



ANR-1031

ALABAMA A & M AND AUBURN UNIVERSITIES

# Forest Practices And Water Quality: Guidelines For Landowners

Water quality became an important issue to the general public almost 30 years ago. At that time attention was focused on industrial waste and urban sewage treatment. Protecting and improving water quality remains an important topic today although the problems we face and the methods being used to address these problems have changed significantly. Because of these changes, land management activities and their effects on water quality are receiving increasing attention. Forest management activities are not exempt from this attention.

People worry about water quality for a number of reasons. The most obvious reason is the impact polluted water can have on human health. Treating polluted water to make it drinkable is extremely expensive. In addition, polluted water can harm wildlife, adversely affect recreational activities, and is often aesthetically unpleasant. Because people have become interested in improving and maintaining water quality, federal and state legislatures have passed water pollution control laws. Compliance with these laws is an additional, although hopefully not primary, reason for considering the effects of land management activities on water quality.

## A Brief Overview Of Water Quality Legislation

### The Federal Clean Water Act

The most important water pollution control law is the Federal Water Pollution Control Act, which was first passed in 1948. In 1977 this Act was amended and its name changed to the Clean Water Act (CWA). The purpose of this law is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." This Act has been amended several times, most recently in 1987, in response to the public's increased awareness of, and concern about, water quality.

Congress periodically reviews the Clean Water Act in order to determine if any changes are needed. It has now been 10 years since the last amendments, which means review of this law is overdue.

The Clean Water Act is important because it gives the federal government the primary role in determining water pollution policy and establishes specific water quality goals. The states are given the role of implementing federal policy once they have a qualifying state program in place.

There are three areas within the CWA that affect, or have the potential to affect, activities in nonindustrial private forests. These three areas are point source regulation, nonpoint source regulation, and water quality standards.

Point source pollution originates from a confined discharge and can be reduced through technological adaptations that reduce or treat effluent. Examples of point source pollution include municipal sewage treatment plants and industrial discharges.

Nonpoint source pollution originates from an undefined source. Examples include land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrological modification. Elimination of nonpoint source pollution requires adjustments in the land use activities causing runoff into streams. Nonpoint source pollution is much more difficult and costly to reduce or eliminate than is point source pollution simply because it does not originate from a single identifiable source but from numerous activities involving almost anyone who owns property.

Until the 1987 version of the CWA the goal of improving the water quality of U.S. waters was focused primarily on reducing point sources of pollution. This attention has resulted in improvements in water quality, but we still have water quality problems. Recent studies by both the Environmental Protection Agency and state water quality agencies have shown that most of our remaining water quality problems are caused by nonpoint source pollution, urban storm water discharge, and combined sewer overflows. This means increasing attention will be focused on activities that generate these types of pollution. Many land management activities, including some forestry activities, generate nonpoint source pollution. Nonpoint source pollution is a problem that will require changes in the way many of us conduct our land management activities.

When the CWA was revised in 1987, Congress added Section 319 to the Act. Section 319 established a national program through which the States must address nonpoint source pollution. Each state is required to assess its nonpoint source problem, after which it must adopt and implement a management program to control the identified sources of nonpoint source pollution. This has resulted in the development of Best Management Practices (BMPs), which are to be used to control nonpoint source pollution. BMPs are defined by the EPA as “schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States from discharges of dredged or fill material.”

### **The Alabama Department Of Environmental Management Administrative Code**

At the state level, the Alabama Department of Environmental Management (ADEM) has an Administrative Code that defines “waters of the state” as “every watercourse, stream, river, wetland, pond, lake, coastal, ground or surface water, wholly or partially in the state, natural or artificial, which is not entirely confined and retained on the property of a single landowner.” This code prohibits deposition of pollutants or degradation of the physical, chemical, or biological integrity of these waters. Both point source and nonpoint source pollutants are included in this description. With respect to silvicultural activities, nonpoint source pollutants include sediment, organic materials, elevated water temperature, trash, pesticides, and nutrients that are anthropogenic (originate from human activities) in origin.

The Alabama Forestry Commission’s recommendations for BMPs that address water quality problems associated with forestry practices are voluntary. These voluntary BMPs were revised in 1993. On the other hand, the state guidelines for forest road BMPs that address stream crossings and wetland road construction are mandatory (see Mandatory BMPs For Stream Crossings And Wetland Road Construction). These BMPs are identical to federal road construction BMPs.

Both the voluntary and the mandatory BMPs are designed to prevent violation of state water quality statutes. When timber is sold, a written contract should include the mandatory BMPs and the applicable voluntary BMPs that need to be followed.

### **Mandatory BMPs For Stream Crossings And Wetland Road Construction**

These BMPs must be followed to retain exemption status for road operation.

1. Permanent roads, temporary access roads and skid trails (all for forestry) in waters of the United States shall be held to the minimum feasible number, width, and total length consistent with the purpose of specific silvicultural operation, 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 which must cross water bodies) to minimize discharges of dredged or fill material into waters of the United States;
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 United States 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 United States (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;
6. In designing, constructing and maintaining roads, vegetative disturbance in the waters of the United States 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 whenever feasible;
9. The discharge 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;
10. Discharges into breeding and nesting areas for waterfowl, spawning 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;
15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

(Source: U.S. Army Corps of Engineers Section 404, Corps of Engineers Permit Requirements, 40 CFR Part 233.22)

# The Impact Of Forest Practices On Water Quality

Forest practices can have positive or negative impacts on water quality. Forested areas serve as filters, which generate clean, clear water. Each of us has to ensure that our activities within forests do not interrupt this supply of clean water. With proper planning and careful management of activities, we can minimize the negative water quality impacts of forest management activities.

This planning and management has the added bonus of enhancing other aspects of our forest environment. For example, prevention of sediment movement into streams means the topsoil so important for site productivity is not being exported to a neighbor's pond or to the city reservoir. Maintenance of streamside management zones can provide wildlife habitat and wildlife movement corridors while an adjacent harvested area is revegetated.

The most obvious impact associated with forestry activities is erosion of sediment into water bodies, and it is this problem most people think about when they think about forestry and water pollution. The easily observed problem of sediment in a water body is usually the most serious impact to water quality associated with forest management activities. However, a number of other pollutants, associated with forestry activities, can impact water quality. These include fertilizers and herbicides if improperly applied and elevated water temperature if streamside management zones are not maintained. In addition, there can be an increase in biological oxygen demand (the amount of oxygen necessary to allow breakdown of organic matter by microorganisms) if large amounts of organic material (tops and branches) are deposited into stream channels.

## Erosion Of Sediment

Besides the obvious aesthetic impacts, there are a number of reasons why excess sediment in a water body is considered pollution. Sediment in a stream or lake can settle out of suspension and fill up the small spaces in streambeds or lake bottoms. These small spaces are usually occupied by bottom-dwelling organisms as well as the young of many aquatic organisms. Sediment deposited on these organisms will kill them by smothering them. Loss of these organisms can have a significant impact on the diversity and health of a water body.

If sediment deposition is heavy enough, it can decrease the water-holding capacity of a stream, lake, or reservoir by physically filling it up. This can result in increased flooding and/or decreased

water supply if the water body serves as a reservoir for drinking water.

Sediments that remain suspended in the water will decrease the amount of light that can penetrate through the water. Since all plants, even aquatic ones, require light for photosynthesis (the process by which plants use sunlight to produce their own food), excess amounts of suspended sediment in the water will weaken or kill plants. Aquatic organisms that depend on sight to locate food will also be negatively impacted by the decrease in light penetration. Sediment suspended in the water can also damage the gills of fish, making it more difficult for them to get enough oxygen.

## Logging Debris

Another readily apparent water quality problem is the deposition of logging debris in waterways. Virtually all streams have some amount of organic debris present. This organic material provides food and cover for various aquatic organisms. However, excessive amounts of organic debris can adversely affect water quality in several ways.

First, the physical presence of greater than normal amounts of debris interferes with the natural hydrology of a waterway. Water may back up and flood areas that are not normally wet, movement of aquatic organisms may be hindered, and parts of small streams may actually be starved of water due to the damming effect of upstream debris.

In addition, as this debris begins to decay, there is an increased demand for oxygen by microorganisms breaking down the organic matter. This increased oxygen demand can deplete the oxygen dissolved in the water and kill aquatic organisms.

## Streamside Management Zones

Another problem that can affect water quality results from a lack of adequate streamside management zones. These vegetated zones are located adjacent to water bodies and serve several purposes.

The primary purpose of a streamside management zone is to filter water before it enters the stream. This vegetated zone, if properly established, will serve to trap any sediments that erode from disturbed soil areas. In order for streamside management zones to be effective sediment filters, the slope adjacent to the stream must be taken into account when deciding the width of the zone.

A secondary purpose is to provide continued shading of the waterway. This shade will help prevent development of elevated stream temperatures. Elevated stream temperature reduces the amount of oxygen that can be dissolved in the water. This type of water pollution has major impacts on both

animal and plant life in water bodies. Typically, stream water temperature is more sensitive in smaller streams.

A third benefit of streamside management zones is the provision of cover for wildlife. The state BMP manual offers advice for establishment of these streamside management zones.

## **Forest Chemicals**

Forest chemicals include herbicides, insecticides, fungicides, and fertilizers. Typically, private landowners will use these chemicals for forest management infrequently and will apply them at low rates. As long as the label instructions are followed, there is little danger that forestry activities will contribute in any significant way to impaired water quality from these chemicals.

## **How Forest Landowners Can Protect Water Quality**

According to the EPA, the best method of protecting water quality is to reduce or eliminate pollutants, to prevent movement of pollutants off-site during land disturbance, to properly time activities to minimize the impact of rainfall on disturbed areas, and to protect natural hydrology and sensitive areas.

A less optimal, but still useful, method of protecting water quality involves reduction or interception of polluted runoff before it reaches a waterway. However, reduction or interception of runoff is often extremely difficult. ADEM supports and encourages the use of voluntary BMPs or other preventive measures rather than “restoration after the fact.”

## **If You Plan To Harvest, Plan The Harvest**

Another important way a forest landowner can protect water quality is to plan forestry activities in advance. Advanced planning may be the single most effective way to avoid negative impacts to water quality as well as to site productivity, wildlife habitat, and aesthetics.

When developing your land management plan, consider how you will address the following activities, which you may carry out over the course of 20 to 30 years and which have the potential to affect water quality:

- Preharvest planning.
- Establishment of streamside management zones.
- Road construction, repair, and maintenance.
- Establishment, repair, and maintenance of stream crossings.
- Road management.

- Timber harvesting.
- Site preparation and forest regeneration.
- Fire management and controlled burning.
- Revegetation of disturbed areas.
- Forest chemical management.
- Wetland forest management.

Many people find planning to be a tiresome or confusing process. However, keep reminding yourself that prevention of a problem is almost always easier, more economical, and more successful than coming back after the fact to correct or repair damage.

## **Planning Forest Roads**

Several studies have attributed as much as 90 percent of the total sediment production from forestry operations to forest roads. This means that careful planning of road placement, design, and maintenance is extremely important. Roads are a source of sediment from the time construction begins until they are “put to bed” or replanted—particularly if the road has steep grades, stream crossings, and poorly drained areas along its length. If you already have a road system on your property, you may want to evaluate the roads to see if there are locations along the length that appear to be the source of water quality problems and work to improve these areas as part of your maintenance plan.

Road construction that will take place within a jurisdictional or defined wetland area is subject to 15 mandatory BMPs developed by the EPA and designed to address pollution problems. In addition, construction of stream crossings at all locations must adhere to these mandatory BMPs. Forest road construction within wetlands is exempt from the Section 404 wetland permitting process, but the 15 mandatory BMPs must be followed. BMPs for road construction in non-wetland areas are voluntary.

## **Obtaining Information About Forest Management**

The responsibility for maintaining water quality is very broad. It can include everyone from the landowner to any forestry professional who is involved in the management activities. For this reason, if you do not have a copy of the state BMP manual, which is entitled "Alabama's Best Management Practices for Forestry 1993," you should contact the county office of the Alabama Forestry Commission and request a copy. They make every effort to provide this manual, free of charge, to landowners.

There are also a number of publications available, free of charge, from the Alabama Cooperative Extension System. These publications offer landowners advice on how to manage land in an environmentally sound manner:

- Circular ANR-626, "Selling Timber Successfully."
- Circular ANR-560, "Timber Sale And Harvesting Contracts."
- Circular ANR-539, "Best Management Practices For Timber Harvesters."
- Circular ANR-641, "BMPs For Stream Crossings."
- Circular ANR-916, "Forest Roads And Construction Of Associated Water Diversion Devices."
- Circular ANR-846, "The Environmental Safety Of Forestry Herbicides."
- Circular ANR-275, "Site Preparation Methods—Regenerating Southern Pines."
- Circular ANR-331, "Prescribed Burning In Alabama Forests."

If you would like a copy of any of these publications, contact your county Extension agent or any of the Forestry Extension Specialists at the School of Forestry at Auburn University.



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**For more information**, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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