



Kentucky Forest Practice Guidelines for Water Quality Management

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Introduction and Background

Purpose

The purpose of the *Kentucky Forest Practice Guidelines for Water Quality Management* is to provide, in capsule form, the most feasible ways to manage silvicultural activities, including timber harvesting, with respect to water quality. Section 319 of the Federal Clean Water Act Amendment of 1987 requires states to develop management programs for the control of nonpoint sources of pollution from various land use activities, including silviculture. The 1997 version is the third edition of the *Forest Practice Guidelines* and establishes Best Management Practices (BMPs) for silvicultural operations, including timber harvesting, in Kentucky. BMPs, as defined by Kentucky Revised Statute 224.71, are “the most effective, practical, and economical means of reducing and preventing water pollution. BMPs establish minimum acceptable quality levels for planning, siting, designing, installing, and maintaining agriculture and silviculture facilities and operations.” The 1997 version was developed to support the planning and implementation of Silvicultural BMPs set forth by the *Kentucky Agriculture Statewide Water Quality Plan* (Kentucky Agriculture Water Quality Act [KRS 224.71]) and was revised in 2001 to reflect amendments to the Kentucky Statewide Plan.

This document is designed for technical assistance providers and planners as a technical reference in the identification, planning, and treatment of existing or potential nonpoint sources of pollution resulting from silvicultural activities. Neither the requirements of the *Agriculture Statewide Water Quality Plan* or the *Forest Practice Guidelines* is in any way intended to prevent the practice of state-of-the-art silviculture, but rather that silviculture may be practiced in such a way that it will result in the least possible negative impact upon water quality through nonpoint source pollution.

History of the *Kentucky Forest Practice Guidelines for Water Quality Management*

The *Kentucky Forest Practice Guidelines for Water Quality Management* has been revised three times since its development in 1980 by the Silviculture Nonpoint Source Task Force for Statewide Water Quality Management Planning directed by the Department for Natural Resources and Environmental Protection, Division of Water Quality in response to the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500, section 208). The Task Force was composed primarily of personnel from public forestry and natural resource agencies and private forest industries. The Kentucky Division of Forestry was responsible for chairing the Task Force and publishing the *Forest Practice Guidelines*. The second edition was prepared by the second session of the Silviculture Nonpoint Source Task Force convened in 1991-92. The 1991-92 Task Force was composed of a broader spectrum of both public agencies and private entities than the 1980 Task Force. The second edition was also compiled and printed by the Kentucky Division of Forestry. The technical specification of the third

edition of the *Forest Practice Guidelines* was completed in 1997 by the Silviculture Technical Advisory Committee of the Silviculture Subcommittee of the Kentucky Agriculture Water Quality Authority and voted on by the Silviculture Subcommittee. Table 1 provides the names and affiliations of the Silviculture Subcommittee and the Silviculture Technical Advisory Committee. The 1997 edition included a new BMP providing information for operations around sinkholes. In addition to the new BMP, revisions were also made to previous versions of the BMPs. Four of the BMPs were substantially revised, including “Access Roads, Skid Trails and Landings,” “Vegetative Establishment on Silviculturally Disturbed Areas,” “Streamside Management Zones,” and “Silviculture in Wetland Areas.”

The 1997 edition of the *Kentucky Forest Guidelines for Water Quality Management* was compiled and edited by Jeffrey W. Stringer, Assistant Professor, Department of Forestry, University of Kentucky, and Cary Perkins, Chief Forest Resource Management, Kentucky Division of Forestry, Natural Resources and Environmental Protection Cabinet. Assistance in editing was also provided by Vicki Hilpp, Continuing Education Specialist, Department of Forestry, University of Kentucky. The 1997 edition was published as a joint effort by the University of Kentucky, Department of Forestry, and the Kentucky Division of Forestry through the University of Kentucky Cooperative Extension Service.

The 2001 edition *Kentucky Forest Guidelines for Water Quality Management* was compiled and edited by Jeffrey W. Stringer, Associate Professor, Department of Forestry, University of Kentucky, and Cary Perkins, Forest Stewardship Section Supervisor, Kentucky Division of Forestry, Natural Resources and Environmental Protection Cabinet. Assistance in editing was also provided by Amy Thompson, BMP Program Coordinator, Department of Forestry, University of Kentucky. The 2001 edition was also published as a joint effort by the University of Kentucky, Department of Forestry, and the Kentucky Division of Forestry through the University of Kentucky Cooperative Extension Service. This edition of the Forest Practice Guidelines contains only limited changes and clarifications to the 1997 edition. These revisions reflect changes in the Agriculture Statewide Water Quality Plan.

Kentucky Agriculture Water Quality Act and the Kentucky Forest Practice Guidelines for Water Quality Management

1997 Edition

The 1997 edition of the *Kentucky Forest Practice Guidelines for Water Quality Management* was developed to support effective implementation of silvicultural BMPs as mandated by the Kentucky Agriculture Water Quality Act (AWQA). In 1994, the Kentucky General Assembly enacted the Kentucky Agriculture Water Quality Act (KRS 224.71-100). The act established a 15-member Agriculture Water Quality Authority representing the state’s agricultural and environmental community. The Authority developed the Kentucky Agriculture Statewide Water Quality Plan (Statewide Plan), which was an effort to produce a practical, flexible, coordinated natural resources management system that protects the waters of the Commonwealth and complied with applicable government regulations. It should be noted that the Water Quality Act or the Statewide Plan does not alter existing water quality or waterway regulations. Rather, it provides a system for development and implementation of practices to eliminate or mitigate pollution from agricultural and silvicultural operations. The act also provides a system that governs the process of addressing deficiencies in the observance of water quality or waterway regulations.

Table 1. Silviculture Subcommittee

Mark Matuszewski	Subcommittee Chair Director, Kentucky Division of Forestry	State Agency
Bob Bauer	Kentucky Forest Industries Association	Industry
Don Girton	Kentucky Woodland Owners Association	Landowner
Judith McCandless	Kentucky Conservation Committee	Environmental Organization
Pete McNeill	Private Forest Owner	Landowner
Paschal Phillips	Private Forest Owner	Landowner
Walt Rybka	Private Forest Owner	Landowner
Rep. William Scott	Private Logger and State Representative	Industry
James “Tommy” White	Chairman, Forestry Committee Farm Bureau	Producer Organization

Technical Advisors

Cary Perkins^{1,2}	AWQA Staff, Kentucky Division of Forestry	State Agency
David Brown¹	Department of Forestry, University of Kentucky	University
Gary Mullaney¹	Westvaco Corporation	Forest Industry
Jeffrey W. Stringer^{1,2}	Department of Forestry, University of Kentucky	University
Bill Bailey	Natural Resources Conservation Service	Federal Agency
Danny Barrett ¹	Corps of Engineers	Federal Agency
Robert Blevins	Department of Agronomy, University of Kentucky	University
Faith Burns	Office of Legal Services, NREPC	State Agency
George Chalfant	Daniel Boone National Forest	Federal Agency
Gary Coleman ¹	Daniel Boone National Forest	Federal Agency
Mary Lynn Collins	Legislative Research Commission	State Agency
Henry Duncan	Division of Conservation	State Agency
Lynn Garrison	Kentucky Department of Fish and Wildlife Resources	State Agency
Craig Givens	Division of Conservation	State Agency
Donald Graves	Department of Forestry, University of Kentucky	University
J.K. Henshaw	Farm Bureau Federation	Producer Organization
Morgan Jones	Kentucky Division of Water	State Agency
Curtis Kirk	Division of Conservation	State Agency
Patti Kirk	Economic Development Cabinet	State Agency
Laura Knoth	Farm Bureau Federation	Producer Organization
Larry Lowe ¹	Kentucky Division of Forestry	State Agency
Tom Marcum	Natural Resources Conservation Service	Federal Agency
Bob Marsh	University of Kentucky Cooperative Extension Service	University
Mike Mills	Kentucky Division of Water	State Agency
Bill Morris	Economic Development Cabinet	State Agency
Robert Muller	Department of Forestry, University of Kentucky	University
Ken Negray ¹	Westvaco Corporation	Forest Industry
John Perry ¹	Berea College	University
David Rome	Kentucky Division of Water	State Agency
Ann Ross	Economic Development Cabinet	State Agency
Larry R. Smith	Farm Bureau Federation	Producer Organization
Jeff Sole ¹	Kentucky Department of Fish and Wildlife Resources	State Agency
David Stipes ¹	Natural Resources Conservation Service	Federal Agency
Jon Walker ¹	Daniel Boone National Forest	Federal Agency
Benjamin Worthington	Daniel Boone National Forest	Federal Agency

Boldface type: Indicates Technical Advisor Ad hoc Committee Chairs

¹ Technical Advisor Ad hoc Committee Members

² Development, Silviculture Section Agriculture Water Quality Authority Producer Workbook

The Statewide Plan mandates that any person, who owns 10 or more contiguous acres of land in Kentucky and who uses that land for agriculture and/or silviculture, must have an individual water quality plan by October 23, 2001. The individual plan must stipulate the BMPs, as set forth by the Kentucky Agricultural Statewide Water Quality Plan, which will be used during agricultural and silvicultural operations on the property. The Statewide Plan is based on pollution prevention through the use of BMPs. These BMPs are divided into the following categories: silviculture, pesticide and fertilizer, farmstead, crops, livestock, and streams and other waters. The silvicultural portion of the plan includes ten BMPs that are to be used in silvicultural operations (including timber harvesting). To facilitate the development of the individual water quality plan, the Kentucky Agriculture Water Quality Authority developed a Producer Workbook. This workbook allows the landowner to determine which BMPs should be used by answering a set of questions for each operation. The landowner must also ensure that the plan is implemented as part of operations on the property. In effect, this mandates the use of the BMPs as defined in the Statewide Plan.

The *Kentucky Forest Practice Guidelines for Water Quality Management* contains detailed BMP information and is cited as the reference document in the silvicultural section of the Statewide Plan. In many instances, the *Forest Practice Guidelines* include tables, graphics, and detailed explanations providing specific implementation information not included in the Statewide Plan. For example, the Statewide Plan stipulates in silvicultural BMP No. 2 that silviculturally disturbed areas are to be revegetated and references BMP No. 2 in the *Forest Practice Guidelines*. BMP No. 2 in the *Forest Practice Guidelines* provides detailed information on the recommended temporary and permanent species for different sites and conditions; recommendations for the timing of seeding, mulching, fertilizing, and liming; and other information needed to facilitate the revegetation of silviculturally disturbed areas.

2001 Edition

In 1998 the Kentucky Forest Conservation Act (KRS 149.330 to 149.355) was established. A part of this legislation required that forestry best management practices be implemented on timber harvesting operations. The act also formed the Forestry Best Management Practices Board whose duties (among others) are to review and rewrite, as necessary, forestry best management practices used in timber harvesting operations. This governor-appointed board was established in 1999. The board is provided monthly status reports on the implementation of forestry best management practices as determined by the Kentucky Division of Forestry. It uses this information as well as site visits; operator, landowner, and forestry industry testimonials; and results of ongoing research to periodically review Kentucky's forestry best management practices as outlined in the *Kentucky Forest Practice Guidelines for Water Quality Management*.

Table 2. Kentucky Forestry Best Management Practices Board and Silviculture Subcommittee of the Agriculture Water Quality Authority.

Name	Representing
Jeff Stringer	UK Department of Forestry
Greg Dale	Kentucky Wood Industry
Robert Dunning	Logger In Good Standing
Jane Harrod	At-Large Woodland Owner
Oliver H. Lloyd	At-Large Woodland Owner
Walter Rybka	Farmers-At-Large
Roger Smith	Department of Agriculture
Bob Woford	Kentucky Wood Industry
Mike Lyon	At-Large Woodland Owner
Leah MacSwords	Kentucky Division of Forestry
Bob Bauer	Kentucky Wood Industry
John Bullock	Kentucky Farm Bureau Federation
Pam Wilson	Farmers-At-Large

In 2000, members of this board were also named to the Silviculture Committee of the Agriculture Water Quality Authority, and as such the board currently has responsibilities to the Kentucky Forest Conservation Act and the Kentucky Agriculture Water Quality Act. This dual appointment allows the forestry community to function efficiently within the current statutory framework, providing all those engaged in forestry operations with a consistent set of forestry best management practices. In 2001 the board submitted changes, additions, and clarifications to the Agriculture Water Quality Authority for approval and inclusion in the *Agriculture Statewide Water Quality Plan*. These changes were approved by the authority, and the 2001 version of the *Kentucky Forest Practices for Water Quality Management* reflects the forestry best management practices that are required as part of the Kentucky Forest Conservation Act to be implemented by timber harvesting operators and for landowners to include in their individual water quality plans as specified by the Kentucky Agriculture Water Quality Act.

Summary of AWQA Minimum Requirements and Recommendations

The *Kentucky Forest Practice Guidelines for Water Quality Management* contains detailed BMP information and is cited as a reference document in the silvicultural section of the Statewide Plan. In many instances, the *Forest Practice Guidelines* includes tables, graphics, and detailed explanations providing specific implementation information not included in the Statewide Plan. For example, the Statewide Plan stipulates in silvicultural BMP No. 2 that silviculturally disturbed areas are to be revegetated and references BMP No. 2 in the *Forest Practice Guidelines*. BMP No. 2 in the *Forest Practice Guidelines* provides detailed information on the recommended temporary and permanent species for different site and conditions; recommendations for the timing of seeding, mulching, fertilizing, and liming; and other information needed to facilitate the revegetation of silviculturally disturbed areas. The recommendations along with the minimum requirements were developed by the forestry BMP board and ultimately approved by the Agriculture Water Quality Authority.

Implementation of the BMPs as specified by the *Kentucky Forest Practice Guidelines for Water Quality Management* is recommended for all silvicultural operations, regardless of size, to help control nonpoint source pollution from all silvicultural operations, including timber harvesting.

Nonpoint Source Pollutants from Silvicultural Operations

Silvicultural Operations as a Contributor to Water Pollution in Kentucky

Silvicultural activities have the potential to create a number of nonpoint source pollutants. Nonpoint source pollution is defined as pollution that comes from many diffuse or scattered sources rather than from a concentrated point. When silvicultural and/or timber-harvesting operations produce nonpoint pollution, they often do so by allowing sediments or other pollutants to enter a water body at a number of different points and not at a single source.

Pollution from silvicultural operations is a concern nationwide. In Kentucky, the most prevalent forest operation is timber harvesting and is included as a silvicultural activity in Kentucky. Pollution from timber harvesting operations is most noticeable on small-order streams. These types of streams often contain shallow, riffle areas where abundant oxygen and habitats for pollutant-intolerant organisms can be found. When streams containing riffle areas maintain good water quality, they will contain a wide variety of organisms. Timber harvesting operations can negatively impact these systems by creating a number of

nonpoint source pollutants. In a study determining the source of suspended sediments in two to three small watersheds in each major physiographic region in the state, it was found that silvicultural operations accounted for approximately 2 to 25 percent of the suspended sediments found in the stream.¹ The highest values were found in the eastern coalfield physiographic region.

However, impacts of nonpoint source pollutants from silvicultural activities is minor when compared to other contributors on a statewide basis. Figure 1² shows that silvicultural activities are a relatively minor source of pollution, accounting for only 2.7 percent of the problems associated with loss of aquatic habitat or recreation use of our large watersheds.

A survey of timber harvesting operations in Kentucky³ found that 20 percent of the sites sampled either had no surface waters/drainage features (including swallets) present (6 percent) or the intensity or design of the harvesting operation was sufficient to avoid surface runoff into bodies of water or drainage features (14 percent). Active BMPs were necessary on the remaining 80 percent (Figure 2). BMPs were needed but not implemented on 34 percent of these sites. Eight percent of the sites had BMPs, that because of improper implementation did not mitigate any nonpoint source runoff. Ten percent of the sites had both properly and improperly implemented BMPs that partially mitigated nonpoint source runoff. Twenty-eight percent of the sites had BMPs that were implemented correctly and were functioning to effectively reduce nonpoint source runoff.

Figure 1. Sources of Non-Support for Recreational Use and Aquatic Habitat in Kentucky.

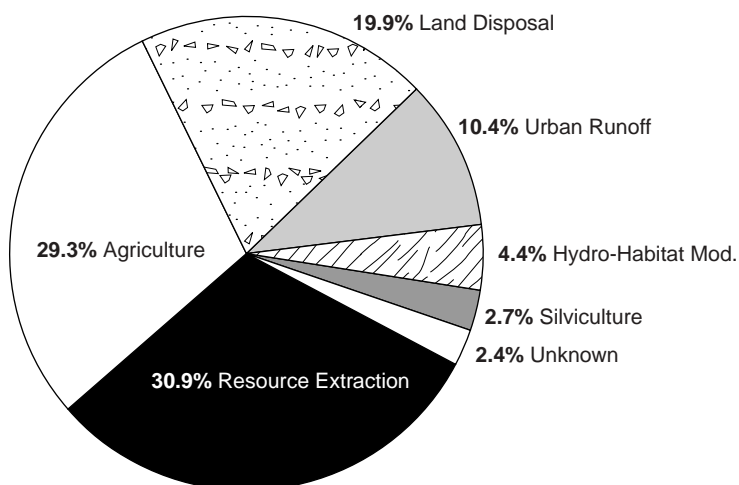
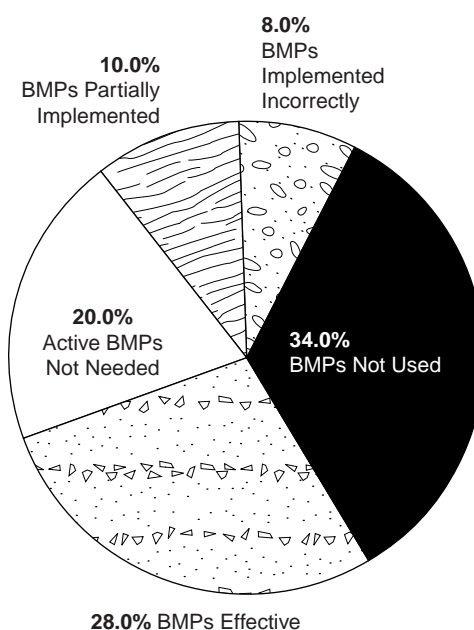


Figure 2. Timber Harvesting BMPs in Kentucky.



¹ USDA and KNREPC. 1985. Source Distribution of Sediment by First Approximation of Sediment Source (FASS) Procedure. 55 pp.

² Division of Water. 1996. Kentucky Report to Congress on Water Quality, Commonwealth of Kentucky, Natural Resources and Environmental Protection Cabinet. Frankfort, KY.

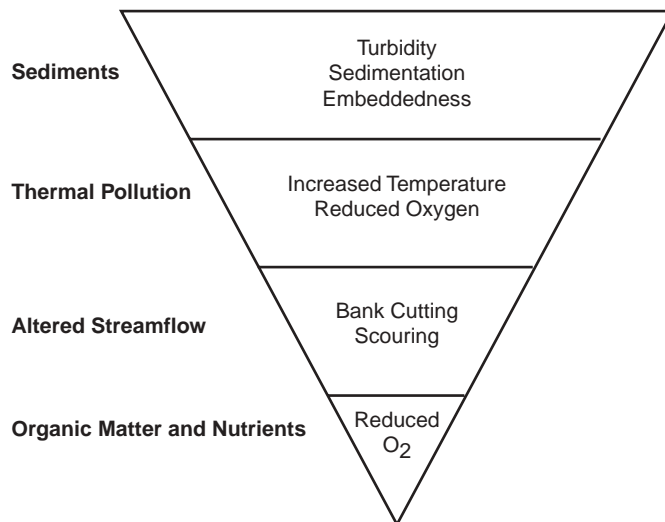
³ Stringer, J. W., and T. R. Queary. 1997. Kentucky's Timber Harvesting BMP Implementation Study. Preliminary Results. University of Kentucky, Department of Forestry. FORFS 97-4. 2 pp.

Types of Nonpoint Source Pollutants from Silvicultural Operations

Silvicultural activities can cause an increase in a number of factors that have harmful effects on aquatic habitats and decrease the ability of our streams to support aquatic communities. The following is a brief description of each of the nonpoint pollutants that can be produced by silvicultural operations. Figure 3 shows the relative importance of each of these pollutants to silvicultural operations in Kentucky.

- **Sediment:** Sediments are the most common pollutant resulting from silvicultural activities. Sediments principally result from erosion of soil, but they can also include organic matter. Excessive sediments upset balanced ecology within streams by smothering bottom-dwelling organisms in the water, interfering with photosynthesis by reducing light penetration, serving as carriers of nutrients and pesticides, inhibiting fish reproduction, eliminating benthic habitats, and altering stream flow.

Figure 3. Relative Importance of Silvicultural Nonpoint Source Pollutants.



- **Nutrients:** Nutrients, above natural levels, generally originate from the application of fertilizers. Soluble nutrients can reach surface or ground water through runoff, seepage, and percolation. Insoluble forms can be absorbed on soil particles and reach surface waters through erosion. Nutrients can also reach water by direct washoff from debris and recently applied fertilizer. Excessive nutrients lead to an imbalance in natural life cycles of water bodies. In Kentucky, silvicultural use of fertilizers is limited and generally excessive nutrients are not a primary pollutant from silvicultural activities.
- **Organic debris:** Tree limbs, tree tops, and other waste materials are the principal organic pollutants from silviculture. They may reach streams through direct pushing or felling into water drainages, or washout during storms. Organic debris can place oxygen demand on the receiving body of water during the decomposition process. Associated decomposition problems include odor, color, taste, and nutrients. In addition, large, pieces of woody debris (e.g., logs, tree tops) have the potential to cause downstream damage during flood conditions.
- **Thermal pollution:** Thermal pollution is an increase in water temperature such that some aquatic organisms can no longer survive. Removal of canopy cover along stream drainages causes water temperature to rise. Temperature increases influence dissolved oxygen concentrations, algal growth, fish populations, invertebrates, and bacteria populations in streams. The saturated dissolved oxygen concentration in streams is inversely related to temperature.
- **Streamflow:** Removal of vegetation can result in a temporary increase in streamflow by reducing evapotranspiration. The amount of streamflow increases as more vegetation is removed. Increased streamflow can result in erosion of the stream bank and scouring of the streambed.
- **Forest chemicals:** Pesticides, including herbicides, insecticides, and fungicides, are used to control forest pests and undesirable vegetation. Pesticides in surface or ground water can result in toxicity problems, affecting water quality and food sources for aquatic life. Pesticides used in connection with forestry in Kentucky are limited and not considered a problem on a statewide basis.

Outline of Kentucky's Silvicultural Best Management Practices

The Silvicultural Best Management Practices found in the *Kentucky Forest Practice Guidelines for Water Quality Management* were developed to guide silvicultural and timber harvesting operations in a manner that protects water quality. However, implementation of the *Guidelines* will also help maintain soil productivity and ecological components of riparian habitats. Each BMP section contains specific practice recommendations, as well as information on the regulatory requirements that might be mandated during the operation and the minimum requirements of the *Kentucky Agricultural Statewide Water Quality Plan*. The following is a brief description of each Silvicultural Best Management Practice.

BMP No. 1 Access Roads, Skid Trails, and Landings

General recommendations for the placement, grade, drainage, maintenance, and retirement of access roads, skid trails, and landings as part of silvicultural and timber harvesting operations are given. These recommendations were devised to minimize soil erosion and to protect nearby bodies of water from sediments. Specific information on placement relative to bodies of water and sinkholes is presented in BMP No. 3 and No. 4, respectively. Details of the revegetation component of retirement are presented in BMP No. 2.

BMP No. 2 Vegetative Establishment on Silviculturally Disturbed Areas

This BMP contains species and species mix recommendations for various soil and site conditions for the revegetation of sediment-producing, erodible, or severely eroded areas, such as access roads, skid trails, and landings. These areas have the potential to produce sediment in runoff, which can affect downstream areas. Recommended seeding dates, seeding rates, cultural practices and general fertilizer and mulching rates are also provided. These guidelines normally apply to roads, trails, and landings. Disturbed areas resulting from site preparation activities, such as shearing, raking, chopping, and prescribed burning, will be allowed to revegetate naturally or be converted directly to a forest crop. Revegetation of these areas, based on this BMP, is often not appropriate or consistent with state-of-the-art silviculture. Guidelines for site preparation, prescribed burning, and tree planting are provided in other BMPs.

BMP No. 3 Streamside Management Zones

Streamside Management Zones (SMZs) are areas adjacent to intermittent and perennial streams and other waters where only limited disturbance is desirable. To help minimize or eliminate sediment delivery to bodies of water, this BMP specifies the minimum distance, based on slope percent and water body type, between roads, trails, and landings and bodies of water. This BMP also provides information on the width of residual trees that should be maintained near bodies of water and the percent of trees that can be removed within these zones during timber harvesting operations. These latter specifications are used to maintain natural stream temperature in perennial streams through shading, to maintain the integrity of the stream bank, and to reduce the amount of sediment entering the water by minimizing soil disturbance and filtering overland flow. As a general rule these guidelines do not apply to watercourses that flow only in direct response to precipitation (ephemeral channels). BMP No. 5 “Logging Debris,” also contains information concerning streams and ephemeral channels.

BMP No. 4 Sinkholes

The purpose of this BMP is to minimize the flow of nonpoint source pollutants into sinkholes. For purposes of this BMP, sinkholes include: depressional areas with or without swallets, sinking streams, caves, karst windows, and pits or vertical shafts. Silvicultural pollutants can cause degradation to groundwater, underground drainage systems, and downstream surface waters into which the underground streams flow. Sinkholes containing open swallets are of particular concern. This BMP specifies the distance between sediment-generating structures, such as roads, skid trails, and landings, and the bottom or open swallet of a sinkhole. Information concerning felled tree density and other logging debris is also given.

BMP No. 5 Logging Debris

Logging debris consists of the noncommercial portions of trees and brush, including tops and cutoffs, or other logging operation waste products, that can clog or in some other way degrade water courses and water quality. This BMP specifies removal of debris, fill, and trash from intermittent and perennial streams and provides information for operations around ephemeral channels. It also provides guidance for equipment concerning fluid leakage.

BMP No. 6 Proper Planting of Tree Seedlings by Machine

This BMP provides recommendations for the proper planting of tree seedling stock with mechanical tree planters in order to minimize potential degradation of water quality resulting from planting slits.

BMP No. 7 Fertilization

This BMP concerns minimizing water quality degradation while artificially applying specific chemicals to the soil to favor increased growth of vegetation. General guidelines concerning application in Streamside Management Zones and in and around sinkholes are also given.

BMP No. 8 Application of Pesticides

Pesticides include insecticides, herbicides, fungicides, rodenticides, and nematocides. These chemicals are used to destroy, prevent, or control woody or herbaceous vegetation and forest pests on forested lands or areas being reforested. All forest chemicals are labeled with detailed use information, which must be strictly followed. This BMP has general information on cleanup, storage, and use of pesticides around Streamside Management Zones and in and around sinkholes.

BMP No. 9 Site Preparation for Reforestation

The purpose of this BMP is to minimize potential water quality degradation while eliminating or suppressing undesirable vegetation that would otherwise prevent the successful establishment and growth of tree seedlings through competition for sunlight, moisture, and nutrients, and to facilitate hand- or machine-planting operations. Specifications for windrowing and other site-preparation methods using heavy equipment are given.

BMP No. 10 Silviculture in Wetland Areas

Wetlands are defined as areas characterized as having hydric soils and supporting a dominance of hydrophytes (plants adapted to primarily wet conditions). Such areas are transition zones between predominately dry upland sites and permanent water in streams and lakes. The U.S. Army Corps of Engineers officially determines whether a forested area is a wetland, unless there is adjacent cropland, in which case the Natural Resources Conservation Service may make the determination. The requirements in this BMP are supplemental to other silvicultural BMPs and contain information and specifications for trafficking and timber harvesting around streams, sloughs, and other waters in a wetland.

BMP No. 11 Livestock Management

Livestock management in forested areas is often necessary to maintain enough cover to protect the soil and prevent sedimentation of nearby bodies of water; to protect, maintain, or improve the quantity and quality of the plant resources; and to maintain soil productivity and to prevent soil compaction. This BMP can be applied where desired forest reproduction, soil hydrologic values, and/or existing vegetation can be seriously damaged by livestock.

BMP No. 12 Fire Lines for Wildfire Control

A fire line is a path of varying width constructed through the litter on the forest floor down to mineral soil to restrict and control wildfire. Both hand tools and mechanized equipment can be used to construct fire lines, and this BMP contains information to minimize the sedimentation of water bodies resulting from erosion of the line after fire suppression.

BMP No. 13 Prescribed Burning

Prescribed burning involves the use of fire under conditions that will assure confinement yet produce the intensity of heat and behavior required to accomplish one or more management objectives. The purpose of this BMP is to conduct those burning practices used to modify a forest stand or to reduce forest residue to some desired level that minimizes soil erosion and protects nearby bodies of water from sedimentation. Guidelines concerning fire lane placement, drainage, and retirement are also included in this BMP.

Relationship between Silvicultural Activities, Nonpoint Pollutant, and Best Management Practices

Different silvicultural operations and suboperations have the potential to generate nonpoint source pollutants to varying degrees. Table 2 summarizes, in broad terms, the relationship between nonpoint source pollutants, their sources, and BMP measures used to mitigate pollution in streams.

Table 3. Relationship between NPS Pollutants, Their Sources, and Corrective BMP Measures

Nonpoint Source Pollutant	Primary Source	Corrective BMP Measures
Sediments:		
Turbidity Sedimentation Embeddedness	Disturbed bare ground: Roads, trails, landings Intensive site preparation Mechanical tree planting Stream Crossings	1. Proper location relative to water bodies, sinkholes, and surface channels 2. Properly drain roads, trails, and landings 3. Revegetate and retire
Thermal	Removal of streamside vegetation	1. Maintain streamside management zones
Chemicals:		
Herbicides Pesticides	Runoff from site preparation activities Plantation stand management activities	1. Apply pesticides according to label 2. Maintain streamside management zones and sinkhole protection
Organic Matter and Nutrient Overloading:		
Fertilizer Logging slash	Runoff from retired, revegetated, fertilized roads Leaching and the breakdown of vegetation	1. Maintain streamside management zones and sinkhole protection 2. Keep tops out of water bodies
Altered Streamflow:		
Diverted flow Increased flow	Large logging debris in streams	1. Keep tops and logging slash out of streams

Determining Best Management Practices for Silvicultural Operations in Kentucky

The thirteen silvicultural BMPs in Kentucky have been developed to address nonpoint source pollution concerns in operations commonly found in the state. Table 3 identifies the appropriate silvicultural BMP for mitigating a particular pollutant associated with a specific type of silviculture operation. For any particular activity, a single BMP or a combination of BMPs may be needed.

Table 4. Nonpoint Source Pollutant and Applicable Kentucky BMP

Activity	Pollutant	Applicable BMPs
Timber Harvesting	sediment	1,2,3,4
	debris	3,4,5
Road, Skid Trail, & Log Landing Construction & Management	sediment	1,2,3,4
Activity in Streamside Corridors and Around Ponds and Lakes	sediment	3,11
	water temperature	3
	debris	3,5
	pesticides*	3,8
	fertilizers	4,7
Activity near Sinkholes	animal waste	11
	sediment	4
	debris	4,5
	pesticides*	4,8
	fertilizers	4,7
Revegetation of Disturbed Areas	animal waste	11
	sediment	2
Site Preparation and Forest Regeneration	fertilizers	7
	sediment	6,9
	pesticides*	8
Forest Wetland Activity	fertilizers	7
	sediment	1,2,3,10
	pesticides*	8,10
Application of Fertilizers and/or Pesticides*	fertilizers	7,10
	pesticides*	3,7
Woodland Grazing	fertilizers	3,8
	sediment	11
Fire Lines	animal waste	11
	sediment	2, 12
Prescribed Burning	sediment	12, 13

*Pesticides include insecticides, herbicides, fungicides, rodenticides, nematocides, etc.

Evaluating Sites and Operations

The following guide¹ can be used to determine which BMPs from the *Kentucky Forest Practice Guidelines for Water Quality Management* should be implemented on silvicultural operations in Kentucky. Use one or more of the following Silvicultural BMPs if your answer is “yes”:

- As part of any timber harvesting and/or silvicultural operation, will roads, skid trails, and/or log landings be constructed, used, and/or maintained?
 Yes No If yes, use BMPs No. 1 and No. 5.
- Does the area where the silvicultural operation is to occur contain, or is it directly adjacent to, perennial or intermittent streams or other bodies of water?
 Yes No If yes, use BMPs No. 3 and No. 5.
- Does the boundary or tract where the silvicultural operation is to occur contain sinkholes?
 Yes No If yes, use BMPs No. 4 and No. 5.
- In conjunction with the silvicultural operation, are there disturbed or otherwise bare areas, such as roads, skid trails, or landings, that need to be revegetated to prevent and/or control soil erosion?
 Yes No If yes, use BMP No. 2.
- Will silvicultural activities occur in areas classified as wetlands by the Natural Resources Conservation Service (NRCS) or the U.S. Army Corps of Engineers?
 Yes No If yes, use BMP No. 10.
- Will site preparation activities occur as part of reforestation practices?
 Yes No If yes, use BMPs No. 6 and No. 9.
- Will pesticides, including herbicides, fungicides, rodenticides, insecticides, and nematocides, or fertilizers be used in connection with your silvicultural activities?
 Yes No If yes, use BMP No. 7 and/or No. 8.
- Do livestock have access to forested areas or to forested areas in streamside corridors or around lakes or ponds?
 Yes No If yes, use BMP No. 11.¹
- Have fire lines been constructed on the property for wildfire control?
 Yes No If yes, use BMP No. 12.
- Will prescribed burning activities be used to minimize wildfire potential, improve wildlife habitat, restrict undesirable plant growth, and/or prepare a seedbed favorable to natural seeding reforestation?
 Yes No If yes, use BMP No.13.

¹ This guide is similar to the silvicultural section of the *Kentucky Water Quality Authority Producer Workbook*. Note: The *Producer Workbook* refers those grazing livestock in woodlands to the “Livestock” section of the *Producer Workbook*. This guide also contains BMPs No. 11, 12, and 13, which are not included in the *Kentucky Water Quality Authority Producer Workbook*.

Planning: The Key to Proper BMP Effectiveness

Selection of the BMPs that must be used is only the first step in proper water quality management. Proper implementation is also critical to BMP effectiveness. BMP implementation begins before any silvicultural activity, by planning the layout and location of sale boundaries, streamside management zones, and access roads. Equipment type and operating systems, along with site characteristics, will influence which recommendations within each BMP will be needed. Familiarity with the operating systems and equipment limitations is critical for developing the operation so that the BMPs used will be effective. For example, the size and type of log truck and the equipment used to skid logs or trees may determine whether a stream will be crossed or the type of water control structures that will be used on access roads. The time of year also plays an important role in the selection and timing of construction of water control structures and revegetation mixes that should be used for retirement.