



## ***Water Quality Guidelines for East Texas Timber Producers***

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**F**or more than fifty years the forest conservation movement in East Texas has stressed the importance of reforestation and forest management. As a result, forests now constitute much of the region and provide many benefits for individual landowners, the state and the nation. As the demand for timber increases, forests in Texas and other states will have to be more intensively managed. This would lead to more road construction, harvesting, site preparation and other management measures. Such development increases the possibility of damage to the water quality of nearby streams, rivers and lakes.

Public concern over the effects that forestry and other land uses might have on water quality was expressed in the Federal Water Pollution Control Act Amendments of 1972. The amendments set several national goals regarding water quality and established a framework for achieving them. Within this framework the individual states are responsible for identifying and dealing with pollution problems. In Texas, forest landowners and loggers are encouraged to voluntarily comply with guidelines that insure their management practices have minimal effects on water quality. If this fails, the state might be compelled to implement a regulatory program.

This publication should help forest landowners and loggers in East Texas coordinate their manage-

ment activities with the protection of water quality. It describes the kinds of pollution found on forest lands and recommends ways to minimize the effects of forest practices on water quality.

### ***Types of Pollution***

**I**f the source of a water pollutant cannot be traced, it is called a nonpoint source. Forestry activities that lead to pollution are considered nonpoint sources. The resulting pollution includes:

#### ***Sediment***

Sediment is soil that has been washed away and deposited elsewhere by the erosive force of rainfall and moving surface water. Some sediment occurs naturally in the streams, rivers and lakes of East Texas, but man's activities can increase concentrations enough to impair water quality. Excessive sediment can alter stream flow, inhibit photosynthesis, clog reservoirs and drainage ditches and adversely affect the reproduction of certain fish. In East Texas, sediment is the most common form of pollution caused by forestry operations.

#### ***Nutrients***

Elements such as nitrogen or phosphorous continually enter the forest soil by decomposition or other natural processes. Eventually they may find their way into streams, rivers and lakes. In certain concentrations such nutrients are essential

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to plants and animals. However, excessive amounts can stimulate abnormal plant growth and adversely affect the aquatic ecosystem.

### **Organics**

Plant and animal organic matter enters water by direct application or surface run-off. Decomposing organics impair water quality by reducing life-sustaining oxygen levels. In addition, organic compounds may lead to undesirable changes in the taste, color and odor of water.

### **Temperature**

Temperature is an important determinant of overall water quality. Increases in water temperature caused by the removal of shading vegetation can decrease the amount of dissolved oxygen, increase fish susceptibility to disease and affect the aquatic food cycle.

### **Chemicals**

Artificial chemical compounds enter waterways through direct application, leaching or surface flow. Chemical impact on water quality depends primarily on mobility, persistence and toxicity. The introduction of alien chemicals may mean death to many forms of aquatic life — plants and animals.

## **Forest Practices and Pollution Guidelines**

### **Regeneration Systems**

A regeneration system is the means by which an existing forest stand is liquidated and a new one established. There are basically four alternatives. Three of these — the selection, shelterwood and seed-tree systems — entail removing the existing stand in two or more stages. The fourth — the clearcutting system — involves the complete removal of the existing stand in one step.

Regardless of the system used, trees must be felled and some mineral soil exposed. This creates a potential for water quality problems. Use the following guidelines to minimize any detrimental effects:

- Use the system that economically accomplishes your management objectives with the least amount of site disturbance.
- Use topography maps, aerial photos and soil surveys with field study to determine local site conditions.
- Assure prompt reforestation.

### **Roads**

Management of a forest usually begins with the development of a road network to provide access to the property. As management activities intensify, the road system expands. In East Texas, the potential pollution impact of roads is not as great as in other parts of the country because of the gentle terrain and the rapid rate of natural revegetation. Still, roads can be a primary source of increased sediment, since they disturb the soil and concentrate water runoff.

The possible detrimental effects that roads have on water quality are minimized by proper planning of road location, design and construction. Specific guidelines include the following:

- Locate roads on stable soils away from streams.
- Locate roads on the crest of ridges and along contours.
- Avoid planning roads in marshes, wet fields and natural drainage channels.
- Design roads sufficient to carry anticipated traffic loads.
- Construct roads well in advance of use to assure roadbed stability.
- Do not use right-of-way debris in roadbeds or fills.
- Construct roads with dips and wing ditches to reduce surface water velocity.
- Install ditches, culverts and other drainage devices concurrent with road construction, particularly upgrade of live stream crossings.
- Where stream crossings are necessary, construct roads at right angles to the stream channel.
- At stream crossings, do not place side-cast material below the high-water mark of the stream.
- If all the vegetation in some places has to be removed, use preventive erosion methods such as seeding.
- Crossings should not constrict clearly defined stream channels.
- Where necessary, use large aggregate surfacing material to stabilize road surfaces.
- Continually inspect and maintain roads after construction.
- Keep roads free of logging debris.
- After use, roads, especially in high erosion areas, should be drained, revegetated and closed to nonessential traffic.

- Where practical, restrict road use during periods of wet weather.
- Repair temporary stream crossings after use.

### **Harvesting**

Several types of harvesting operations are used in East Texas. These are distinguished largely by the length of the material removed. Tree-length logging has gained in popularity in recent years as large harvesting equipment has become available.

All harvesting methods entail at least five phases — felling, limbing, skidding, loading and hauling. Of these, skidding has the greatest potential for affecting water quality. The exposure and compaction of soils caused by skidtrails and landings may increase sediment loads. Felling and limbing can also lead to problems, such as increased nutrient concentrations, increased organic loadings and increased water temperatures.

To minimize the impact of harvesting operations on water quality, follow these guidelines:

- Identify potentially erodible or unstable soils and minimize logging disturbances in these areas.
- Avoid felling trees into streams. However, if they are so felled, remove them before limbing or bucking.
- Remove logging debris from streams or drainage channels during the harvesting operation.
- Use the least damaging skidding method to remove trees that have been cut within streamside buffer strips.
- Service harvesting equipment away from streams.
- Keep landings and skidtrails to the minimum number required for economical logging.
- Keep stream crossings to a minimum. Where crossings are necessary, provide protection for the stream banks.
- Leave vegetative buffer strips adjacent to streams, rivers and lakes.
- Whenever practical, limit harvesting activities during wet weather.
- Insure that abandoned skidtrails and landings are revegetated as needed and provided with appropriate water diversion structures.

### **Site Preparation and Planting**

Successful reestablishment of a forest stand sometimes requires site preparation. This is often done with fire, chemical herbicides or mechanical

means. All three methods can adversely affect water quality, but most concern has focused on the use of mechanical procedures. Practices such as shearing, raking, chopping, disking and bedding can drastically alter a site and expose large areas of mineral soil. While such areas usually revegetate quickly in East Texas, there is a period during which sediment production may be substantially increased.

Once a site has been prepared, a new stand may be established either naturally or artificially. In East Texas there has been a trend toward the use of clearcutting followed by artificial regeneration by machine planting. Typically, the planting machines are pulled by small tractors equipped with a dozer blade. The planting operation itself can cause some degree of soil disturbance.

Certain guidelines can be used to minimize the impact of site preparation and planting activities on water quality:

- Minimize the use of a dozer blade during machine planting operations.
- Windrow slash along contours and away from streams.
- Retain streamside buffer strips.
- Avoid using mechanical site-preparation techniques on sensitive sites.
- Use a prescribed burning program throughout the life of stand to minimize the need for intensive site preparation.
- Use the site preparation technique that gets the job done economically and with minimum soil disturbance.
- Plant on the contour.
- Use hand planting on steep areas or areas with highly erodible soils.

### **Prescribed Burning**

Fire is an important forest management tool. In southern forests fire is used to reduce the risk of wildfire, stimulate forage production, improve wildlife habitat, control certain tree diseases, improve accessibility and reduce competition, thereby stimulating the growth of crop trees. Studies indicate that properly performed burning poses no threat to water quality. However, if carelessly conducted, the entire surface litter layer can be consumed and the soil exposed.

For proper burning activities:

- When burning, use trained personnel supplied with suppression equipment.
- Burn only when weather and fuel moisture conditions allow the burning of just the top portion of the organic layer.

- Use firelines or other barriers such as roads to contain fires.
- Avoid burning erosion-prone areas.
- Maintain unburned buffer strips around drainages and adjacent to bodies of water.
- To the extent possible, avoid constructing firelines up-and-down slopes.
- Construct fire lines with water bars and other water diversion devices and seed exposed areas if natural vegetation is not adequate.

### **Chemicals**

Forest chemicals such as fertilizers, insecticides, herbicides, fungicides and fire retardants are used sparingly in East Texas. When applied as prescribed by law and in accordance with the manufacturers instructions, they do not pose a serious threat to water quality. However, if carelessly applied, they can have a dramatic impact on the aquatic environment.

Listed below are several recommendations for preventing water pollution by forest chemicals:

- Follow state and federal regulations governing the registration and use of forest chemicals.
- Use chemicals according to tested procedures and for registered purposes only.
- Follow manufacturers recommendations concerning application rates and frequencies.

- Avoid fertilization during periods of heavy rainfall.
- Use indirect controls instead of insecticides where possible.
- Use injection or stump treatment herbicide methods adjacent to streams.
- When applying chemicals, plan spray boundaries that exclude streams from treatment areas.
- Avoid application in flat, poorly drained areas.
- To prevent drift, conduct aerial spraying of chemicals only when the wind is calm.
- Use the application method that is most economical and has the greatest precision for applying chemicals to the intended target.

### **Summary**

**F**orests represent a major part of the East Texas economy. With prudent management they provide many benefits, including timber and high-quality water when recommended guidelines are followed. Voluntary adherence to the guidelines also decreases the likelihood of state regulations.

Additional information on how forest management can be coordinated with the protection of water quality is available from the Texas Agricultural Extension Service, the Texas Forest Service, various state and federal forestry agencies, the forest industry and private forestry consultants.

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