



Determining Best Management Practices for Timber Harvesting Operations in Kentucky: A Training Manual for Loggers

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All those involved in timber harvesting operations, including landowners and loggers, are responsible for water quality protection. One of the most effective methods of providing this protection is to use Best Management Practices (BMPs) specifically designed for timber harvesting operations. BMPs are guidelines and techniques that, when used properly, can eliminate or help reduce water pollution. Specifically, timber harvesting BMPs are designed to reduce “nonpoint source pollutants.” Timber harvesting operations can generate nonpoint source pollutants, such as muddy runoff, tree tops and debris left in streams, excessive sunlight, and vehicle fluids. Each of these can noticeably degrade water quality and affect animals and plants that live in the water.

Logger and Landowner Responsibilities for Protecting Water Quality

One of the first steps in protecting water quality during a timber harvesting operation is to select the correct BMPs for that specific operation. The selection of BMPs is based on the design of the timber harvesting operation, topography, and the type of water or drainage features present. Both loggers and landowners need to know how to determine which BMPs should be used. Most landowners in Kentucky who are conducting a timber harvesting operation on their property are required by law to have a written *Agriculture Water Quality Plan*. This plan indicates which silvicultural BMPs are to be used in timber harvesting operations on their properties. Silviculture means growing forest trees and, in this instance, includes timber harvesting operations. While landowners have the legal obligation of maintaining a written plan specifying which BMPs are to be used, loggers are responsible for implementing the BMPs. In some instances, loggers may also need to assist landowners with writing the plans.

This training manual will help loggers become familiar with “writing” *Kentucky Agricultural Water Quality Plans* and provide an opportunity to become familiar with the BMPs commonly used in timber harvesting operations in Kentucky. These timber harvesting BMPs are contained in the technical manual FOR-67, *Kentucky Forest Practices for Water Quality Management* (1997). This manual is the reference document for silviculture BMPs contained in the *State Agri-*

culture Water Quality Plan and serves as the reference document for all field guides for forestry and timber harvesting BMPs in Kentucky. See Appendix A for a general description of the BMPs.

When Is a Landowner Required To Have a Water Quality Plan?

No one is exempt from protecting the waters of the commonwealth. However, not all landowners are required to have a plan. You can use the following questions to determine if a landowner is *required* to have an *Agricultural Water Quality Plan*. It is important to remember that the term silviculture, used a number of times in agriculture water quality information, includes timber harvesting operations.

1. Does the landowner have 10 or more contiguous acres of land in Kentucky?

(**Helpful Hint:** Contiguous means all in one place. Notice that the question does not ask for the size of the operation. The size of the operation is not important; it is the size of the ownership that matters.)

- No - No plan needed. Yes - Go to 2.

2. Is the property being used for agricultural and/or silvicultural operations?

(**Helpful Hint:** For the purpose of the Agriculture Water Quality Authority, timber harvesting is included as a silvicultural operation.)

- No - No plan needed. Yes - Go to 3.

3. Does the landowner have a conservation, compliance, or forest stewardship plan for their operation?

(**Helpful Hint:** Conservation and compliance plans are written for farming operations in Kentucky and forest stewardship plans are written for the landowner by the Kentucky Division of Forestry.)

- No - You will need an AWQA plan.
 Yes - Develop an AWQA plan or update other plans to include surface water protection.

How To Use This Training Manual

This manual contains four **Timber Harvesting Exercises**, one for each region of the state. Each of these exercises includes:

- a written description of a typical timber harvesting operation for that region,
- a BMP Table for checking off which BMPs should be used in that operation, and
- a set of Logger Questions.

This manual also contains a set of **Silviculture BMP Questions** taken from the *Agriculture Water Quality Authority Producer Workbook*. These questions are used for each of the Timber Harvesting Exercises.

Use the following steps to complete the exercises:

1. Select one of the **Timber Harvesting Exercises**. While it would be a good idea to go through all the exercises, start with the one for the region you work in.
2. Read the description thoroughly. You will use this description to answer the **Silviculture BMP Questions**.
3. Turn to the **Silviculture BMP Questions** (page 3) and answer the first question. If the question is answered “no,” move to the next question. If the question is answered “yes,” you must use the BMPs that are specified.
4. To keep track of the BMPs that must be used, go to the **BMP Table** in the exercise you are working through and place a mark in the box below the BMP(s) indicated by the question.
(Example: You have read a timber harvesting description and answered “yes” to the first Silviculture BMP Question that asks, “As a part of any timber harvesting and/or silvicultural operation, will you or the logger need to construct, use, and/or maintain roads, skid trails, and/or log landings on your property? A “yes” answer indicates that BMPs No. 1 and No. 5 are needed. Go to the BMP Table in the example you are working on and place a check in the box below numbers 1 and 5.)
5. Go back to the Silviculture BMP Questions and answer the next question. Proceed until you have answered all Silviculture BMP Questions and have marked the appropriate BMPs in the BMP Table.
6. After going through all the questions, the BMPs marked in the **BMP Table** are those required for that operation. A similar type of table completed by a landowner, or a simple statement indicating that those Silvicultural BMPs will be used in their timber harvesting operations, would meet the requirements of the Agriculture Water Quality Authority.
7. **Logger Questions.** After completing the **BMP Table**, use a copy of Kentucky’s Field Guide to BMPs to answer the **Logger Questions**. These questions are not part of the *Agriculture Water Quality Plan*. However, these are the types of questions you must be able to answer to implement the BMPs properly.

Silviculture BMP Questions	4
Timber Harvesting—<i>Exercise 1</i>	5
Eastern Kentucky	
Timber Harvesting—<i>Exercise 2</i>	6
South Central Kentucky	
Timber Harvesting—<i>Exercise 3</i>	7
Western Kentucky	
Timber Harvesting—<i>Exercise 4</i>	8
Northeast Kentucky	
Appendix A. Outline of Kentucky’s Silvicultural BMPs	9
Appendix B. Answers to BMP Tables and Logger Questions	11
Appendix C. Streams and Other Waters BMPs	11

Silviculture BMP Questions

- It is important to remember that “silviculture operations” includes timber harvesting.
 - Also, remember that these questions are written for the landowner.
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Question 1.

As part of any timber harvesting and/or silvicultural operation, will you or the logger need to construct, use, and/or maintain roads, skid trails, and/or log landings on your property?

- Yes No If yes: BMPs No. 1 and No. 5

Question 2.

Does the area where the silvicultural operation is to occur contain perennial or intermittent streams, or other bodies of water?

(Helpful Hint: Perennial streams flow all year round. Intermittent streams flow only during the wet portions of the year and directly after rainfall in dry summer months.)

- Yes No If yes: BMPs No. 3 and No. 5

Question 3.

Does the boundary or tract where the silvicultural operation is to occur contain sinkholes?

- Yes No If yes: BMPs No. 4 and No. 5

Question 4.

In conjunction with your silvicultural operation, are there disturbed or otherwise bare areas (including roads, trails, and landings) that need to be revegetated to prevent and/or control soil erosion?

(Helpful Hint: Generally, the only time a road, trail, or landing would not need revegetating is when it is covered with gravel or otherwise armored.)

- Yes No If yes: BMP No. 2

Question 5.

Will you conduct any silvicultural activities in areas classified as wetlands by the Natural Resources Conservation Service (NRCS) or the U.S. Army Corps of Engineers?

(Helpful Hint: Although it is sometimes difficult for an untrained individual to determine if an area is a wetland, it would be wise to consider as a wetland any area having soils that are wet throughout most of the year, until officially told otherwise. Check with the Natural Resource Conservation Service, County Cooperative Extension Agent, or the Kentucky Division of Forestry for help in determining a wetland area.)

- Yes No If yes: BMP No. 10

Question 6.

Will you, an operator, or a vendor working for you engage in site preparation activities prior to, or as part of, reforestation practices on your property?

(Helpful Hint: Site preparation activities are forestry practices used to help establish the next crop of trees. Although loggers are concerned with future tree growth, these practices are not normally a part of timber harvesting operations and, this question is normally answered “no.”)

- Yes No If yes: BMPs No. 6 and No. 9

Question 7.

Will you, an operator, or a vendor working for you be applying pesticides, including herbicides or fertilizers, in connection with your silvicultural activities?

(Helpful Hint: Normally, timber harvesting operations do not use pesticides. However, fertilizers might be used to help ensure successful revegetation of roads, trails, or landings. If this is the case, use only BMP No. 7, which is the fertilizer BMP. BMP No. 8 is for pesticide use.)

- Yes No If yes: BMPs No. 7 and No. 8

Question 8.

Do you allow livestock to have access to your forested areas or to forested areas in streamside corridors or around lakes or ponds?

- Yes No

If “yes,” refer to the appropriate BMP in the “Livestock Section” of the *Agriculture Water Quality Authority Producer Workbook*.

Question 9.

Will low water stream crossings be constructed, or will gravel or logjams be removed from a stream?

If “yes,” refer to the “Streams and Other Waters Section” of the *Agriculture Water Quality Authority Producer Workbook* (Appendix C).

Timber Harvesting—Exercise 1

Eastern Kentucky

A timber harvesting operation is being planned along an **intermittent stream** in Perry County. A dozer will be used to open two primary skid trails, and wheeled skidders will be used to move logs from the stump to the landing. Several ephemeral channels will have to be crossed. However, there is **no sign of sinkholes or wetlands**. The land along the intermittent stream has a **35 percent slope**. The property has two access points, one next to a state highway where the intermittent stream has to be crossed, and a second on the ridge where a surface mine road is open and leads to the property.

The landowner would like to ensure that the landing and primary skid trails are well covered with **a temporary cover species and a permanent grass and legume mix**. You have agreed that you will do everything you can to get the grass growing well, including mulching with straw and **fertilizing**. The harvesting operation will be completed **outside the recommended seeding dates**. The majority of the skid trails are relatively **steep (greater than 10 percent slope) and will receive full sunlight after the harvest**. Answer the **Silviculture BMP Questions** on page 3 and fill in the table below.

Silvicultural BMPs									
1	2	3	4	5	6	7	8	9	10

Logger Questions

- How far back from the stream bank would you leave standing trees? (BMP No. 3) _____ feet
- What distance should roads, trails, and landings be from the stream bank? (BMP No. 3) _____ feet
- What are the **primary temporary species** recommended for starting the revegetation of the disturbed ground? (BMP No. 2) _____

What revegetation **Tables and Mixes** from BMP No. 2 would you use for each of the following disturbed ground areas? Specify which *permanent seeding tables* should be used and which *seeding mixes* are recommended primarily for ease of establishment and erosion management.

- Primary Skid Trails (sunny and steep)
 - Table name _____
 - Primary mixes _____
- Landings (sunny and flat)
 - Table name _____
 - Primary mixes _____
- Due to the timing of the seeding, how much more seed should you put on the areas?

- From the standpoint of water quality, what access would cause the least number of problems?

- If the intermittent stream is crossed, what type(s) of crossing are recommended? (circle one)
 - Culvert
 - Bridge
 - Loose fill and debris
 - A and B
- How would you describe the density of tree tops that can be left in the ephemeral channels? (BMP No. 1)

Timber Harvesting—Exercise 2

South Central Kentucky

A timber harvesting operation is being planned along the Barren River in Warren County, near Bowling Green. It is a large **perennial, warm water aquatic habitat**. The **land along the river is a flat, well-drained** floodplain extending 300 feet back from the river bank. **Sinkholes are present** in the timber boundary. Only one primary skid trail will be used for wheeled skidders, and it has a **slope of less than 10 percent**. The majority of the wheeled skidding will be done with secondary skid trails. The cut will be heavy, and the primary **skid trail will get direct sunlight**. However, there will be no cutting along the haul road leading to the harvest boundary, and the road will **remain in the shade**. The haul road has an **average grade of 5 percent** and can get muddy. It enters directly onto a paved state highway. Answer the **Silviculture BMP Questions** on page 3 and fill in the table below.

Silvicultural BMPs									
1	2	3	4	5	6	7	8	9	10

Logger Questions

- How far back from the stream bank would you need to leave standing trees? (BMP No. 3) _____ feet
- What percent of overstory trees should be left in the Streamside Management Zone (SMZ)? (BMP No. 3) _____ percent
- What distance should roads, trails, and landings be from the stream bank? (BMP No. 3) _____ feet
- What are the primary **temporary species** recommended for starting the revegetation of the disturbed ground? (BMP No. 2) _____

What revegetation **Tables and Mixes** from BMP No. 2 would you use for each of the following disturbed ground areas? Specify which *permanent seed tables* should be used and which *seeding mixes* would be best for ease of establishment and erosion management.

- Primary Skid Trail (sunny)
 - Table name _____
 - Primary mixes _____
- Haul Road (**The haul road is shaded—Search the tables for a mix recommended for shade.**)
 - Table name _____
 - Primary mix _____
- Should tree tops and logging debris be concentrated in sinkholes? (BMP No. 4) (circle one) Yes No
- What is the recommended distance between drainage control structures on the haul road? (BMP No. 1) _____ feet
- What reverse grade structure is recommended to retire the primary skid trails (assume that a wheeled skidder is the only equipment available for building the structures)?

10. If a bulldozer was available, what reverse grade structure should be used?

Extra Questions:

- Could mud be a problem on the highway? (circle one) Yes No
- What could be done to reduce the problem?

Timber Harvesting—Exercise 3

Western Kentucky

A timber harvesting operation is being planned for a boundary **adjacent to the Ohio River** in Henderson County. The tract is relatively flat, and approximately 35 acres of this boundary contains **soils that are wet most of the year**. A warm water **perennial stream flows through the area of wet soils** as it meanders to the Ohio River. The rest of the boundary has soils that are dry throughout the summer and fall. A natural levee is located on the bank of the Ohio River. The property is close to a pulp and paper facility, and both pulp and sawtimber sized trees will be harvested. The skid **trails will be in full sunlight** after the harvest. Answer the **Silviculture BMP Questions** on page 3 and fill in the table below.

Silvicultural BMPs									
1	2	3	4	5	6	7	8	9	10

Logger Questions

- How far back from the bank of the Ohio River would you leave standing trees? (BMP No. 3) _____ feet
- What percent of overstory trees should be left in the Streamside Management Zone (SMZ) next to the Ohio River? _____ percent
- How far should disturbed ground be kept from the bank of the Ohio River? (BMP No. 3) _____ feet?

What revegetation **Tables and Mixes** from BMP No. 2 would you use for each of the following disturbed ground areas? Specify which *permanent seeding tables* should be used and which *seeding mixes* would be best for ease of establishment and erosion management.

- Skid trails in the area with wet soil.

A. Table name _____

- Skid trails in the remainder of the areas. A. Table name _____

B. Primary mixes _____

In the area with the wet soils:

- How far back from the stream would you need to leave standing trees? (BMPs No. 3, No. 10) _____ feet
- What percent of overstory trees should be left in the SMZ? (BMPs No. 3, No. 10) _____ percent
- What distance should skid trails be from the stream bank (BMPs No. 3, No. 10)? _____ feet

Extra Questions:

- Based on the BMPs, could you use the old road on top of the levee on the bank of the Ohio River?

(circle one) Yes No

- Why might using the road on the levee be preferable to placing a new road on the floodplain?

- Should you try to construct skid trails so that they do not cross the stream? (circle one) Yes No

Timber Harvesting—Exercise 4

Northeast Kentucky

A timber harvesting operation is being planned for a 17-acre farm woodlot. A wheeled skidder will be used during the selective harvest planned for the property. The majority of the skidding will be done along two old woods roads with a maximum grade of 5 percent. The woodlot, **which is being grazed**, is on a **hillside with a 15 percent slope**. At the bottom of the hill is the **Licking River**, which has just come through the dam of Cave Run Lake. The **water is cool and can hold trout**. The timber boundary has two access points. At the top of the hill is a pasture with a farm road leading to tobacco and feed barns next to a county road. This farm road runs through an ephemeral channel that drains a 4-acre area and contains running water only after a rainfall. A second old woods road runs next to the river. Either road could carry skidders or log trucks; however, the owner is concerned about the use of the pasture as a haul road. Answer the **Silviculture BMP Questions** on page 3 and fill in the table below.

Silvicultural BMPs									
1	2	3	4	5	6	7	8	9	10

Logger Questions

1. What distance from the river bank should skid roads be kept? (BMP No. 3) _____ feet
2. How far from the river bank should standing trees be left? (BMP No. 3) _____ feet
3. What percent of the standing trees should be left in the Streamside Management Zone (SMZ)? (BMP No. 3) _____ percent
4. From a water quality standpoint, which access road would be better to use? (circle one)
 - A. woods road near river
 - B. pasture farm road
5. If the pasture road were to be used, what should be done where the road crosses the ephemeral channel? (circle one)
 - A. use a culvert
 - B. fill with dirt
 - C. do nothing
6. If a culvert were used, what would be the recommended diameter? (BMP No. 1) _____ inch(es)

Extra Question:

7. What section of the Producer Workbook should the landowner go to for grazing BMPs?
-

Appendix A. Outline of Kentucky's Silvicultural BMPs

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 BMPs 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 percentage 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.

Appendix B. Answers to BMP Tables and Logger Questions

Exercise No. 1

Silvicultural BMPs: No. 1, No. 2, No. 3, No. 5, and No. 7
Logger Questions: 1. 0 feet (it is an intermittent stream); 2. 60 feet (use the table, “Minimum Distances for Intermittent Streams...”); 3. winter wheat, grain rye, and spring oats; 4a. Mixtures for Highly Erodible Areas; 4b. mixes a and b are primary recommendations; 5a. Mixtures for Slopes Less Than 10 Percent; 5b. mixes in bold (a, b, and d) are primary recommendations; 6. 50 percent; 7. surface mine road; 8. d; 9. do not concentrate.

Exercise No. 2

Silvicultural BMPs: No. 1, No. 2, No. 3, No. 4, and No. 5
Logger Questions: 1. 25 feet; 2. 50 percent; 3. 25 feet; 4. winter wheat, grain rye, and spring oats; 5a. Mixtures for Slopes Less Than 10 Percent; 5b. mixes in bold (a, b, and d) are primary recommendations; 6a. Mixtures for Highly Erodible Areas; 6b. c: creeping red fescue mix; 7. no; 8. 300 to 500 feet; 9. skidder bar; 10. water bar; *Extra Questions:* 11. yes; 12. gravel haul road.

Exercise No. 3

Silvicultural BMPs: No. 1, No. 2, No. 3, No. 5, and No. 10
Logger Questions: 1. 25 feet; 2. 50 percent; 3. 25 feet; 4. Mixtures for Poorly Drained Areas; 5a. Mixtures for Slopes Less Than 10 Percent; 5b. mixes in bold (a, b, and d) are primary recommendations; 6. 50 feet; 7. 50 percent; 8. 50 feet; *Extra Questions:* 9. no; 10. It is high and away from drainage channels on the floodplain and in the wetlands; 11. yes.

Exercise No. 4

Silvicultural BMPs: No. 1, No. 2, No. 3, and No. 5
Logger Questions: 1. 55 feet; 2. 60 feet; 3. 75 percent; 4. b: farm pasture road; 5. a; 6. 15 inches; *Extra Question:* 7. Live-stock Section.

Appendix C. Streams and Other Waters BMPs

Details of these BMPs can be obtained from the *Kentucky Agriculture Water Quality Authority Producer Workbook*. The minimum requirements for each of the four Streams and Other Waters BMPs are as follows:

BMP #1—Stream Crossing Protection

- Construct low water crossings in a manner that does not obstruct the normal flow of the stream.
- Minimize soil erosion and removal of streamside vegetation.

BMP #2—Sand and Gravel Removal

- Minimize disturbance to streams by excavation equipment and access gravel from shore as much as possible.

BMP #3—Stream Bank and Shoreline Protection

This includes requirements for stream bank stabilization for banks that are eroding at an accelerated rate and stream crossings that might be damaged by vehicular traffic.

BMP #4—Proper Stream Drainage Maintenance

Specifies requirements for clearing logjams or sediment blockage as follows:

For projects in streams where the watershed above the work is less than one square mile (640 acres):

- Focus work only in areas where problems occur and avoid unnecessary disturbance to adjacent stream habitat.
- Minimize the removal of streamside vegetation. Remove only the necessary vegetation and operate equipment from only one side of the stream.
- Minimize straightening of stream meanders.
- When working in streams that have been channelized, consult the NRCS and the Kentucky Division of Water.
- Care should be taken to avoid impacts to wetlands adjacent to streams (see special note on Corps of Engineer notification in *Producer Workbook*).

For projects in streams where the watershed above the work is more than one square mile (640 acres), assistance must be obtained from sources such as: the U.S. Army Corps of Engineers, USDA Natural Resource Conservation Service, private consultants, etc., and the Kentucky Division of Water. The Kentucky Division of Forestry and County Extension offices can help identify the appropriate sources in your area.

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