planning for Water Quality

2.1.2.2 Practices to Avoid Within SMZ of Trout Streams

- Any forest activity within 25 feet of the stream, unless using Option B above.
- Mechanical *site preparation* and high intensity burns on *ephemeral areas* above trout waters.

2.1.3 Ephemeral Areas

Since *ephemeral areas* can direct stormflow into *intermittent stream channels*, care should be taken to minimize disturbing the soil in these areas. Where *ephemeral areas* transition into well-defined *intermittent* or *perennial streams*, those areas should be treated as an *intermittent stream* (See Section 2.1, pg 8).

2.2 SPECIAL MANAGEMENT AREAS

2.2.1 Braided streams - Treat each *channel* individually, depending upon whether the stream is *perennial*, *intermittent*, or *ephemeral*. These unique streams require highly site-specific management planning and recommendations. In some cases, the potential for wind throw of trees left in the SMZ will dictate variances in the removal of the *canopy cover*. Seek the assistance of a *qualified professional*.

2.2.2 Canals and Ditches - Minor drainage to temporarily lower the water level on a wetland site during road construction, timber harvesting, and site preparation is considered normal and exempt from Section 404 permitting if it does not result in the immediate or gradual conversion of a wetland to an upland or other land use. Minor drainage does not include the construction of a canal, dike or any other structure which continuously drains or significantly modifies a wetland or other waterbody. If the ditches could potentially move *sediment* or other *pollutants* off site, provide appropriate water protection. *Ditches* should not empty directly into streams. Do not locate new drainage *ditches* in the SMZ.

2.2.3 Gullies - Many old gullies have healed and are not active as *ephemeral areas*. Care should be taken not to re-activate gullies. If the practice(s) lead to re-activation of flow, then the gullies must be treated as *ephemeral areas*.

2.2.4 Lakes, ponds, and other bodies of flowing water - Follow the BMPs recommended for *perennial streams* if they could potentially move *sediments* or other *pollutants* off site.



2.2.5 Protected Mountain Tops - Forestry activities on mountain tops above 2,200 feet elevation with slopes greater than 25% including the reforestation require-

ment shall comply with BMPs (See Section 8.2.3.4, pg 56 and Figure 8-C, pg 57).



2.2.6 Protected River Corridors - Forestry activities within the 100 foot buffers along those rivers at a point and below where the flow is 400 cubic feet per second (cfs) shall comply with BMPs (See Section 8.2.3.3, pg 55 and Figure 8-B, pg 56).

2.2.7 Seeps and springs - Treat as *perennial streams* if they flow all year long or *intermittent* otherwise.

2.2.8 Sinkhole - A geologic feature, typically found in Karst geology, that might provide a direct connection between land surface and groundwater. Treat as *perennial streams*.

2.2.9 Slough - (Sometimes referred to as an oxbow.) Treat as *perennial* or *intermittent stream* if they could potentially move *sediment* or other *pollutants* off site.



2.2.10 Water Supply Reservoir/Watershed (See Section 8.2.3.1 and Figures 8-A, pg 54-55).

- For governmentally owned impoundments or intakes occurring within a 100 square mile or larger *watershed*, forestry activities within a 150 foot buffer adjacent to all reservoirs and 100 foot buffer adjacent to all *perennial streams* within a seven-mile radius above intakes shall comply with BMPs.
- For governmentally owned impoundments or intakes within a *watershed* of less than 100 square miles, forestry activities within a 150 foot buffer adjacent to the reservoir, a 100 foot buffer adjacent to *perennial streams* within a seven-mile radius, and a 50 foot buffer adjacent to all *perennial streams* above the seven-mile radius shall comply with BMPs.



2.2.11 Wetlands - For regulatory purposes, *wetlands* are defined by the presence or absence of specific plant communities, *hydric soils* and hydrologic conditions. Because of the generally wet soil conditions associated with forested *wetlands*, these areas are sensitive to forestry activities. For instance, bottomland hardwood sites, Carolina bays, cypress domes, other swamps, and some pine savannas differ from upland forest types because their soils are wet most of the year. They frequently are connected directly to a larger aquatic system, often have overbank flow from nearby stream flooding, and may accumulate *sediments* and nutrients from upstream *erosion* and runoff.

To properly manage forested *wetlands*: plan for *regeneration*; consider the areas beyond the actual harvest site; and remember that special harvesting techniques may be necessary to protect water quality. Any stream *channels* should be identified and the appropriate SMZs established. The BMPs that apply to any other forest type generally apply to forested *wetlands*. For more information on harvesting and site-preparing *wetlands*, refer to Section 4.7, pg 31 and Section 5.2, pg 34.



Section 3: Road Location, Construction, Stream Crossings, Maintenance, Retirement

Access roads are an essential part of any forest management operation and provide access for other activities on forestland. With proper planning, location, construction, and maintenance techniques, well-constructed access roads allow for productive operations and cause minimal soil and water quality impacts. However, poorly located, poorly constructed, or poorly maintained access roads, especially at stream crossings, can result in sediment reaching streams; changing stream flow patterns, degrading fish and aquatic organism habitat, and adversely affecting aesthetics.

There are two types of access roads typically constructed in the state. In mountainous and hilly terrain, the *broad-based dip* road is commonly used. In the flatwoods and along major flood plains, the *crown and ditch* road is commonly used.

3.1 BMPS FOR ROAD LOCATION

- Identify Federal, State and local laws, regulations or ordinances that apply to road purpose, construction, and maintenance prior to construction and operation. Include needed considerations and measures to meet requirements.
- Use soil surveys and topographic maps to identify soils, stream locations and other natural features (rocky areas, steep slopes, wet areas, etc.) on the property that might pose problems.
- Locate potential control points i.e. *log decks* and stream crossings on topographic maps prior to designing access roads in the field.
- New permanent access roads should follow the *contour* of the land as much as possible with grades ideally kept below 10%. An engineer's divider can be used to lay roads out with the desired grade on a topographic map. Grades can run up to 12% for short distances. If soil is highly erosive, reduce grades and install *water control structures*.
- Temporary access roads should follow the *contour* of the land as much as possible. Grades can run up to 25% for short distances provided that *water control structures* are properly installed.
- Except for planned stream crossings, locate new roads outside of SMZs.
- Minimize stream crossings. Where crossings are necessary see Section 3.3, pg 18.
- Minimize the number, length, and width of access roads.
- Locate new access roads on high ground, preferably on the sides of ridges, for

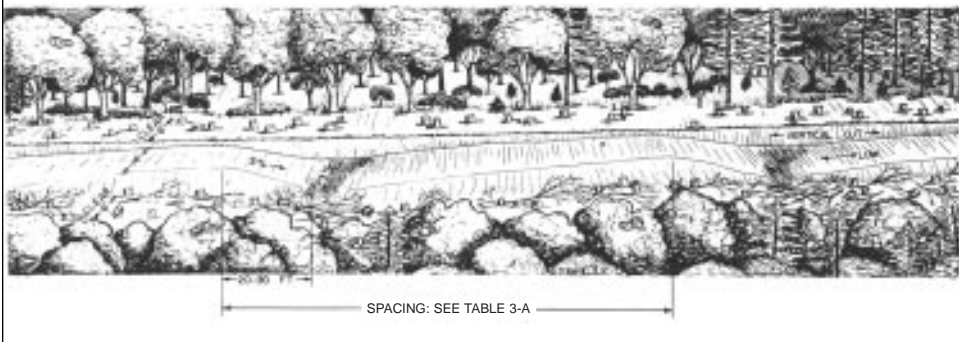
- proper surface drainage.
- Locate new *access roads* on southern or western sides (*aspect*) of ridges if possible to expose the roadbed to more sunlight.
 - Conduct site reconnaissance to verify road layout with potential soil problems, stream locations, sensitive areas (See Section 7.4, pg 45), and *watershed* conditions.
 - Evaluate the condition of existing roads and potential water quality impacts. If necessary, plan for improvements or replace with new routes.

3.2 BMPS FOR ROAD CONSTRUCTION

Note: Words in italics are found in the glossary.

- Construct *access roads* only wide enough (usually 12-16 feet) to safely handle equipment that will use the road.
- Schedule construction during favorable weather.
- Maximize sunlight exposure along roadsides where surface drainage is a problem.
- On permanent *access roads* with 3% or more grade, *broad-based dips* should be installed at proper intervals (30° angles across road surfaces), have reverse grades of 3%, and the bottom of the dips should be *outsloped* about 3%. If necessary, outfall of dips may need sediment barriers such as rock, hay bales, or silt fence installed (See Figure 3-A for a schematic of a *broad-based dip* road and Table 3-A for recommended spacing of dips).
- On temporary access or spur roads that have little traffic at low speeds, rolling dips can be installed. They resemble “stretched out” water bars (See Figure 3-B and Table 3-A for spacing of rolling dips).

Figure 3-A. Broad-based Dip Road



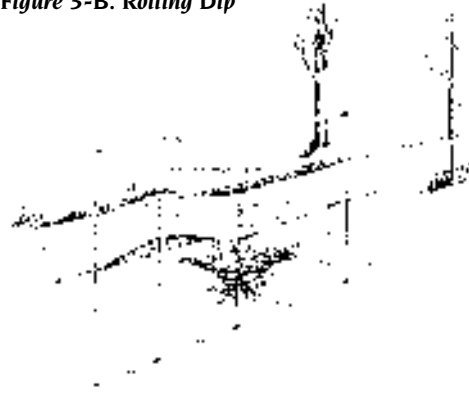


**Section 3:
Road Location, Construction,
Stream Crossings, Maintenance,
Retirement**

Road Grade (percent)	Distance Between Dips and Turnouts (feet)
3	235
4	200
5	180
6	165
7	155
8	150
9	145
10	140
12	135

**Table 3-A.
Recommended Spacing for Broad-based
Dips in Permanent Access Roads and
Rolling Dips in Temporary Access Roads**

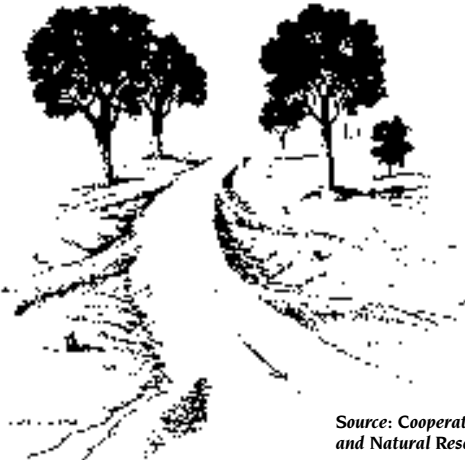
Figure 3-B. Rolling Dip



Source: Cooperative Extension Service Division of Agricultural Sciences and Natural Resources, Oklahoma State University

- On *crown and ditched* roads, install *water turnouts* at proper intervals (See Figure 3-C and Table 3-B). Turnouts should never tie directly into streams or water bodies. If necessary, outfall of turnouts may need sediment barriers such as rock, hay bales, or silt fence installed.

Figure 3-C. Design and Installation of Turnouts



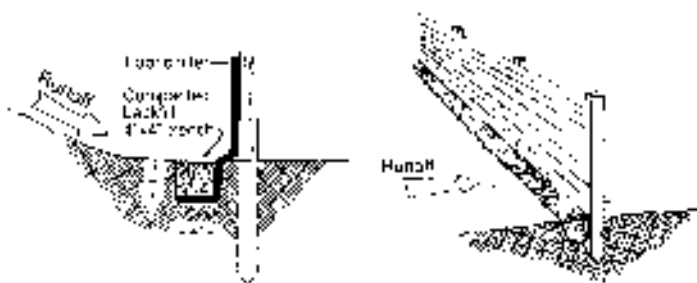
**Table 3-B.
Spacing of Turnouts**

Road Grade (percent)	Spacing (feet)
2 - 5	500-300
6 - 10	300-200
11 - 15	200-100
16-20	100

Source: Cooperative Extension Service Division of Agricultural Sciences and Natural Resources, Oklahoma State University

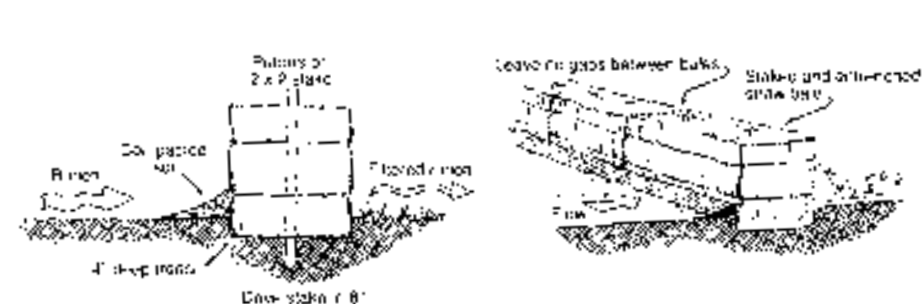
- Keep roads free from obstructions and *logging debris*.
- Roadbeds on erosive soils should be stabilized with appropriate measures.
- Stabilize exposed soil on shoulders of permanent or temporary *access roads* located within SMZs, *wetlands*, or at stream crossings as soon as possible with any one or combination of the following: seed and mulch, *silt fence*, hay bales, *excelsior blankets*, or *geotextiles*.
 1. See Section 6.4 for grassing recommendations.
 2. Type A (36 inch) or Type B (22 inch) *silt fence* can be used. Wooden stakes should be fastened to the fence every 6 feet on the down slope side. The bottom edge of the fence should be installed in a 4 inch deep trench with the bottom two inches of the fence facing upslope in the trench (See Figure 3-D).
 3. Hay bales should be placed on sides in 4 inch deep trenches and staked down (See Figure 3-E).

Figure 3-D. Silt Fence Installation



Source: Bureau of Forestry, Wisconsin Department of Natural Resources

Figure 3-E. Installation of Hay Bales



Source: Bureau of Forestry, Wisconsin Department of Natural Resources

- For more information refer to Georgia Soil and Water Conservation Commission's Field Manual for Erosion and Sediment Control in Georgia, pg 79.

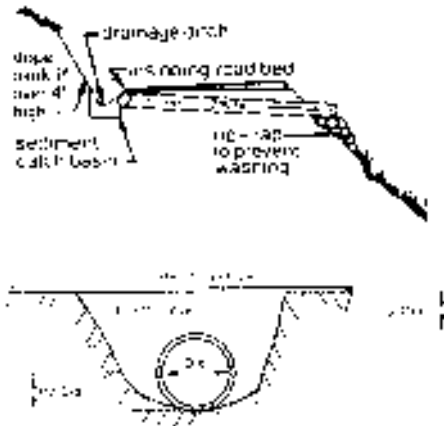


**Section 3:
Road Location, Construction,
Stream Crossings,
Maintenance, Retirement**

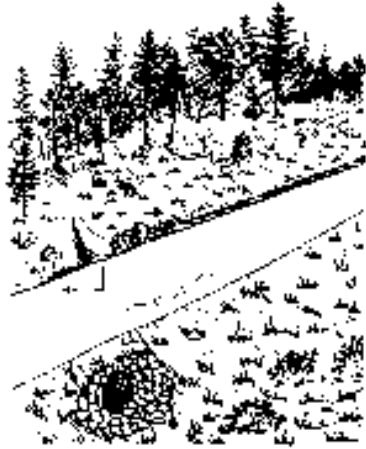
3.2.1 Practices to Avoid During Road Construction

- Except at planned stream crossings, road construction inside the SMZ.
- Insloping of roads. Where unavoidable, use *cross-drain culverts* positioned under the road at a 30° angle and spacing as in Table 3-B for proper inside road drainage. Place *rip-rap* at culvert outfall to prevent washing (See Figure 3-F).

Figure 3-F. Cross-drain Culvert Design and Installation



Source: Georgia Forestry Commission



Source: Bureau of Forestry, Wisconsin Department of Natural Resources

- Using *ditches* on steep roads. Some *ditches* may have to be lined with rock to prevent gullying and sedimentation.
- Turnouts tied directly into *perennial* and *intermittent streams* or *ephemeral areas*.

3.3 STREAM CROSSINGS FOR ROADS

Stream crossings are often necessary for access to forestlands. From a water quality standpoint, stream crossings are the most critical aspect of the road system. Failure of a stream crossing, due to improper planning or construction, can result in *erosion* and introduction of sediment into a stream, which can possibly affect water quality. Therefore, stream crossings should be avoided, if possible, through pre-harvest planning.

Where crossings are necessary, planning should address the type of road and road-use pattern, stream *channel* characteristics, stream flow levels, and the aquatic organisms in the stream. Minimizing impacts is critical. Permanent and temporary stream crossings should be based on expected applicable storm flow return intervals and watershed acreage above the crossing (See Table 3-C, pg 22).

3.3.1 **Clean Water Act Provisions and Requirements for Stream Crossings**

The Federal Clean Water Act, Section 404 (40 CFR Part 232.3), exempts normal, established, ongoing *silvicultural* activities from the permitting process for discharges of dredged or fill material in jurisdictional *wetlands*. However, fifteen (15) baseline provisions for forest road construction and maintenance in and across *waters of the U.S.* (lakes, rivers, *perennial* and *intermittent streams*, *wetlands*, *sloughs* and natural ponds) are mandated to qualify for the forest road exemption:

1. Permanent roads, temporary access roads and *skid trails* (all for forestry) in *waters of the U.S.* shall be held to the minimum feasible number, width and total length consistent with the purpose of specific *silvicultural* operations, and local topographic and climatic conditions;
2. All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads that must cross water bodies) to minimize discharges of dredged or fill material into *waters of the U.S.*;
3. The road fill shall be bridged, culverted or otherwise designed to prevent the restriction of expected flood flows;
4. The fill shall be properly stabilized and maintained during and following construction to prevent *erosion*;
5. Discharges of dredged or fill material into *waters of the U.S.* to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers or other heavy equipment within *waters of the U.S.* (including adjacent *wetlands*) that lie outside the lateral boundaries of the fill itself;
6. In designing, constructing and maintaining roads, vegetative disturbances in the *waters of the U.S.* shall be kept to a minimum;
7. The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body;
8. Borrow material shall be taken from upland sources wherever feasible;
9. The discharges shall not take or jeopardize the continued existence of a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;



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10. Discharges into breeding and nesting areas for waterfowl, spawning areas, and *wetlands* shall be avoided if less harmful alternatives exist;
11. The discharge shall not be located in the proximity of a public water supply intake;
12. The discharge shall not occur in areas of concentrated shellfish production;
13. The discharge shall not occur in a component of the National Wild and Scenic River System;
14. The discharge of material shall consist of suitable material free from toxic *pollutants* in toxic amounts; and,
15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

There are three types of stream crossings to consider in forest management operations: bridges, *culverts*, and fords.

Bridges, whether permanent or temporary, typically create the least disruption to stream flow and have less effect on fisheries than other stream-crossing methods. Pole bridges can be used for temporary crossings under certain conditions.

Culverts can be either temporary or permanent. Culvert sizing is critical to minimizing problems. Consider both the purpose of the crossing and the duration of use. Sizing may increase if the need is permanent.

Fords can be used for haul roads only where the streambed is firm, banks are low and stable and the stream is shallow.



Pole bridges can be used for temporary crossings under certain conditions.

3.3.2 General BMPs For Stream Crossings

In addition to the fifteen CWA mandated provisions:

- Approaches to all permanent or temporary stream crossings should be made at gentle grades of slope (3% or less) wherever possible.
- Approaches should be made at right angles to stream flow where practical.
- Approaches should have *water control structures*, such as *water turnouts* or *broad-based dips*, on both sides of a crossing to prevent road runoff from entering the stream.
- Stabilize approaches, if necessary, with rock extending at least 50 feet from both sides of the stream bank during the operation.

- For temporary *access roads*, temporary bridges or spans are favored over *culverts* or fords.
- Build *wetlands* fill roads outside the SMZ, except when crossing the *channel*. Cross-drainage structures (*culverts*, bridges, portable spans, etc.) may be necessary in the fill road to allow for surface water movement across the site.
- Stabilize exposed soil around permanent or temporary stream and *wetlands* crossings with any one or a combination of the following: seed and mulch, hay bales, rock, *silt fence*, *geotextiles*, and/or *excelsior blankets* (See Section 3.2, pg 15).

3.3.3 Specific BMPs For Bridges

- With *watersheds* of 300 acres or more, use bridges to cross streams if other alternatives are not suitable for containing storm flows.
- Remove temporary bridges and stabilize approaches and stream banks when operations are completed.

3.3.4 Specific BMPs For Fords

- Use fords only for haul roads (not *skid trails*).
- Locate fords where stream banks are low and the bottoms are relatively hard and level.
- Where necessary, establish a smooth, hard-surface, low water crossing. For a permanent ford use gravel or rock filled Geoweb® or concrete pads. For temporary fords use dragline mats or logs to armor (protect) the stream bottom.
- Material should not significantly impound stream flow, impede fish passage or cause erosive currents. Remove temporary crossings from the *channel* when operations are completed.

3.3.5 Specific BMPs For Culverts

- Where fords are not available or recommended, culverts can be used to cross small streams (usually 300 acre or less watershed, depending on physiographic region) including braided streams in broad flats (See map on inside back cover).
- When crossing streams with a *watershed* larger than 300 acres, consult a *qualified professional*.
- Size permanent *culverts* so that the cross-sectional area will accommodate expected 25-year, 24-hour storm flows (See Table 3-C for recommended diameters).
- Size temporary *culverts* so that the cross sectional area will accommodate the 2-year, 24-hour storm flows (See Table 3-C for recommended diameters).



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Table 3-C. Recommended Diameters for Permanent/Temporary Culverts

Drainage Area (acres)	Lower Coastal Plain (inches)	Upper Coastal Plain (inches)	Piedmont (inches)	Mountains and Ridge & Valley (inches)
PERMANENT (Based on 25-year, 24-hour storm flows)				
10	24	15	30	24
50	36 or (2-30")	18	48 or (2-36")	48
100	48	24	54 or (2-42")	60 or (2-48")
200	60	36	72 or (2-54")	72
300	2-48"	54	84 or (2-60")	78 or (2-60")
TEMPORARY (Based on 2-year, 24-hour storm flows)				
10	15	15	18	15
50	18	15	30	24
100	24	18	36	30
200	30	24	42 or (2-30")	36
300	48	30	48	42

- Under normal conditions, two alternative methods of culverting are acceptable:
 1. Smaller multiple culverts can be substituted to provide for the same cross-sectional area of pipe required as shown in the above table.
 2. A combination of a smaller culvert(s) with rock surfaced road dips constructed in the roadbed to handle the runaround flow from larger storm events (See Figure 3-G).



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- Place fill dirt around the lower half of the *culvert* and pack during installation.
- Place at least 15 inches or at least one-third the *culvert's* diameter, whichever is greater, of fill dirt over the top of the *culvert* so that the fill over the *culvert* is the high spot in the stream crossing. This creates an emergency run-around for high flows.
- The *culvert's* ends should be long enough to achieve no more than a 2:1 slope on the fill.
- Stabilize fill at ends of a *culvert* with either *rip-rap*, Geoweb®, *excelsior blankets*, *gabions*, headwalls, grass seed and mulch, hay bales, etc.
- Periodically inspect culverts and remove any debris inside.
- Remove all temporary *culverts* and fill material used in stream or wetland crossings and stabilize streambanks when operations are completed (See Section 3.2 for stabilization recommendations).

3.3.6 Practices To Avoid When Constructing Stream Crossings

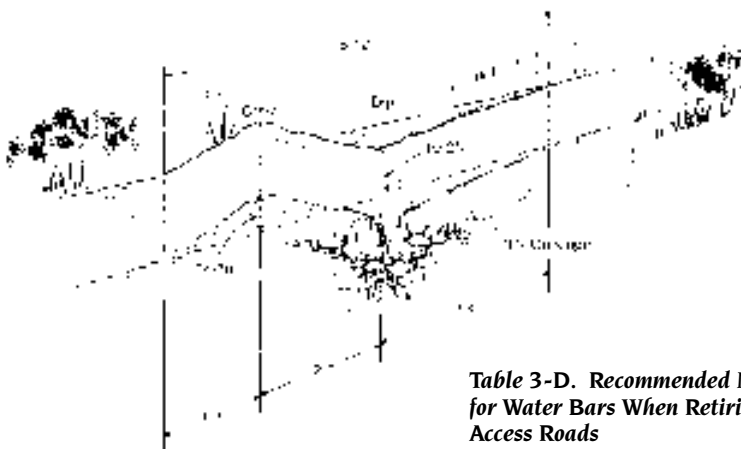
- Using steep approaches (> 3%) into the stream *channel*.
- Crossings at bends in the stream.
- Using fords in streams for *skid trails*.
- Constructing hard surface crossings on streams with mucky, muddy or unstable bottoms.
- Using asphalt materials for low water crossings.
- Anything that impedes the free or expected flow of water.
- Temporary crossings of logs and brush "topped" with soil.
- Using undersized *culverts*.

3.4 BMPS FOR THE MAINTENANCE AND RETIREMENT OF ROADS

- Maintain existing roads in accordance with BMPs.
- Maintain points of ingress from county roads or highways to prevent mud and debris being brought onto these roads.
- Minimize road grading and reshaping on hilly or mountainous terrain unless required to repair damaged road sections.
- Keep outfall of *broad-based dips*, *water bars*, and *water turnouts* open at all times during logging operations. If necessary, install sediment barriers such as rock, hay bales, or silt fence just below outfall.

- Retire temporary *access roads*, *log decks*, *skid trails*, by reshaping and/or constructing *water bars* at recommended intervals. Stabilize as necessary by seeding and *mulching* or scattering *logging debris* over the road surface (See Figure 3-I and Table 3-D for spacing recommendations).
- Periodically inspect retired roads to assure stabilization techniques are still effective and permanent stream crossings are clear and operating properly.

Figure 3-I. Profile of Retired Temporary Access Road Showing Water Bars



Source: Cooperative Extension Service Division of Agricultural Sciences and Natural Resources, Oklahoma State University.

Table 3-D. Recommended Maximum Spacing for Water Bars When Retiring Temporary Access Roads

Road Grade (percent)	Distance Between Water Bars (feet)
2	245
5	125
10	80
15	60
20	50
25	40

3.4.1 Practices To Avoid During Road Maintenance and Retirement

- Excessive traffic on wet roads.



Section 4: Timber Harvesting

Timber harvesting encompasses several operations. In addition to cutting trees, it typically includes the layout of *access roads*, *log decks*, and *skid trails* and the construction and stabilization of these areas. Timber harvesting can be accomplished while protecting water quality and site productivity and improving the composition and quality of future forests. Evolving timber harvesting technology, equipment, and procedures will provide for better protection of Georgia's waters.

Potential water quality impacts can be avoided or minimized if the harvest plan considers seasonal weather conditions, stand composition, soil type, soil moisture, topography, and type of equipment used. It is important to keep out of streams, to maintain the integrity of their banks, water flow, and stream biology. Specific BMPs for *log decks* and *skid trails* are provided in this section. BMPs for roads are presented in Section 3.

4.1 LOG DECKS

Log decks, also called brows and landings, are areas of concentrated equipment and traffic resulting in a high degree of soil disturbance, soil compaction, and rutting. Storm water runoff and surface *erosion* may increase on these exposed areas and, depending on their locations, could impact water quality. Runoff may contain toxic materials from fuels and lubricants. The following BMPs should be implemented to prevent runoff from reaching nearby watercourses.

4.1.1 BMPs For Log Decks

- Locate *log decks* before planning the road system.
- Minimize the number of *log decks* necessary for the operation.
- Minimize the size of *log decks*.
- Locate *log decks* uphill and *skid* up to them. This results in a cone-shaped pattern of *skid trails*, which disperses water running downhill. If trees must be skidded downhill, *erosion* can be minimized using smaller *log decks* with fewer, shorter and less-traveled *skid trails* leading to any one deck. Install *water bars* with *water turnouts* in *skid trails* prior to final approach to deck to disperse water.
- Locate *log decks* in a stable, well-drained area away from gullies when possible.
- Stabilize as needed when the harvest is completed, using *water bars*, logging

slash, or vegetative cover (See Table 6-A, pg 42 for seeding recommendations).

4.1.2 Practices to Avoid for Log Decks

- Locating *log decks* within the SMZ.
- Allowing *log decks* to concentrate storm runoff onto roads, trails, or direct paths leading to a watercourse.

4.2 SKID TRAILS

Skid trails are for temporary use during the timber harvest. Control and minimize site-damaging effects to soil stability and water quality, such as rutting, puddling, and compaction from harvest equipment. If trails will remain after the harvest for vehicular access, upgrade them to road building standards.

Control and minimize site-damaging effects to soil stability and water quality, such as rutting, puddling and compaction from harvest equipment.

4.2.1 BMPs for Skid Trails

- *Skid* uphill to *log decks* on ridges or hills.
- Have periodic breaks in grade to help disperse surface flow.
- Use temporary closure techniques, such as *water bars* or covering with logging slash, if significant *erosion* may occur before permanent closure techniques are installed.
- Where needed, retire as soon as possible with properly installed *water control structures*. For *water bars* see Figure 3-1, pg 25, and Table 4-A below for proper spacing.
- When grades exceed 15%, use *water bars* with *water turnouts*.

Table 4-A. Spacing of Water Bars on Skid Trails and Firebreaks

Grade of Skid Trail or Firebreak (percent)	Distance Between Water Bars (feet)
2	250
5	135
10	80
15	60
20	45
30	35
40*	30

* Use grades of 40% and steeper only for short stretches.



Section 4: Timber Harvesting

4.2.2 Practices to Avoid With Skid Trails

- Trails over 40% grade except for short stretches.
- Bladed trails unless required on side slopes to create the appropriate grade for safe operations.
- Using stream and drains with defined *channels* as *skid trails*.
- Main *skid trails* within SMZs.

4.3 SKID TRAIL STREAM CROSSING

In certain situations, crossing a stream with a temporary *skid trail* may be preferable to a permanent road crossing. Factors to consider include the value of the timber to be accessed relative to the cost of a permanent crossing, topographic features limiting construction of permanent crossings, and the size of the stream and/or the upstream *watershed*. Regardless of the factors, protect water quality by maintaining the integrity of the stream bank, using water-permeable fill materials that are easy to recover in the restoration process, and minimizing the amount of fill dirt entering the stream.

4.3.1 BMPs For Skid Trail Stream Crossings

- Follow Federal mandates (See Section 3.3.1, pg 19).
- Minimize the number of crossings.
- Cross stream at right angles.
- Maintain stream bank integrity.
- Approach streams at gentle grades of slope, ideally at < 3%.
- Use temporary bridges or spans rather than temporary *culverts*.
- If temporary *culverts* are used, make sure they are properly sized for the *watershed* (See Table 3-C, pg 22).
- Stabilize *culvert* fill during and after construction using any one or a combination of: hay bales; seed and *mulch*; *silt fence*; rock; *excelsior blankets*; *geotextiles*; etc. (See Section 3.2, pg 15).
- Use logs or stems as fill over temporary *culverts* instead of fill dirt whenever possible.
- Remove all temporary fills and restore the *channel* to its original elevation.
- Stabilize approaches during and after construction.

4.3.2 Practices to Avoid For Skid Trail Stream Crossings

- Stream crossings whenever possible.
- Use of fords.
- Blocking stream flow.
- Blocking the migration of aquatic organisms.
- Using *sloughs* as *skid trails*.
- Random crossings with mechanized equipment.
- Leaving logs or stems in stream crossing.

4.4 RUTTING

During harvesting, some soil disturbance and rutting is inevitable, due to the mechanized nature of most harvesting systems. Excessive or inappropriate rutting can impact water quality when it causes *sediment* or silt-laden runoff to enter a stream or when it interrupts or changes the natural flow of water to the stream. Rutting that results in the discharge of *sediment* to a stream may violate Federal and State water-quality laws.

4.4.1 BMPs to Minimize Rutting

- Use low ground pressure equipment, logging mats, or other techniques on saturated soils where practical.
- Minimize the grade of *skid trails*.
- Follow the BMPs for *skid trails* listed in Section 4.2.



Example of soil degradation and water channelization from excessive rutting.

4.4.2 Practices to Avoid For Rutting

- Facilitating the potential movement of *sediment* to a stream or water body.
- Breaking down the integrity of a stream bank.

4.5 EQUIPMENT WASHING AND SERVICING

Improper equipment washing and servicing can introduce hazardous or toxic materials to the harvest site, which can affect water quality.



Section 4: Timber Harvesting

4.5.1 BMPs for Washing and Servicing Equipment

- Wash and service equipment away from any area that may create a water quality hazard, especially within SMZs and along *ephemeral areas*.
- Dispose of oils, lubrications, their containers and other wastes according to local, State and Federal regulations.
- Remove all used tires, batteries, oil cans, and trash from logging operations before leaving the site.
- Clean up and/or contain fuel and oil spills immediately. Report any chemical spills of twenty-five gallons or more of fuel and oil to soils, and spills of fuels or oils into waterways which produce visible sheens to the GA EPD Emergency Response Program (1-800-241-4113).

⊘ 4.5.2 Practices to Avoid When Washing and Servicing Equipment

- Washing or servicing equipment where it could affect water quality.

4.6 PROTECTING STREAMSIDE MANAGEMENT ZONES (SMZs) DURING HARVESTING

4.6.1 BMPs for Harvesting Streamside Management Zones

In addition to the BMPs listed in Section 2.1:

- Use techniques that minimize soil disturbance, such as backing trees out with machine, using low ground pressure equipment, using equipment with booms or cable winch.
- Maintain the integrity of stream banks.
- Minimize the exposure of mineral soil by spreading logging slash and using it to drive over.



A well-protected SMZ.

⊘ 4.6.2 Practices to Avoid When Harvesting Within SMZs

In addition to the avoidance guidelines listed in Section 2.1:

- Using trees or de-limbing gates in the SMZ.
- Leaving tops in stream *channels*.
- Rutting.

4.7 PROTECTING WETLANDS DURING TIMBER HARVESTING

4.7.1 BMPs for Harvesting Forested Wetlands

In addition to the BMPs listed in Section 2.2.11, pg 13:

- Plan the timber harvest for the dry season of the year when possible.
- Use site-specific equipment and methods to minimize water quality impacts, including high-flotation, low-pressure harvesting equipment, shovel logging, or cable yarding.
- Concentrate *skid trails* and use logging slash, mats or other techniques to minimize soil compaction and rutting.
- Use practices conducive to rapid *regeneration*.
- Follow Federally mandated stream and wetland crossings (See Section 3.3.1, pg 19).



Section 5: Site Preparation and Reforestation

Site preparation facilitates the *regeneration* process and is the first step towards successful *regeneration*. Site preparation methods prepare harvested and non-forested areas for desired tree species and stocking. Site preparation may be used for both natural and artificial forest regeneration. Methods chosen should reduce logging debris, lessen logging impacts, control competing vegetation, and enhance seedling survival.

The site preparation technique used depends on soils, slope, condition of the site, vegetation, crop tree species, cost, location, and landowner goals. Analyze the *erosion* potential of the site prior to any site preparation. Topography, soil type, and residual ground cover determine *erosion* potential.

Topography - The steepness and length of the slope are major considerations when determining the treatment intensity. Intensive treatments that are acceptable in areas of little or no slope may be unacceptable in areas of steep slope.

Soil Type - Soil types or mapping units differ in texture, slope, stoniness, erodibility, wetness, or other characteristics that affect the use of the soils by man. Soil surveys describe these limitations as slight, moderate, or severe. Any limitations should receive extra care to prevent soil degradation.

Residual Ground Cover - The amount, species, and size of ground vegetation, logging debris and other organic matter should be a consideration in prescribing the type and intensity of the treatment.

Site preparation techniques can be grouped into three categories: mechanical, chemical, and *controlled burning*. Combinations of these techniques are common.

5.1 MECHANICAL SITE PREPARATION

Mechanical site preparation includes *shearing*, *raking*, *subsoiling*, *chopping*, *windrowing*, *piling*, *bedding*, and other physical methods to cut, break apart, or move logging debris, or improve soil conditions following harvest. This category is often described by its impact on the soil. Methods vary from low intensity to high intensity. High intensity methods such as *disking* and *bedding* expose the soil on more than 50% of the site. *Chopping* is a low intensity method. *Erosion* potential usually increases with higher intensity methods, especially in areas with steep slopes. Therefore, high intensity methods are: appropriate for

flat and gentle slopes, used with caution on moderate slopes, and avoided on steep slopes. Low intensity methods are preferred on moderate to steep slopes.

5.1.1 BMPs for Mechanical Site Preparation

- Plan the *site preparation* job before starting to ensure that the best treatment is implemented.
- Use the minimum intensity of *site preparation* required.
- On slopes of 6%-10%, intensive mechanical methods should follow the *contour* of the land.
- On slopes of 11%-20%, mechanical methods, other than *chopping*, should follow the *contour* of the land. On soils with moderate to severe erosion potential, strips of untreated areas or windrows should be left to slow water and soil movement down the slope.
- On slopes of 21%-30% with severely erosive soils, use only low intensity mechanical methods that follow the *contour* of the land. Drum chopping should be perpendicular to the slope.
- On slopes greater than 30%, use only hand tools (chainsaw *felling*).
- Where accelerated *erosion* is likely, use methods that leave *logging debris* and other litter scattered evenly over the site.
- When constructing beds on slopes greater than 5%, follow the *contour* of the land.
- Protect forest floor and limit soil disturbance in stabilized gullies that are not eroding.

⊘ 5.1.2 Practices to Avoid During Mechanical Site Preparation

- Any mechanical methods except drum roller *chopping* or spot cultivation on slopes greater than 30%. Drum chopping should not follow the *contour* of the land.
- Intensive mechanical methods on slopes greater than 20% with severe erosion potential.
- *Windrow* construction that could direct runoff into waterways.
- Mechanically preparing sites when soils are saturated.
- Mechanical methods in SMZs.
- Blocking any drainage with beds, *windrows*, or similar structures.
- *Bedding* that channels surface runoff into waterways and roadbeds.
- Moving soil into *windrows* and piles.
- Re-activating stabilized gullies.



Section 5: Site Preparation and Reforestation

5.2 MECHANICAL SITE PREPARATION IN WETLANDS



Forested *wetlands* offer unique challenges for *site preparation*. The EPA and Army Corps of Engineers have determined that major drainage in jurisdictional wetlands will require a Section 404 permit from the Army Corps of Engineers. Also a Section 404 permit may be required for mechanical *site preparation* for pine establishment in the following forested wetland types, unless they no longer exhibit their unique distinguishing characteristics due to past practices.

1. **Permanently flooded, intermittently exposed and semi-permanently flooded wetlands:** Examples include cypress-gum swamps, muck and peat swamps, and cypress strands/domes.
2. **Riverine bottomland hardwood wetlands:** Seasonally flooded or wetter bottomland hardwood sites within the first or second bottoms where overbank flooding has resulted in alluvial features such as natural levees. Soils are listed in NRCS surveys as poorly or very poorly drained. Bottomland hardwoods do not include sites in which greater than 25% of the canopy is pine.
3. **White cedar swamps:** *Wetlands* greater than one acre in headwaters and greater than five acres elsewhere, underlain by peat of greater than 40 inches, where natural white cedar represents more than 50 % of the *basal area* and where the total *basal area* for all tree species is 60 square feet or greater.
4. **Carolina Bay wetlands:** Oriented, elliptical depressions with a sand rim, either underlain by (a) clay-based soils and vegetated by cypress or (b) peat of greater than 20 inches and typically vegetated with an overstory of red, sweet, and loblolly bays.
5. **Non-riverine forest wetlands:** Rare, high quality (undisturbed) wet forests, with mature vegetation, located on the Southeastern coastal plain, whose *hydrology* is dominated by high water tables. Two forest community types fall into this group:

- **Wet hardwood forests** - interstream flats comprising ten or more contiguous acres typically found on the margins of large peatland areas that are seasonally flooded or saturated by high water tables. Soils are listed as poorly drained mineral soils. Vegetation is dominated (greater than 50% of basal area) by mature swamp chestnut oak, cherrybark oak, or laurel oak alone

or in combination.

- **Swamp forests** - flats comprising five or more contiguous acres found on sites that are seasonally to frequently flooded or saturated by high water tables. Soils are listed as very poorly drained. Vegetation is dominated by mature bald cypress, pond cypress, swamp tupelo, water tupelo, or Atlantic white cedar alone or in combination.

Note: Sites dominated by red maple, sweetgum, or loblolly pine alone or in combination are not considered to be of high quality, and therefore do not require a permit.

6. **Low pocosin wetlands:** Central, deepest parts of domed peatlands on poorly drained interstream flats, underlain by peat soils greater than 40 inches, typically vegetated by a dense layer of short shrubs.
7. **Wet Marl forest:** Hardwood forest *wetlands* underlain with poorly drained marl-derived, high pH soils.
8. **Tidal freshwater marshes:** *Wetlands* with dense herbaceous vegetation located on the margins of estuaries or drowned rivers and creeks regularly or irregularly flooded by freshwater.
9. **Maritime grasslands, shrub swamps, and swamp forests:** Barrier island *wetlands* in dune swales and flats, underlain by wet mucky or sandy soils vegetated by wetland herbs, shrubs, and trees.

These forested wetland areas are more precisely described in an EPA and Corps November 1995 memorandum concerning Application of Best Management Practices to Mechanical Silvicultural Site Preparation Activities for the Establishment of Pine Plantations in the Southeast. Consult a *qualified professional* for additional information to determine if one of these wetland types is present on a site.

5.2.1 Other Wetlands

Other jurisdictional forested wetlands do not require a Section 404 permit if mechanical *site preparation* is conducted according to the following six federally mandated minimum BMPs.

5.2.1.1 Federally Mandated BMPs for Mechanical Site Preparation in Wetlands

1. Position shear blades or rakes at or near the soil surface. *Windrow*, pile, and move logs and *logging debris* by methods that reduce dragging or pushing through the soil to minimize soil disturbance associated with *shearing*, *raking* and moving trees, stumps, brush, and other unwanted vegetation.
2. Activities should avoid excessive soil compaction and maintain soil tilth.



Section 5: Site Preparation and Reforestation

3. Arrange *windrows* to limit erosion, overland flow, and runoff.
4. Prevent disposal or storage of logs or *logging debris* in SMZs.
5. Maintain the site's natural *contour* and ensure that activities do not immediately or gradually convert the wetland to a non-wetland.
6. Conduct activities with appropriate water management mechanisms to minimize off-site water quality impacts.

5.3 CHEMICAL SITE PREPARATION

Herbicides are valuable tools in forest management and are used to control competing vegetation in the establishment and management of natural and planted pine stands. *Herbicide* treatments are acceptable site preparation methods on all slopes if conducted properly.

Proper planning and execution are key to safe *herbicide* use. Follow label directions and applicable State and Federal laws in the storage, transportation, handling, and application of all *herbicides*. Apply *restricted-use herbicides* only under the supervision of a certified *pesticide* applicator.

5.3.1 BMPs for Chemical Applications

- Establish appropriate SMZ along *perennial* and *intermittent streams* and flowing bodies of water.
- Consider weather conditions (e.g. temperature, wind speed and *precipitation*), equipment capabilities and *pesticide* formulations to avoid *pesticide* drift into the SMZ.
- Conduct all on-site *pesticide* handling, such as tank mixing, loading and rinsing equipment, away from streams, ponds, wells, and roadside *ditches*.
- Dispose of *pesticide* containers and/or excess *pesticides* according to local, State and Federal regulations and label requirements.
- Clean up and/or contain all *pesticide* spills immediately. Report spills to the GA EPD Emergency Response Program (1-800-241-4113).

⊘ 5.3.2 Practices to Avoid During Chemical Applications

- Applying a *pesticide* directly to water bodies (streams, lakes, and swamps) unless it is specifically prescribed and labeled for aquatic management.
- Broadcast applications of *pesticides* within SMZs.

5.4 SITE PREPARATION (CONTROLLED) BURNING

Controlled fire is often used alone or in conjunction with chemical or mechanical *site preparation* to prepare sites for *regeneration*. A properly executed site prep burn only slightly increases the chance for *erosion*. Fires that expose significant mineral soil on moderate and steep slopes, however, may increase *erosion* potential. Other factors also must be taken into consideration. If in doubt about appropriate *site preparation* treatment, consult a *qualified professional*.

5.4.1 BMPs for Site Preparation Burning

- Unless protected by natural barriers, the area to be burned should be protected by *firebreaks* installed following BMP recommendations (See Section 5.5).
- Moisture levels within the soil, forest fuels, and the air should be sufficient to prevent major exposure or damage to the mineral soil, especially on moderate to severely erosive soils.
- Exclude high intensity *site preparation* fires from the SMZ. Cool, low intensity, hazard-reduction fires that do not consume the *duff* layer are allowed.

5.5 PRE-SUPPRESSION FIREBREAKS

Pre-suppression *firebreaks* aid in *site preparation* (controlled) burning, *prescribed burning*, and in controlling wildfires. Proper planning and BMP implementation for pre-suppression *firebreaks* can minimize sediment delivery to surface water. Aerial photographs, topographic maps, or county soil survey maps should be used to locate tract boundaries, streams, *wetlands*, rock outcrops, gullies, and cemeteries, etc. that require extra precautions.

5.5.1 BMPs for Firebreaks

- Where possible, use natural barriers such as roads, streams, and fields as *firebreaks*.
- Install *firebreaks* on the *contour* as much as possible.
- When *firebreaks* cannot be installed on the *contour*, use a gradual grade.
- Use bladed or harrowed *firebreaks* instead of plowed *firebreaks* whenever possible.
- On slopes exceeding 3%, install *water bars* with water turnouts in *firebreaks* according to the BMP recommendations for *skid trail* retirement (See Table 4-A, pg 27).
- Use hand tools or *back blade firebreaks* away from the edge of streams, roads, or *gullies*.
- Install *water bars* and *water turnouts* at approaches to streams, roads, and *gullies* to prevent channeling water from *firebreaks* into these areas.
- Treat active *gullies* the same as streams, using appropriate buffers and plowing practices.



Section 5: Site Preparation and Reforestation

⊘ 5.5.2 Practices to Avoid During Firebreak Construction

- Firebreaks that channel surface runoff into streams, roads, or gullies.
- Plowing inside the SMZ.

5.6 REFORESTATION

Reforestation can be accomplished artificially or naturally. Natural *regeneration* and hand planting generally pose less of a threat to water quality as opposed to mechanical methods. Complete artificial *regeneration* projects as quickly as practical. A *qualified professional* can provide advice on reforestation choices.

5.6.1 BMPs For Reforestation

- Hand plant on >21% slopes with severely erosive soils.
- Machine plant on the *contour* on slopes between 5% and 20%.



**Mechanical
tree planting**

⊘ 5.6.2 Practices to Avoid During Mechanical Reforestation

- Machine planting up and down slopes greater than 5%.
- Machine planting within SMZs.



Section 6: Management and Protection

6.1 PRESCRIBED BURNING/HAZARD REDUCTION

Prescribed burning is used to reduce hazardous accumulations of forest fuels, manage competing plant vegetation, improve wildlife habitat, and perpetuate certain endangered plant and animal ecosystems. When properly planned and conducted, *prescribed burning* has minimal impacts on water quality. These burns should follow federal, state, county and local regulations.

6.1.1 BMPs for Prescribed Burning

- Follow the same BMPs listed in Sections 5.4 and 5.5.

6.2. WILDFIRE SUPPRESSION

Wildfires are suppressed aggressively with the safety of personnel and equipment a primary concern. After suppression, when safety allows, BMPs should be installed during mop up or as soon as possible.

6.2.1 BMPs for Wildfire Suppression Firebreaks

- Locate camps and *staging areas* on upland sites.
- Stabilize areas designated for *water supply points* and dip sites for helicopters to prevent excessive rutting from support equipment.
- Mix and/or handle fire retardants, lubricants, etc. away from streams, ponds, wells, and roadside *ditches*.
- Repair wildfire suppression *firebreaks* as soon as practical after the fire is under control to meet BMPs for pre-suppression plowing.

6.3 FERTILIZATION

Forest fertilization is a valuable *silvicultural* practice that enhances tree survival and growth. The primary nutrients applied are nitrogen and phosphorus. Plan any forest fertilization to prevent direct applications and runoff into water bodies. When conducted properly, forest fertilization poses little threat to water quality. *Fertilizer* applications should not result in violations of State water quality standards for nitrates and phosphorous for lakes. For more information, contact the GA EPD Water Protection Branch (1-404-656-4708) for those water quality standards.

6.3.1 BMPs for Fertilization

- Consider weather conditions (such as temperature, wind speed and precipitation), and equipment capabilities to avoid *fertilizer* drift into the SMZ.
- Conduct all on-site *fertilizer* handling, such as mixing and loading, away from streams, ponds, wells and roadside ditches.
- Clean up and/or contain all *fertilizer* spills immediately. In case of accidental spills, call 1-800-241-4113.
- Dispose of *fertilizer* containers and/or excess *fertilizer* according to local, State and Federal regulations and label requirements.

⊘ 6.3.2 Practices to Avoid When Applying Fertilizers

- Applying *fertilizer* directly to water bodies (streams, lakes, and swamps) unless specifically prescribed and approved for aquatic management.
- Applications of *fertilizer* within SMZs.

6.4 REVEGETATION AND STABILIZATION OF SITES

Forest management often creates openings in the form of roads, stream crossings, *log decks*, *skid trails*, and *firebreaks*. Establishing a vegetative cover as soon as possible on these sites reduces erosion and prevents sedimentation. In addition to protecting the soil, vegetative cover can enhance wildlife habitat. Establishing a vegetative cover may include selecting the proper plant species, preparing the site, liming, fertilizing, seeding, and *mulching*. This section provides a variety of seeding mixtures that stabilize sites quickly and also provide benefits to wildlife. Table 6-A provides a quick reference to help with the selection and establishment of seeding mixtures. Selection of plant species, establishment methods, and maintenance procedures should be based on site characteristics, including climate, soils, *aspect*, and land use objectives.

6.4.1 Land Preparation

Site preparation, such as smoothing or reshaping rutted roads and landings, may be necessary before conventional equipment can prepare seedbeds, which are important for vegetation establishment. Disc *harrowing* and dragging will firm and smooth soil and promote good germination. Heavily compacted areas may require *sub-soiling*, ripping, or *disking* to allow water infiltration and to provide a suitable seedbed for root growth.

6.4.1.1 Fertilizer and Lime

A soil test can determine fertility and pH. If a soil test is not available and lime has not been applied in the past three years, apply it at the rate shown in the fol-

Table 6-A. Seeding Mixtures for Erosion Control Plantings

Fall Plantings		Planting Date			Fertilizer (lb/acre)	Wildlife Value	Remarks
Recommended Planting ¹	Seedling ² Rate (lb/acre)	Coastal	Piedmont	Mountains			
Ladino Clover ³	5						
Red Clover	10	September	September	August 1		Excellent	Well drained clayey or loamy soils. Perennial clover can persist for several years. Inoculate clover seed. Maintaining pH above 6.0 is critical.
Ryegrass	15	15	1	to	500		
Rye	30	to	to	October 15	10-10-		
Wheat	30	November 15	November 1		10		
Crimson Clover	15	September 15	September 1	September 1	500	Excellent	Well drained clayey or loamy soils. Inoculate clover. Tolerates lower soil pH. Disk lightly in September to encourage reseeding and overseed with wheat.
Hairy Vetch	15	to	to	to	10-10-		
Wheat	60	November 15	November 1	October 15	10		
Arrowleaf Clover or Crimson Clover	15	September 15	September 1	September 1	500	Good	Well drained sandy or loamy soils. Inoculate clover. Disk lightly in September to encourage reseeding clover and overseed with wheat and rye.
Ryegrass	15	to	to	to	10-10-		
Wheat	40	November 15	November 1	October 15	10		
Wheat or Rye Unhulled	50	September to	September 1	September 1	500	Poor	
Bermuda in sandy soil	10	December 15	to	to	10-10-		
or Fescue in clayey soil	25		December 1	November 15	10		
Spring Plantings		Planting Date			Fertilizer (lb/acre)	Wildlife Value	Remarks
Recommended Planting ¹	Seedling ² Rate (lb/acre)	Coastal	Piedmont	Mountains			
Ryegrass	20	Feb. 15	Feb. 15	March 1	500	Excellent	Low maintenance, reseeding annuals. Inoculate Kobe Lespedeza.
Kobe	30	to	to	to	10-10-		
Lespedeza		April 1	April 1	April 15	10		
Bahiagrass	25	March 25	April 15		500	Good	Include hulled Bermuda at a rate of 10 lb. per acre on sandy sites. Kobe Lespedeza can be added at lb per acre to increase wildlife value.
Brown Top	25	to	to	NA	10-10-		
Millet		July 1	July 1		10		
Bermuda Grass	10	March 15	March 15	April 15	500	Fair	Does well in dry, sandy sites.
Brown Top	25	to	to	to	10-10-		
Millet		July 1	July 1	July 1	10		

Footnotes for Erosion Control Plantings Table

- 1) To maximize wildlife value, avoid plantings with Fescue, weeping love grass, Bermuda grass, and sericea Lespedeza.
- 2) Seeding depths should be 1/4 inch unless otherwise noted.
- 3) For mixtures including Ladino clover, lime at the rate indicated by soil test or at the rate of 2 tons per acre.

lowing table. Lime and *fertilizer* are most efficient when incorporated into the soil. Spread them uniformly over the site prior to land preparation and mix them completely with the soil. Lime takes several months to react with the soil and become fully effective.

Table 6-B. Rate of Lime to Use When a Soil Test is Unavailable

Soil Texture	Tons/Acre	Pounds/1000 sq. ft.
Sands and loams	2	100
Clayey, acidic	3	150
Clayey, alkaline	0	0

Base additional applications of lime on soil test recommendations.

Forest soils are typically low in phosphorous and/or potassium and usually require lime. Clovers are not productive in acid sites (below pH 6.0) with low fertility unless *fertilizer* and lime are added.

6.4.1.2 Seeding and Mulching

Seeding can be done in a number of ways. The most common method is with a farm tractor and a broadcast seeder. On steep or severely erosive sites, use a hydro-seeder. Seed should be covered by pulling a section harrow, cultipacker, or brush.

Mulch should be used on slopes over 5%, on sites where vegetation will establish slowly, or on deep sands or heavy clay soils. Mulch helps prevent *erosion* and allows vegetation to become established. Structural measures such as a diversion, which moves concentrated runoff, usually require mulch. Where there is a danger of mulch being blown or washed off-site, anchor it by running over the mulched area with a disk harrow with the discs set to run straight. On steep slopes, anchor mulch with netting and tack-down staples or spray it with a tackifier.



Section 7: Additional Management Objectives

The *Best Management Practices* recommendations in this publication are directed at maintaining water quality, which is critical for the conservation of all natural resources. Forest management practices such as timber harvesting, *site preparation*, *tree regeneration*, and forest stand treatments may be conducted in ways that enhance fish and wildlife habitat, *aesthetics*, and recreational opportunities, while accommodating sensitive sites and endangered species. Landowners may have other resource objectives that can be achieved only through the use of practices that vary but are consistent with the protection of water quality. The following comments describe additional management options that landowners may wish to consider.

7.1 WILDLIFE MANAGEMENT

- Compare your current habitat conditions, along with those on adjacent lands, to your wildlife management objectives before making land management decisions.
- Some fish and wildlife species benefit from SMZs wider than the minimum widths specified for water quality BMPs.
- Manage for a diversity of forest types and age classes to enhance wildlife habitat quality.
- Maintain mature mast producing hardwoods in groups or stands.
- Leave corridors of trees connecting mature forest stands to provide food, cover and travel avenues for wildlife while adjacent stands are regenerated.
- Leave snags, dead and down woody debris, brush piles or *windrows* throughout timber harvest areas.
- Use *prescribed fire*, which is one of the most cost effective forest and wildlife management practices.
- Use wildlife friendly plantings for *log decks*, roads and *skid trails* following logging operations.
- For more information on any of the above recommendations, contact the Georgia DNR Wildlife Resources Division (1-706-557-3020).

7.2. PROTECTED SPECIES

The University of Georgia Cooperative Extension Service, the College of Agricultural and Environmental Sciences, or the Georgia Department of Natural

Resources Wildlife Resources Division have publications with listings.

If you suspect the presence of an endangered species, contact the Georgia Department of Natural Resources Wildlife Resources Division or the U.S. Fish and Wildlife Service for verification and management considerations.

7.3. AESTHETICS

- Consider aesthetics during forest management activities and be aware that appearance may influence public opinion.
- Use forest management methods that can minimize visual impacts such as single tree and group selection, *seed tree* and *shelterwood regeneration*, and small patch clearcuts.
- Leave corridors of trees along well-traveled public roads to enhance visual quality.
- Shape harvest areas with natural features of the landscape.
- Reseed bare soil areas promptly.
- Maintain a mixed tree species composition.
- During artificial regeneration, establish tree rows parallel to the road and avoid 90-degree angles.
- Minimize the “skylining” of residual snags and cull trees.
- For more information, see the American Pulpwood Association’s *Forestry Aesthetics Guide, Image and Opportunity*.



Aesthetics can influence public perception of forestry.

7.4 SENSITIVE SITES

- Consider protective management prescriptions for unique cultural (Native American sites), ecological (protected species), archeological (Civil War breastworks), geological (rock formations), or historical (old forts and cemeteries) sites. They may need special consideration to manage their values. Contact the DNR Historic Preservation Division (1-404-656-2840).



Section 8: Appendix

8.1 FEDERAL LAWS AND REGULATIONS AFFECTING FOREST LANDOWNERS

8.1.1 The Federal Clean Water Act, Section 404, 40 CFR Part 232.3

- Exempts normal, established, on-going *silvicultural* operations from permitting.
- Requires *silvicultural* operations to adhere to BMPs and fifteen baseline provisions for forest road construction and maintenance in and across *waters of the U.S.* (lakes, rivers, perennial and *intermittent streams*, *wetlands*, *sloughs* and natural ponds) in order to qualify for the *silvicultural* exemption from the permitting process (See Section 3.3.1, pg 19-20 for the baseline provisions).
- Requires Army Corps of Engineers permit for the conversion of forested *wetlands* to other uses such as agriculture or development.
- A Memorandum of Understanding dated November 28, 1995, between the Army Corps of Engineers and the U.S. Environmental Protection Agency - requires permit for the conversion of specific high-quality bottom land hardwood *wetlands* to pine plantations by mechanical *site preparation* methods and mandates the use of six BMPs in other jurisdictional *wetlands* (See Section 5.2.1.1, pg 35 for the list).
- Provides for civil and criminal penalties up to \$125,000 per day.

8.1.2 USDA Programs

Participation by landowners in various loan, price support, agriculture, forestry incentive and assistance programs subject landowners to rules and regulations regarding the Federal Farm Bill (Swampbuster and Sodbuster Provisions).

- Prohibits landowners from converting forested *wetlands* to agricultural uses.
- Provides for penalties including program payments plus interest to be paid back from the time of the conversion, loss of benefits and loss of eligibility in future programs.

8.2 STATE LAWS AND REGULATIONS AFFECTING FOREST LANDOWNERS

8.2.1 The Georgia Water Quality Control Act (O.C.G.A. 12-5-29)

- Makes it unlawful to discharge excessive *pollutants* (*sediment*, nutrients, pesticides, animal waste, etc.) into *waters of the State* in amounts harmful to public health, safety, or welfare, or to animals, birds or aquatic life or the physical destruction of stream habitats (See Section 1 or the Glossary for definition of *waters of the State*).

- Provides for civil and criminal penalties up to \$100,000 per day.

8.2.2 **Excerpts from Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6-.03 Water Use Classifications and Water Quality Standards (Amended).**

General Criteria for All Waters. The following criteria are deemed to be necessary and applicable to all *waters of the State*:

Turbidity. All waters shall be free from *turbidity*, which results in a substantial visual contrast in a water body due to a man-made activity. The upstream appearance of a body of water shall be as observed at a point immediately upstream of a *turbidity*-causing man-made activity. That upstream appearance shall be compared to a point, which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation, and maintenance of *best management practices* and compliance with issued permits shall constitute compliance.

Temperature: Not to exceed 90°F. At no time is the temperature of the receiving waters to be increased more than 5°F above intake temperature except that in estuarine waters the increase will not be more than 1.5°F. In waters designated as primary *trout streams* by the Wildlife Resources Division, there shall be no elevation of natural stream temperatures. Waters designated as primary *trout streams* are waters supporting a self-sustaining population of rainbow, brown or brook trout. In waters designated as secondary *trout streams*, there shall be no elevation exceeding 2°F natural stream temperatures. Streams designated as secondary *trout streams* are those with no evidence of natural trout reproduction, but are capable of supporting trout throughout the year.

Following is a listing of *trout streams*. *Trout streams* are classified in accordance with the designations and criteria established by the Georgia Environmental Protection Division. This list may be updated every two years. For the most current list contact the Georgia EPD (404-656-4708).



Section 8: Appendix

Designations by County.

BARTOW COUNTY

Primary:
None.

Secondary:

1. Boston Creek and its tributaries upstream from GA. Hwy. 20.
2. Connesena Creek and its tributaries.
3. Dykes Creek and its tributaries.
4. Pine Log Creek and its tributaries.
5. Pyle Creek and its tributaries.
6. Salacoa Creek and its tributaries.
7. Spring Creek and its tributaries.
8. Stamp Creek and its tributaries upstream from County Rd. 269.
9. Toms Creek and its tributaries upstream from County Rd. 82.
10. Two Run Creek and its tributaries.
11. Ward Creek and its tributaries.

CARROLL COUNTY

Primary:
None.

Secondary:

1. Brooks Creek and its tributaries.
2. Mud Creek and its tributaries.
3. Tallapoosa River.

CATOOSA COUNTY

Primary:
None.

Secondary:

1. Hurricane Creek and its tributaries upstream from Peters Branch.
2. Little Chickamauga Creek and its tributaries upstream from County Rd. 387.
3. Tiger Creek and its tributaries upstream from GA. Hwy. 2.
4. Dry Creek and its tributaries upstream from County Rd. 257 (East Chickamauga Creek Watershed).

CHATTOOGA COUNTY

Primary:
None.

Secondary:

1. Allgood Branch and its tributaries upstream from Southern Railroad.
2. Chappel Creek and its tributaries.
3. Chelsea Creek and its tributaries.
4. East Fork Little River and its tributaries.
5. Hinton Creek and its tributaries.
6. Kings Creek and its tributaries.
7. Little Armuchee Creek and its tributaries upstream from County Rd. 326.
8. Middle Fork Little River and its tributaries.
9. Mt. Hope Creek and its tributaries.
10. Perennial Spring and its tributaries.
11. Raccoon Creek and its tributaries upstream from GA. Hwy. 48.
12. Ruff Creek and its tributaries.
13. Storey Mill Creek and its tributaries.
14. Taliaferro Creek and its tributaries.

CHEROKEE COUNTY

Primary:
None.

Secondary:

1. Boston Creek and its tributaries.
2. Pine Log Creek and its tributaries.
3. Salacoa Creek and its tributaries.
4. Stamp Creek and its tributaries.
5. Bluff Creek and its tributaries upstream from County Rd. 114.
6. Murphy Creek and its tributaries.
7. Soap Creek and its tributaries upstream from County Rd. 116.
8. Wiley Creek and its tributaries.

COBB COUNTY

Primary:
None.

Secondary:

1. Chattahoochee River upstream from I-285 West Bridge.

DADE COUNTY

Primary:

None.

Secondary:

1. Allison Creek and its tributaries.
2. East Fork Little River and its tributaries.
3. Lookout Creek and its tributaries upstream from County Rd. 197.
4. Rock Creek and its tributaries.
5. West Fork Little River and its tributaries.

DAWSON COUNTY

Primary:

1. Amicalola Creek and its tributaries upstream from County Rd. 192 (Devil's Elbow Road).
2. Sweetwater Creek and its tributaries.
3. Anderson Creek and its tributaries.
4. Long Swamp Creek and its tributaries.
5. Nimblewill Creek and its tributaries.

Secondary:

1. Amicalola Creek and its tributaries from GA. Hwy. 53 upstream to County Rd. 192 (Devil's Elbow Road).
2. Shoal Creek and its tributaries upstream from the mouth of Burt Creek.

ELBERT COUNTY

Primary:

None.

Secondary:

1. Savannah River for the ten-mile reach downstream from Hartwell Dam.

FANNIN COUNTY

Primary:

1. Conasauga River - Jacks River and its tributaries.
2. Ellijay River and its tributaries.
3. Etowah River and its tributaries.
4. Fightingtown Creek and its tributaries.
5. Owenby Creek and its tributaries.
6. Persimmon Creek and its tributaries.
7. South Fork Rapiere Mill Creek and its tributaries.
8. Toccoa River and its tributaries upstream to Blue Ridge Reservoir dam.
9. Toccoa River and its tributaries upstream from the backwater of Blue Ridge Reservoir.
10. Tumbling Creek and its tributaries.
11. Wilscot Creek and its tributaries.

Secondary:

All streams or stream sections not classified as primary in the above list.

FLOYD COUNTY

Primary:

None.

Secondary:

1. Dykes Creek and its tributaries.
2. Johns Creek and its tributaries upstream from County Rd. 212.
3. Kings Creek and its tributaries.
4. Lavender Creek and its tributaries upstream from County Rd. 234.
5. Little Cedar Creek and its tributaries.
6. Mt. Hope Creek and its tributaries.
7. Spring Creek and its tributaries (flows into Etowah River).
8. Spring Creek and its tributaries (flows into State of Alabama).
9. Toms Creek and its tributaries.
10. Silver Creek and its tributaries upstream from GA. Highway 1E.

FORSYTH COUNTY

Primary:

None.

Secondary:

1. Chattahoochee River.

FULTON COUNTY

Primary:

None.

Secondary:

1. Chattahoochee River upstream from I-285 West Bridge.

GILMER COUNTY

Primary:

1. Cartecay River and its tributaries upstream from the mouth of Clear Creek.
2. Clear Creek and its tributaries upstream from County Rd. 92.
3. Conasauga River - Jacks River and its tributaries.
4. Ellijay River and its tributaries upstream from the mouth of Kells Creek.
5. Harris Creek and its tributaries.
6. Johnson Creek and its tributaries.
7. Mountaintown Creek and its tributaries upstream from U.S. Hwy. 76.
8. Tails Creek and its tributaries upstream



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from GA. Hwy. 282.

9. Toccoa River - Fightingtown Creek and its tributaries.

Secondary:

1. All streams or sections thereof except the Coosawattee River downstream from GA. Hwy. 5 Bridge, and Talking Rock Creek (not including tributaries) and those classified as primary.
2. Ball Creek and its tributaries.
3. Sevenmile Creek and its tributaries.
4. Town Creek and its tributaries.
5. Wildcat Creek and its tributaries.

GORDON COUNTY

Primary:

None.

Secondary:

1. Johns Creek and its tributaries.
2. Long Branch and its tributaries.
3. Pine Log Creek and its tributaries upstream from GA. Hwy. 53.
4. Pin Hook Creek and its tributaries upstream from Ryo Rd.
5. Rocky Creek and its tributaries upstream from West Union Rd.
6. Salacoa Creek and its tributaries upstream from U.S. Hwy. 411.
7. Snake Creek and its tributaries.

GWINNETT COUNTY

Primary:

None.

Secondary:

1. Chattahoochee River.

HABERSHAM COUNTY

Primary:

1. Chattahoochee River and its tributaries upstream from GA. Hwy. 255 Bridge.
2. Middle Fork Broad River and its tributaries upstream from USFS Rd. 92-B.
3. Panther Creek and its tributaries.
4. Soque River and its tributaries upstream from King's Bridge (bridge on GA. Hwy. 197 just below the mouth of Shoal Creek).

Secondary:

1. Chattahoochee River and its tributaries upstream from GA. Hwy. 115 to the GA. Hwy. 255 Bridge.
2. Davidson Creek and its tributaries.
3. Middle Fork Broad River tributaries entering below USFS Rd. 92-B.
4. Nancytown Creek and its tributaries upstream from Nancytown Lake.
5. North Fork Broad River and its tributaries.
6. Soque River and its tributaries upstream from the mouth of Deep Creek to King's Bridge.
7. Toccoa Creek and its tributaries.

HARALSON COUNTY

Primary:

None.

Secondary:

1. Beach Creek and its tributaries upstream from County Rd. 34.
2. Flatwood Creek and its tributaries.
3. Lassetter Creek and its tributaries.
4. Mann Creek and its tributaries upstream from County Rd. 162.
5. Tallapoosa River and its tributaries upstream from County Rd. 222.
6. Mountain Creek and its tributaries.
7. Tallapoosa Creek and its tributaries.

HART COUNTY

Primary:

None.

Secondary:

1. Savannah River.

LUMPKIN COUNTY

Primary:

1. Amicalola Creek and its tributaries.
2. Camp Creek and its tributaries.
3. Cane Creek and its tributaries upstream from Cane Creek Falls.
4. Cavender Creek and its tributaries.
5. Chestatee River and its tributaries upstream from County Rd. 52-S976.
6. Clay Creek and its tributaries.
7. Etowah River and its tributaries upstream

- from the GA. Hwy. 52 Bridge.
8. Hurricane Creek and its tributaries upstream from County Rd. 118.
 9. Mooney Branch and its tributaries.
 10. Tobacco Pouch Branch and its tributaries.

Secondary:

1. Cane Creek and its tributaries upstream from GA. Hwy. 52 Bridge to Cane Creek Falls.
2. Chestatee River and its tributaries upstream from the mouth of Tesnatee Creek to County Rd. 52-S976.
3. Etowah River and its tributaries upstream from Castleberry Bridge to GA. Hwy. 52 except those classified as primary above.
4. Shoal Creek and its tributaries.
5. Yahoola Creek and its tributaries upstream from GA. Hwy. 52.

MURRAY COUNTY

Primary:

1. Conasauga - Jacks River and its tributaries upstream from Georgia--Tennessee state line.
2. Holly Creek and its tributaries upstream from County Rd. SR826 (USFS line).
3. Rock Creek and its tributaries upstream from County Rd. 4 (Dennis).

Secondary:

1. All tributaries to Carters Reservoir.
2. Holly Creek and its tributaries (including Emory Creek watershed) upstream from Emory Creek to County Rd. SR826 (USFS line).
3. Mill Creek and its tributaries upstream from County Rd. 27.
4. North Prong Sumac Creek and its tributaries.
5. Sugar Creek and its tributaries upstream from County Rd. 4.
6. Sumac Creek and its tributaries upstream from Coffey Lake.
7. Mill Creek and its tributaries.
8. Rock Creek and its tributaries upstream of County Rd. 301.

PAULDING COUNTY

Primary:

None.

Secondary:

1. Possum Creek and its tributaries upstream from County Rd. 64.
2. Powder Creek and its tributaries.
3. Pumpkinvine Creek and its tributaries

- upstream from County Rd. 231.
4. Pyle Creek and its tributaries.
5. Raccoon Creek and its tributaries upstream from County Rd. SR2299.
6. Tallapoosa River and its tributaries.
7. Ward Creek and its tributaries.
8. Simpson Creek and its tributaries.
9. Thompson Creek and its tributaries.

PICKENS COUNTY

Primary:

1. Cartecay River and its tributaries.
2. Talking Rock Creek and its tributaries upstream from Rt. S1011.

Secondary:

1. Amicalola Creek and its tributaries.
2. East Branch and its tributaries (including Darnell Creek and its tributaries).
3. Fisher Creek and its tributaries (upstream from the confluence of Talona Creek and Fisher Creek).
4. Fourmile Creek and its tributaries.
5. Hobson Creek and its tributaries.
6. Little Scarecorn Creek and its tributaries.
7. Long Branch and its tributaries.
8. Long Swamp Creek and its tributaries upstream from County Rd. 294.
9. Mud Creek and its tributaries.
10. Pin Hook Creek and its tributaries.
11. Polecat Creek and its tributaries.
12. Rock Creek and its tributaries.
13. Salacoa Creek and its tributaries.
14. Scarecorn Creek and its tributaries upstream from GA. Hwy. 53.
15. Ball Creek and its tributaries.
16. Bluff Creek and its tributaries.
17. Sevenmile Creek and its tributaries.
18. Soap Creek and its tributaries.
19. Town Creek and its tributaries.
20. Wildcat Creek and its tributaries.

POLK COUNTY

Primary:

None.

Secondary:

1. Cedar Creek and its tributaries upstream from County Rd. 121.
2. Lassetter Creek and its tributaries.
3. Little Cedar Creek and its tributaries.
4. Pumpkinpile Creek and its tributaries upstream from County Road SR1032.
5. Spring Creek and its tributaries.
6. Swinney Branch and its tributaries.
7. Thomasson Creek and its tributaries.
8. Fish Creek and its tributaries upstream of



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Plantation Pipeline.

9. Silver Creek and its tributaries.
10. Simpson Creek and its tributaries upstream of Lake Dorene.
11. Thompson Creek and its tributaries upstream of County Rd. 441.

RABUN COUNTY

Primary:

1. Chattooga River - all tributaries classified as primary.
2. Little Tennessee River - entire stream and tributaries classified as primary except all streams or sections thereof classified as secondary.
3. Tallulah River - entire stream and tributaries classified as primary except the Tallulah River downstream from Lake Rabun Dam to headwaters of Tugaloo Lake.

Secondary:

1. Little Tennessee River downstream from U.S. Hwy. 441 Bridge.
2. Mud Creek downstream from Sky Valley Ski Resort Lake to the Little Tennessee River.

STEPHENS COUNTY

Primary:

1. Middle Fork Broad River and its tributaries upstream from USFS Route 92-B.
2. Panther Creek and its tributaries upstream from the mouth of Davidson Creek.

Secondary:

1. Davidson Creek and its tributaries.
2. Leatherwood Creek and its tributaries upstream from GA. Hwy. 184 Bridge.
3. Little Toccoa Creek and its tributaries.
4. Middle Fork Broad River and its tributaries upstream from NRCS flood control structure #44 to USFS Route 92-B.
5. North Fork Broad River and its tributaries upstream from NRCS flood control structure #1.
6. Panther Creek and its tributaries downstream from the mouth of Davidson Creek.
7. Toccoa Creek upstream from Toccoa Falls.

TOWNS COUNTY

Primary:

1. Brasstown Creek and its tributaries.
2. Chattahoochee River and its tributaries.
3. Gumlog Creek and its tributaries.
4. Hiwassee River and its tributaries - entire stream and all tributaries classified as primary except all streams or sections thereof classified as secondary.
5. Tallulah River and its tributaries.
6. Winchester Creek and its tributaries.

Secondary:

1. Hightower Creek downstream from the mouth of Little Hightower Creek.

UNION COUNTY

Primary:

1. Arkaqua Creek and its tributaries.
2. Brasstown Creek and its tributaries.
3. Chattahoochee River and its tributaries.
4. Conley Creek and its tributaries upstream from County Rd. S2325.
5. Coosa Creek and its tributaries upstream from mouth of Anderson Creek.
6. Dooley Creek and its tributaries.
7. East Fork Wolf Creek and its tributaries upstream from Lake Trahlyta.
8. Gumlog Creek and its tributaries.
9. Ivylog Creek and its tributaries upstream from USFS property line.
10. Nottely River and its tributaries upstream from the mouth of Town Creek.
11. Toccoa River and its tributaries.
12. Town Creek and its tributaries.
13. West Fork Wolf Creek and its tributaries.
14. Youngcane Creek and its tributaries upstream from the mouth of Jones Creek.

Secondary:

1. All streams or sections thereof except the Butternut Creek and its tributaries and the Nottely River downstream of Nottely Dam and those classified as primary.

WALKER COUNTY

Primary:

1. Furnace Creek and its tributaries.
2. Harrisburg Creek and its tributaries (including Dougherty Creek and Allen Creek) upstream from Dougherty Creek.

Secondary:

1. Chappel Creek and its tributaries.
2. Concord Creek and its tributaries.
3. Dry Creek and its tributaries (tributary to East Armuchee Creek).
4. Duck Creek and its tributaries.
5. East Armuchee Creek and its tributaries upstream from GA. Hwy. 136.
6. East Fork Little River and its tributaries (flows into Dade County).
7. East Fork Little River and its tributaries (flows into Chattooga County; includes Gilreath Creek).
8. Gulf Creek and its tributaries.
9. Johns Creek and its tributaries.
10. Left Fork Coulter Branch and its tributaries.
11. Little Chickamauga Creek and its tributaries.
12. Middle Fork Little River and its tributaries (includes Cannon Branch and Hale Branch).
13. Rock Creek and its tributaries (including Sawmill Branch) upstream from Sawmill Branch.
14. Ruff Creek and its tributaries.
15. Snake Creek and its tributaries.
16. West Armuchee Creek and its tributaries.
17. West Chickamauga Creek and its tributaries upstream from County Rd. 107.
18. West Fork Little River and its tributaries.
19. Chattanooga Creek and its tributaries upstream from County Rd. 235.

WHITE COUNTY

Primary:

1. Cathey Creek and its tributaries upstream from the Arrowhead Camp-ground Lake.
2. Chattahoochee River and its tributaries upstream from GA. Hwy. 255 Bridge.
3. Town Creek and its tributaries upstream from the mouth of Jenny Creek.

Secondary:

1. Chattahoochee River and its tributaries upstream from GA. Hwy. 115 to the GA. Hwy. 255 Bridge.
2. Little Tesnatee Creek and its tributaries upstream from the mouth of Turner Creek.
3. Turner Creek and its tributaries except as listed under primary above (Turner Creek nearest to Cleveland City limits).

WHITFIELD COUNTY

Primary:

None.

Secondary:

1. Coahulla Creek and its tributaries upstream from County Rd. 183.
2. East Armuchee Creek and its tributaries.
3. Snake Creek and its tributaries.
4. Spring Creek and its tributaries.
5. Swamp Creek and its tributaries upstream from County Rd. 9.
6. Tiger Creek and its tributaries.
7. Dry Creek and its tributaries.



Section 8: Appendix

8.2.3 The Georgia Growth Planning Act (O.C.G.A. 12-2-8)

- Authorized the Georgia Department of Natural Resources to develop minimum planning standards and procedures that local city and county planning and zoning jurisdictions could adopt and enforce pertaining to the protection of *river corridors, mountain tops, water supply reservoirs/watersheds, and wetlands.*
- Requires local governments to use these minimum standards in developing and implementing local comprehensive growth development plans.
- *Silvicultural* practices are exempt from permitting requirements according to the guidelines, but the activity must comply with BMPs within these sensitive areas. The rules for environmental planning for each of these sensitive areas, are as follows:

8.2.3.1 Water Supply Reservoir/Watershed (Chapter 391-3-16-. 01)

- Provides local governments criteria to allow development of a water supply reservoir or watershed without contaminating the water source to a point where it cannot be treated to meet drinking water standards.
- The criteria establishes buffer zones and requirements for land disturbing activities along *perennial streams* and lakes and applies to existing and future *water supply reservoirs* and watersheds.
- Local governments may exempt specific forestry activities from the stream and lake corridor buffers provided the activity complies with *Best Management Practices.*

Figure 8-A. Water Supply Reservoir/Watershed

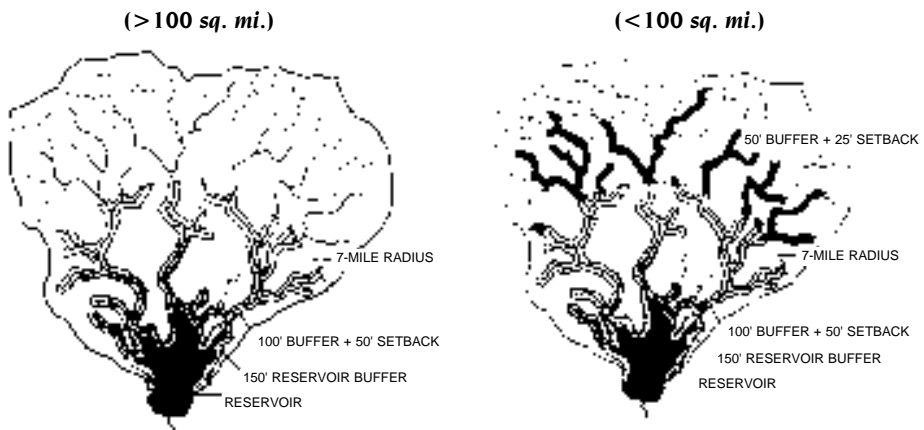
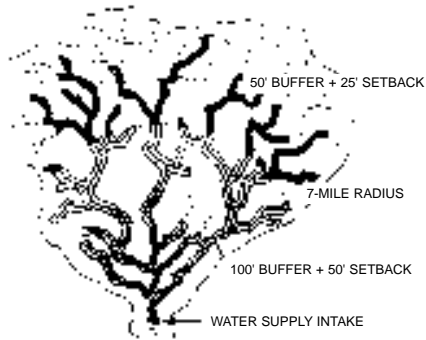


Figure 8-A. Water Supply Intake Watershed (<100 sq. mi.)



8.2.3.2 Wetlands Protection Act (Chapter 391-3-16-. 03)

- Requires local governments and regional development centers to acknowledge the importance of wetlands for the public good in the land-use planning process.
- Where wetlands exceed five acres, local governments are encouraged to protect them.
- Timber production and harvesting are considered acceptable uses.

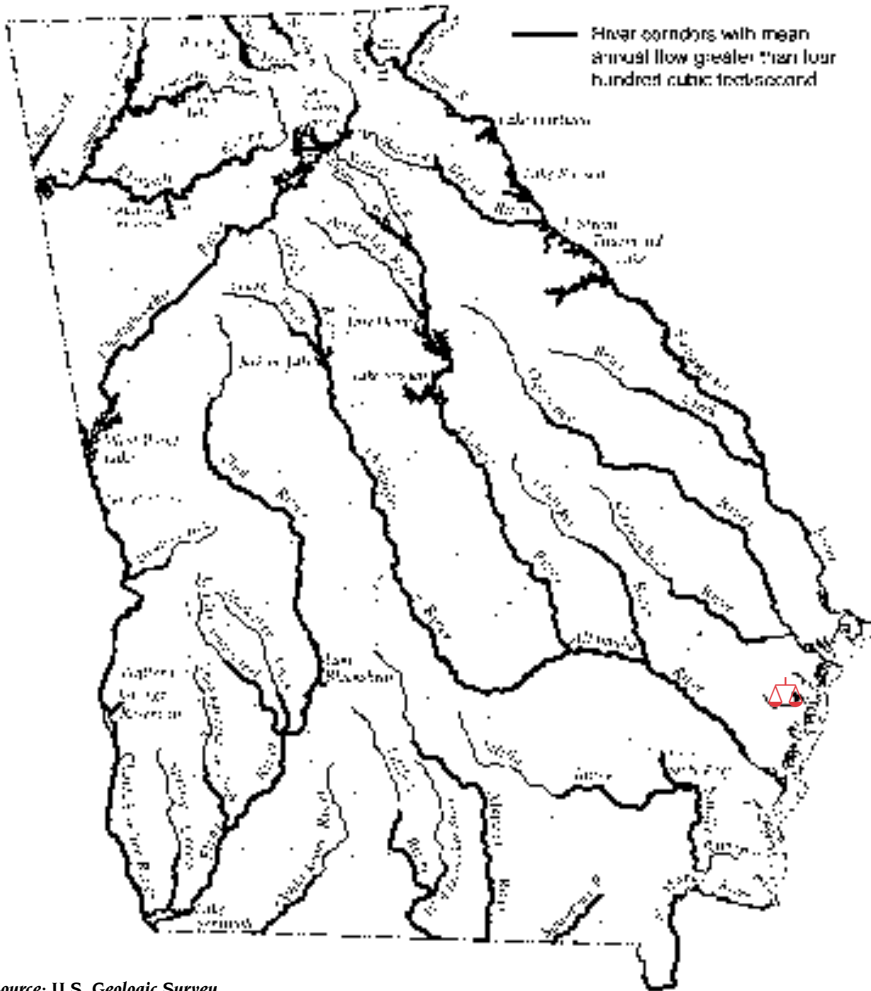
8.2.3.3 River Corridor Protection Act (Chapter 391-3-16-. 04)

- Requires local governments and regional development centers to use standards for the protection of river corridors in developing and implementing local comprehensive development plans.
- Applies to any perennial river or watercourse, at that point and below, where the average annual flow is at least 400 cubic feet per second (cfs) as determined by appropriate U.S. Geological Survey documents.
- Protected buffers include all land within 100 feet horizontally on both sides of the river as measured from the riverbanks.
- Plans shall provide for timber production and harvesting provided the activity complies with *Best Management Practices*.
- See map (Figure 8-B).



**Section 8:
Appendix**

Figure 8-B. State Designated Protected Rivers: 1992



Source: U.S. Geologic Survey

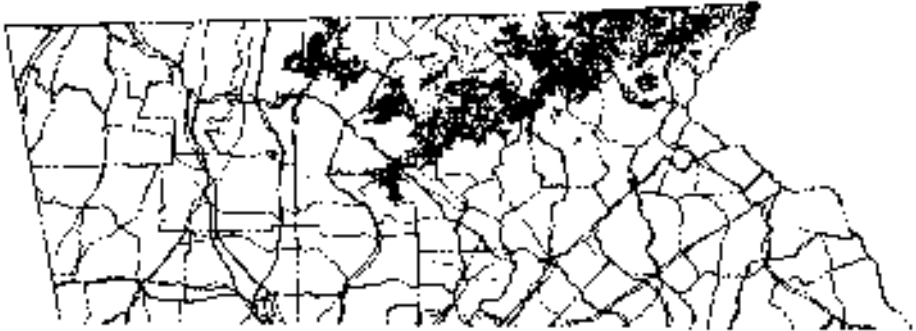
8.2.3.4 Mountain Protection Act (Chapter 391-3-16-. 05)

- Requires local governments and regional development centers to use planning standards for the protection of mountain areas in developing and implementing local comprehensive plans.
- Applies to all land area 2,200 feet or more above mean sea level that has a percentage slope of 25 percent or greater for at least 500 feet horizontally, and

shall include the crests, summits, and ridge tops that lie at elevations higher than any such area.

- Forestry practices are allowed on protected mountains provided the activity complies with *Best Management Practices*.
- See map (Figure 8-C).

Figure 8-C. Generalized Map of Areas Subject to "Mountain Protection"

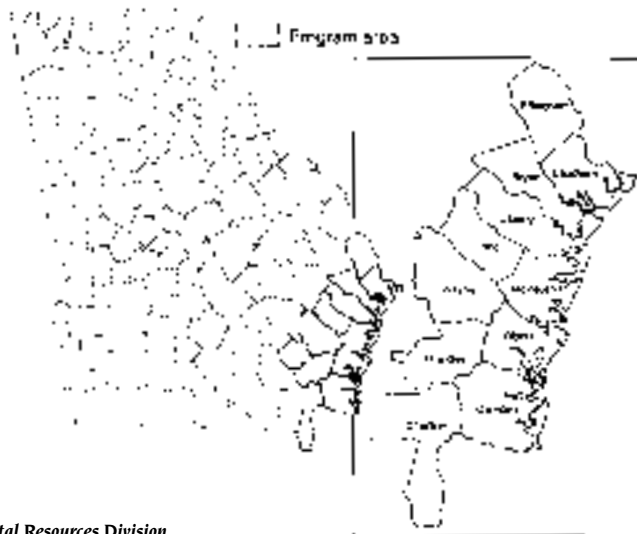


Source: U.S. Geologic Survey

8.2.4 Coastal Management Act (O.C.G.A. 12 -5-260)

- Requires existing authorities in the 11-county coastal area to execute the full range of policies and management techniques identified as necessary for coastal management purposes.
- See map (Figure 8-D).

Figure 8-D. Coastal Zone Management Program Area



Source: Georgia Coastal Resources Division



**Section 8:
Appendix**

 **8.2.5 Metropolitan River Protection Act (O.C.G.A. 12-5-440)**

- Requires the Atlanta Regional Commission (ARC) to adopt a plan that would protect the land and water resources of the Chattahoochee River Corridor from Buford Dam to the southwest edge of Fulton County.
- Establishes a 2,000 foot buffer in which land disturbing activities are regulated.
- Requires a 50 foot buffer of natural vegetation be left in its natural state along the banks of the river and 35 feet along the banks of other tributaries.
- Outside of these buffers and in areas zoned for agriculture, forestry practices are exempt from permitting. However in residential or commercial areas, a plan must be submitted and approved by the ARC when removing healthy trees over two inches in diameter at breast height.
- Establishes civil penalties of \$1,000 per acre per day or part thereof on which such violation occurs.

 **8.2.6 Georgia Forest Fire Protection Act (O.C.G.A. 12-6-90)**

- Requires any person, firm, corporation, or association entitled to burn any woods, lands, marshes, or any other flammable vegetation, whether in cultivated or uncultivated areas, shall prior to such burning notify and/or obtain a permit from the county office of the GFC wherein such burning is to be made.
- Any person who makes a burn and fails to give notice and/or obtain required permit shall be guilty of a misdemeanor.

 **8.2.7 Erosion and Sedimentation Act (O.C.G.A. 12-7-1)**

- Provides permitting by local issuing authorities for land disturbing activities.
- Exempts commercial forestry activities, including harvesting, from permitting and minimum requirements of the Act.
- Harvesting inconsistent with BMPs may be interpreted as being in association with land conversion activities and trigger erosion and sedimentation control permits and requirements.

 **8.2.8 Oil or Hazardous Material Spills or Release Act (O.C.G.A. 12 -14-1)**

- Requires producers of hazardous substances including used motor oils or fuels to collect those substances and deliver to registered handlers.
- Requires that in the event of accidental spills that the spill be contained, contaminated soils be collected and delivered to approved waste handling facility, and GA EPD notified(1-800-241-4113).

8.2.9 State Board of Registration for Foresters Standards of Practice (O.C.G.A. 43-1-19) Chapter 220-5.01

- It is the responsibility of each registered forester to practice professional forestry in a manner which protects the public welfare and safety and in a manner which meets generally accepted standards of practice.
- Generally accepted standards of practice shall include, but are not limited to, adherence to *Best Management Practices* published periodically by the Georgia Forestry Commission and available from the Board office.
- Failure to practice professional forestry in accordance with generally accepted standards of practice shall constitute unprofessional conduct and shall be grounds for disciplinary action as provided for by law.

8.3 LOCAL LAWS, REGULATIONS AND ORDINANCES AFFECTING FOREST LANDOWNERS

Certain counties have adopted local laws and ordinances, which affect forestry activities. These come under the following categories:

8.3.1 Road Protection

May require permits and bonds before harvesting can begin. The Georgia Forestry Association, the Georgia Forestry Commission, and the University of Georgia School of Forest Resources Extension Service maintains current list of those counties.

8.3.2 Zoning

Timber harvesting, in other than agriculture zones, may require permits and specific harvesting requirements.

8.3.3 Timber Tax Collection

Certain counties require permits or notification for timber harvest for the collection of timber tax.

8.3.4 Watershed Protection

Some counties require permits and plans for the removal of timber in floodplains.

8.3.5 Local Land Use Plans

See Comprehensive Growth Planning Act under State laws.

Landowners, forest managers and operators should check with local authorities before undertaking forestry activities.



GLOSSARY

Access Road - A permanent or temporary woods road over which timber is transported from a felling site to a public road. Also known as a haul or system road.

Aesthetics - The study or practices designed to maintain the beauty of forests.

Aspect - The compass direction that the slope of the land faces (north, northwest, south, etc.)

Back Blading - The practice of laying the bulldozer blade on the ground while operating a crawler tractor or other dozer equipment in reverse. This practice is commonly used for smoothing rough soil or for pulling soil or debris away from an area when pushing is not practical.

Basal Area - The area of the cross section of a tree stem near its base, generally at breast height (4 1/2 feet above the ground), inclusive of bark. Expressed in square feet per acre. Stand basal area is generally expressed as the total basal area per unit area.

Bedding - A site preparation technique in which a small ridge of surface soil is formed to provide an elevated planting or seedbed. It is used primarily in wet areas to improve drainage and aeration for seedlings.

Best Management Practices (BMPs) - Methods, measures or practices to prevent or reduce water pollution, including but not limited to, structural and non-structural controls, operation and maintenance procedures, and other requirements, scheduling, and distribution of activities. Usually BMPs are applied as a system of practices rather than a single practice.

Braided Stream - A stream flowing in several dividing and reuniting channels resembling the strands of a braid. The divisions are caused by obstruction from sediment deposited by the stream.

Broad-based Dip - A surface drainage diversion built into the bed of a permanent haul road that consists of a long approach section, a low, out-sloped middle section, and a short terminal section with a reverse grade. They are specifically designed to intercept and divert surface water flow out of a dirt road while allowing vehicles to maintain normal haul speeds. Also called a rolling dip.

Broadcast Burn - A controlled fire within well-defined boundaries to reduce forest fuel hazards.

Brush Barrier - A linear pile of limbs, tops, logs, and other forest debris which is arranged along the lower edge of a road, log deck, or site prepared area to slow, diffuse, or intercept sediment moving off the disturbed site.

Buffer Strip - A transitional area between two different land uses which mitigates the effects of one land use on another. For water quality purposes they are intended to filter surface runoff and trap sediment and associated pollutants before entering water bodies. Some state and local regulations require them.

Canopy Cover - Indices of percent ground surface shaded by a combination of overstory and midstory trees.

Channel - A natural water-bearing trough cut vertically into low areas of the land surface by erosive action of concentrated flowing water.

Chopping - A mechanical treatment in which vegetation is concentrated near the ground and incorporated in the soil. Chopping may be used to facilitate burning.

Clearcutting - A silvicultural system in which all merchantable trees are harvested over a specified area in one operation.

Commercial Forest Land - Forest land bearing or capable of bearing timber of commercial character, currently or prospectively available, and not withdrawn from such use.

Contour - An imaginary line on the surface of the earth connecting points of the same elevation. Also a line drawn on a map connecting points of the same elevation.

Controlled Burning (fire) - See prescribed burning

Cross-Drain Culvert - A metal, wooden, plastic or concrete conduit through which ditch flow is directed underneath the road surface to the opposite side of the road.

Culvert - A metal, concrete or plastic pipe, or a constructed box-type conduit through which water is carried under roads or trails.

Ditches and Canals - Manmade water courses.

Dry Wash - A stream bed that carries water only during and immediately following rainstorms. Sometimes referred to as a gully or ephemeral stream.

Duff - Partially decayed organic matter on the forest floor.

Ephemeral Area - Commonly referred to as drains, draws, or dry washes that typically have no well-defined channel and flow only during and for short periods following precipitation. Leaf, straw, and other forest litter is typically present or sporadically displaced in the ephemeral area. Aquatic insects are not present in these areas.

Erosion - The process by which soil particles are detached and transported by water, wind and gravity to a point downslope or downstream.

Estuary - An inlet or arm of the sea where the tide meets the current at the mouth of a river.

Excelsior Blanket - A machine produced mat of curled wood excelsior bonded with polymer netting.

Fauna - The animals of a specified region or time.

Felling - Cutting down standing trees.

Fertilizers - Any substance or combination of substances used primarily as a source of plant nutrition or soil amendments.

Firebreaks (Fire Lines) - Artificial barriers that contain fires within an area that typically are established by plowing and/or harrowing.

Flora - The plants of a specified region or time.

Forest Chemicals - Chemical substances or formulations that perform important functions in forest management, including fertilizers, herbicides, insecticides, fungicides and repellents.

Gabion - Large, multi-celled, welded wire or rectangular wire mesh boxes, used in stream channel revetments, retaining walls, abutments, check dams, etc. to stabilize steep or highly erosive slopes.

Geotextiles - Fabrics used to improve the load bearing capacity of roads with weak base material.

Geoweb® - A heavy-duty polyethylene cellular confinement system used to improve and stabilize structural fill in roads and embankments.

Gully - A channel, hollow or narrow ravine caused by past land cultivation. Sometimes referred to as a dry wash.

Harrowing (Disking) - A mechanical method of scarifying the soil to reduce competing vegetation and to prepare a site for seeding or planting.

Herbicide - Any chemical or mixture of chemicals intended to prevent the growth of or promote the removal of targeted trees, bushes, and/or herbaceous vegetation.

Humus Layer - The organic layer of the soil formed by the decay of organic matter.

Hydric Soils - Soils exhibiting a considerably wet nature, typically characterized by dark or gray mottled colors and associated with wetlands.

Hydrology - The scientific study of the properties, distribution and effects of water on the earth's surface, in the soil and underlying rocks and in the atmosphere.

Inslope - The feature of a road surface, established during construction or maintenance, that slants the roadbed to the inner or uphill side to facilitate drainage of storm runoff from the road in more concentrated flow into a ditch line.

Integrated Pest Management - The maintenance of destructive agents, including insects, at tolerable levels by the planned use of a variety of preventive, suppressive, or regulatory tactics and strategies that are ecologically and economically effective and socially acceptable.

Intermittent Stream - A watercourse that flows in a well-defined channel during wet seasons of the year but not the entire year. They generally exhibit signs of water velocity sufficient to move soil material, litter and fine debris. Aquatic insects often are difficult to find or not present at all.

Log Deck - A place where logs or tree-length material is assembled for loading and transporting.

Logging Debris - The unused and generally unmarketable accumulation of large limbs, tops, cull logs, and stumps that remain after harvesting.

Mulching - Any loose covering of forest soil with organic residues such as grass, straw or wood fibers that checks erosion and stabilizes exposed soil.

Nonpoint Source (NPS) Pollution - Water pollution that is (1) induced by natural processes including precipitation, seepage, percolation and runoff; (2) not traceable to any discrete or identifiable facility; and (3) better controlled by using BMPs.



Glossary

Outslope - The feature of a road surface, established during construction or maintenance, that slants the roadbed to the outer or downhill side to facilitate drainage of storm runoff from the road in more diffuse flow than occurs at dips and water bars. Outsloping is a contrasting road design to the crowned roadbed or to an incline toward a ditch line.

Perennial Stream - A watercourse that flows in a well-defined channel throughout most of the year under normal climatic conditions. Some may dry up during drought periods or due to excessive upstream uses. Aquatic insects are normally present and easily found.

Pesticide - Any chemical substance used to control undesirable insects, diseases, vegetation, animals or other life forms. Herbicides, insecticides, fungicides and nematicides are considered pesticides.

Pollutants - Natural or manmade waste material that contaminates air, soil, or water.

Precipitation - Any form of water that falls to the ground from the atmosphere, including drizzle, rain, snow, snow pellets, ice crystals, etc.

Prescribed Burning (fire) - The use of planned fire that is deliberately set under specific fuel and weather conditions to accomplish any variety of management objectives and is under control until it burns out or is extinguished.

Protected Mountain Top - Mountain tops above 2,200 feet elevation and greater than 25% slope.

Protected River Corridors - One hundred-foot buffers along those rivers at a point and below where the flow is at 400 cubic feet per second (cfs).

Qualified Professional - A person whose training and experience qualifies him/her to make forestry and water quality recommendations. Examples include foresters, hydrologists, soil scientists, forest engineers, fishery and wildlife biologists, or technically trained individuals such as those who have completed the Master Timber Harvesters workshops.

Raking - A mechanical site preparation method to remove trees and shrubs by raking and piling debris. Raking usually moves less soil into windrows than bulldozing.

Regeneration - A young tree crop that replaces older trees removed by harvest or disaster; also the process of replacing old trees with young ones.

Registered Forester - A person who is registered and licensed to engage in professional forestry practices as determined by the Georgia State Board of Registration for Foresters.

Restricted Use Pesticide - A pesticide that is applied only by certified persons for specific uses.

Retirement of Roads - Preparing a road for a long period of non-use by methods including mulching, seeding and installing water bars.

Rip-rap - Rock or other large aggregate that is placed to protect streambanks, bridge abutments or other erodible sites from runoff or wave action.

Rotation Period - The period of time needed to establish, grow and harvest a crop of trees at a specified condition of maturity.

Sediment - Soil particles that have been detached and transported into water during erosion.

Seed Tree Cut - A timber harvesting method that provides for the natural regeneration of a site by leaving single trees, or small groups of seed-bearing trees, evenly distributed throughout the harvest area. Generally results in an even-aged stand.

Seep or Spring - A place where groundwater flows slowly to the surface and often forms a pool; a small spring.

Selection Cut - Removal of select trees in a forest stand based on some economic or physiological criteria. Generally results in an uneven-aged stand.

Shearing - A mechanical site preparation method of removing large numbers of stems too large for disking or drum chopping. Shear blades, mounted on crawler tractors, are angled or V-shaped, have straight or serrated edges and have a "stinger" for splitting larger trees and stumps.

Shelterwood Cut - Removal of mature timber in a forest stand in a series of harvests that extend over a relatively short portion of the rotation. This cut encourages essentially even-aged reproduction under the partial shade of seed trees.

Side Cast - The act of moving excavated material to the side and depositing it.

Silt Fence - A lofty web of mechanically or melt bonded polymer netting, monofilament or fibers that are entangled to form a strong and dimensionally stable matrix to catch storm runoff and soil particles.

Silviculture - The science and art of growing forest crops. More particularly, the principles, theories and practices for protecting and enhancing the regeneration, growth, development and use of forests for multiple benefits.

Sinkhole - A geologic feature that may provide a direct connection between land surface and groundwater.

Site Preparation - A forest activity to remove unwanted vegetation and other material, and to cultivate or prepare soil for reforestation.

Skid - The short-distance moving of logs or felled trees along the surface of the ground from the stump to the point of loading.

Skid Trail - A temporary, non-structural pathway over forest soil for dragging felled trees or logs to a log deck.

Slough - A poorly defined channel in a swamp, bog, marsh, or riverine system, often without a clearly defined inlet or outlet.

Staging Area - An area designated for the concentration of vehicles and equipment for a specific activity.

Streamside Management Zone (SMZ) - A designated area of varying width adjacent to the banks of streams and bodies of water where management practices that might affect water quality, fish, or other aquatic resources are modified.

Sub-soiling - A mechanical site preparation method for ripping apart compact soils or soils with plow pans, hard pans, or fragi-pans under the soil surface.

Thermal Pollution - A temperature rise in a body of water sufficient to harm aquatic life.

Trout Stream - A perennial stream and its tributaries inhabited by trout. Streams designated as Primary Trout Streams are waters supporting a self-sustaining population of rainbow, brown or brook trout. Streams designated as Secondary Trout Streams are those with no evidence of natural trout reproduction, but are capable of supporting trout throughout the year.

Turbidity - An optical measurement of water clarity.

Water Bar - A hump or small dam-type surface drainage structure used to close abandoned roads, skid trails, and fire lines.

Water Control Structure - Any structure used to regulate surface or subsurface water flows.

Watershed - All land and water within a drainage divide.

Waters of the State - Any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells and other bodies of surface or subsurface water, natural or artificial, lying within or forming part of the boundaries of the state, which are not entirely confined and retained completely upon the property of a single individual, partnership or corporation.

Waters of the U.S. - Includes lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds.

Water Supply Point - An easily accessible location used to pump water into fire-suppression vehicles.

Water Supply Reservoir/Watersheds - Governmentally owned impoundments of water and the watersheds above such impoundments used primarily to provide water to one or more governmentally owned public drinking-water systems.

Water Turnout - The extension of an access road's drainage ditch or skid trail's or fire line's water bar into a vegetated area to disperse and filter storm water runoff.

Wetlands - Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands possess three essential characteristics: hydrophytic vegetation, hydric soils, and hydrology. Wetlands generally include swamps, marshes, bogs, river floodplains, Carolina bays, cypress domes and stringers, pine hammocks and similar areas.

Windrow - Logging debris and unmerchantable woody vegetation that is piled into rows to decompose or be burned.



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SOURCES OF INFORMATION

For other natural resource information, contact any of the following organizations:

State Agencies:

Georgia Forestry Commission
P.O. Box 819
Macon, Ga. 31202
1-800-GA-TREES
www.gfc.state.ga.us

University of Georgia
School of Forest Resources
Athens, GA. 30602
706-542-2686

University of Georgia
Forest Resources Cooperative
Extension Service
School of Forest Resources
Athens, GA 30602
706-542-3446

Federal Agencies:

U.S. Department of Agriculture
Forest Service:
Southern Region
1720 Peachtree St.,NW
Atlanta, GA 30367
404-347-4178
706-546-2272

U.S. Department of Agriculture Forest Service
Chattahoochee-Oconee National Forest
1755 Cleveland Hwy
Gainesville, GA 30501
770-536-0541

U.S. Environmental Protection Agency
Wetlands, Coastal and Water Quality
Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303
404-562-9355

Private Organizations:

The Association of Consulting Foresters
Georgia Chapter
c/o F&W Forestry Services, Inc.
P.O. Box 3610
Albany, GA 31708
912-883-0505

Georgia Department of Natural Resources
Environmental Protection Division
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205 Butler Street, S.E.
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404-656-4887

Georgia Department of Natural Resources
Wildlife Resources Division
2070 US Highway 278 SE
Social Circle, GA. 30279
770-918-6401

Georgia Soil and Water
Conservation Commission
P.O. Box 8024
Athens, GA 30603
706-542-3065

Natural Resources Conservation Service
State Office
Federal Building, Box 13
355 E. Hancock Street
Athens, GA 30601

United States Department of the Interior
Fish and Wildlife Service
Region 4
1875 Century Boulevard
Suite 200
Atlanta, GA 30345

U.S. Army Corps of Engineers
Savannah District
P.O. Box 889
Savannah, GA 31402
912-652-5822

The Atlanta Regional Commission
200 Northcreek, Suite 300
3715 Northside Parkway
Atlanta, GA 30327
404-364-2500

continued . . .



Sources of Information

The Conservation Fund
880 W. Wesley Rd, NW
Atlanta, GA 30327
404-355-7246

The Georgia Farm Bureau
P. O. Box 18002
Macon, GA 31298
912-746-5263

The Georgia Wildlife Federation
1930 Iris Drive
Conyers, GA 30207
770-929-3350

The Society of American Foresters
Georgia Division
912-751-3553

The Georgia Conservancy
1776 Peachtree Street, NW
Suite 400 South
Atlanta, GA 30309
404-876-2900

The Georgia Forestry Association
505 Pinnacle Court
Norcross, GA 30071
770-416-7621

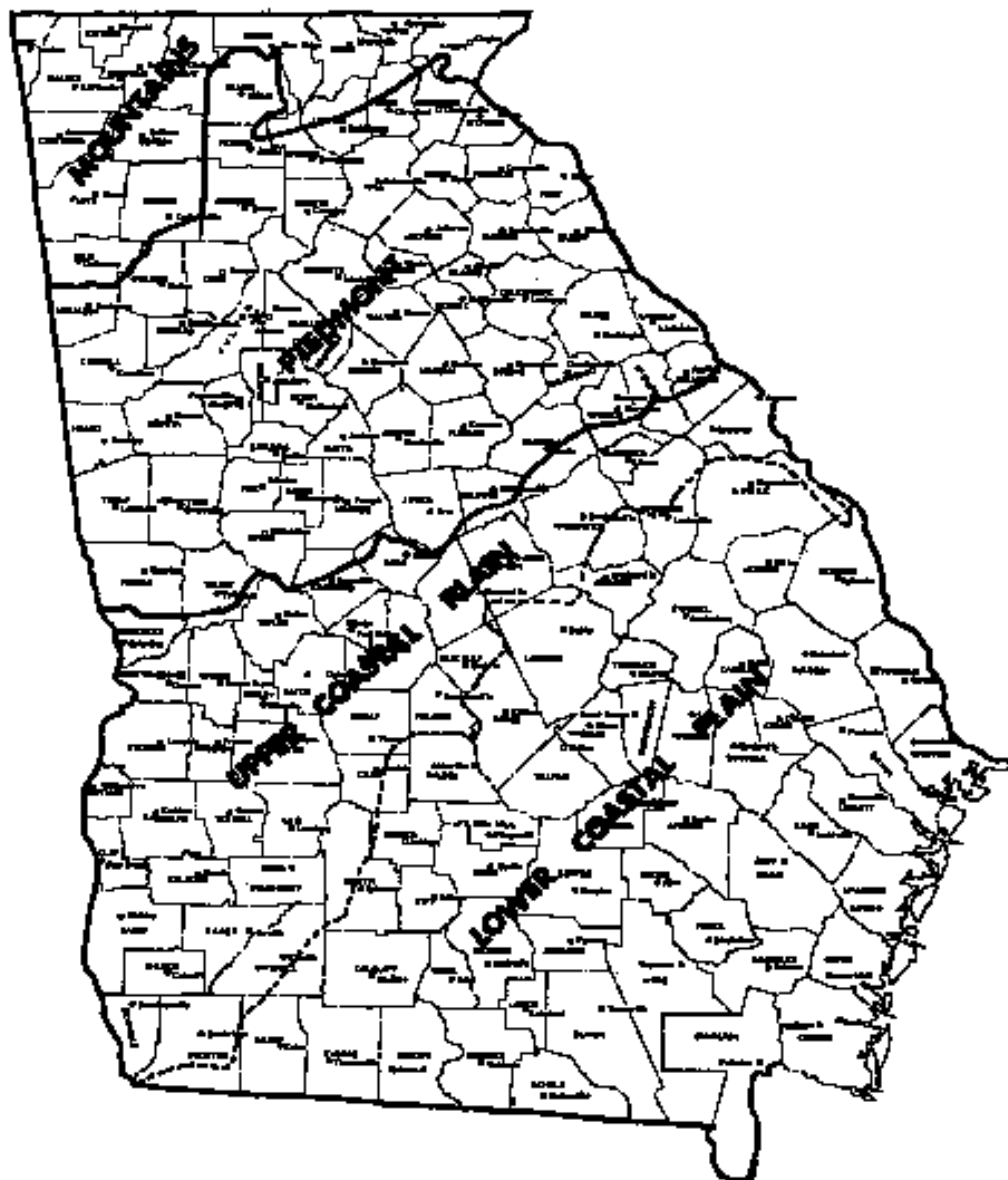
The Nature Conservancy of Georgia
1330 W. Peachtree St, Suite 410
Atlanta, GA 30309
404-873-6946

The Southeastern Wood Producers Assoc.
P. O. Box 9
Hilliard, FL 32046
904-845-7133

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J. Frederick Allen
Director

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