

***TIMBER HARVEST OPERATIONS
FIELD GUIDE
FOR WATERWAYS, WETLANDS
AND EROSION CONTROL***



The Commonwealth of Pennsylvania
Department of Environmental Protection
Bureau of Watershed Management
Harrisburg, Pennsylvania



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

This publication resulted from the joint efforts of the Bucks, Cambria, Cumberland, Wayne and Westmoreland County Conservation Districts, Sustainable Forestry Initiative (SFI), Hardwood Lumber Manufacturers Association (HLMA), Pennsylvania Association of Conservation Districts (PACD), Pennsylvania Game Commission, DCNR Bureau of Forestry and DEP Bureau of Watershed Management.

This publication replaces the previous two publications entitled:

"Best Management Practices for Silvicultural Activities in Pennsylvania's Forest Wetlands", a pocket guide for foresters, loggers, and other forest land managers, prepared by the Forested Wetlands Task Force, May 1993; and

"Controlling Erosion and Sediment From Timber Harvest Operations", publication 3930-BK-DEP2322, Revised 4/2003.

Disclaimer

This Timber Harvest Operations Field Guide for Waterways, Wetlands and Erosion Control was developed as a quick reference guide and contains the most commonly used best management practices (BMPs) for silviculture activities. This field guide does not replace the rules and regulations of the Commonwealth of Pennsylvania.

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REFERENCES

I. PURPOSE

The purpose of this publication is to assist timber harvesters to prepare and implement soil erosion and sediment control plans, and to work around streams and wetlands. Experience has shown that most soil erosion problems originate with the improper layout or construction of skid trails, logging roads and landing areas. Therefore, the focus of this publication is to provide guidance and furnish specifications to properly design and implement an effective erosion and sediment control plan on a timber harvesting site.

Timber harvesting is considered an earth disturbance activity because it disturbs the forest floor and exposes soils to accelerated erosion. While the felling of trees itself does not cause problems, the activities involved in moving the product from the stump to the mill may cause erosion and sediment pollution.

When using this publication, it is important to remember that for every situation described, there may be more than one correct method to minimize erosion and prevent sediment pollution. It is recommended that the agencies establish and maintain cooperative working relationships with the timber harvesting industry in order to prevent soil erosion and protect our water resources.

II. RELEVANT RULES AND REGULATIONS

In Pennsylvania, all earth disturbance activities must be undertaken in accordance with the Department of Environmental Protection's (DEP) Chapter 102 Erosion and Sediment Control regulations adopted under the authority of the Clean Streams Law. Under these regulations, all earth moving or earth disturbance activities over 5,000 sq. ft., including timber harvesting activities, must have an Erosion and Sediment Control Plan developed, implemented and maintained to minimize accelerated erosion and resulting sedimentation to the waters of the Commonwealth. Timber harvesting operations that will disturb 25 or more acres require a permit from DEP (the earth disturbance area is the total area of haul roads, landings, and skid trails). Inquiries as to whether or not a permit is required should be addressed to the local county conservation district or DEP Regional Office.

Activities associated with timber harvesting operations are also governed by DEP's Chapter 105 Dam Safety and Waterway Management regulations adopted under the provisions of the Dam Safety and Encroachments Act and the Fish and Boat Code – Act 175. The Chapter 105 regulations govern the crossing of streams; construction of culverts, fords and bridges, and other impacts to water courses and wetlands that occur during man-made activities. Commonly used general permits are GP-7 – Minor Road Crossings and GP-8 – Temporary Road Crossings.

Questions about permit requirements should be addressed to DEP's Regional Office Permitting and Technical Services Section or a delegated county conservation district office. The Fish and Boat Code is administered by the Pennsylvania Fish and Boat Commission and regulates the impact of man-made alterations or activities on waters of the Commonwealth, and prohibits the introduction of any substance harmful to aquatic life.

III. BMPs CAN WORK FOR YOU

Use of Best Management Practices (BMPs) not only protects streams and wetlands but also benefits loggers and landowners. BMPs should be applied with judgment depending upon each situation. By using the right machinery, careful job layout, and appropriate BMPs, a substantial increase in production can occur with less labor and thus greater financial return.

Benefits of BMPs:

Limits wear and tear on machinery and equipment

- Cleaner wood; less chain sharpening and easier product preparation
- Less *down-time* because of poorly designed roads and impassable skid trails

More efficient utilization of equipment and manpower

- Less idling of the skidder - the most expensive piece of machinery
- Faster skid turn-around times
- Fewer skid trails
- Less time constructing stream crossings by using portable or re-useable bridges
- Dry upland areas of the sale should be set aside for harvesting during the wet seasons
- Efficient location and smaller landing size
- Less time required for post-harvest cleanup

Minimizes impact of timber harvesting on the environment

- Reduces soil disturbance and compaction
- Reduces erosion and sedimentation (as required by Chapter 102)
- Maintains water quality
- Improves fish and wildlife habitat

Maintains forest productivity

- Aids forest regeneration
- Protects tree growing stock for future use
- Protects biological diversity

Adherence to higher environmental standards

- Competitive advantage from higher quality operations
- Improves landowner relationship
- Better acceptance of the industry by the general public
- More interest from potential clients i.e., state foresters, industrial forest product companies and Pennsylvania's half-million private, non-industrial woodland owners

IV. SITE PLANNING

A. Soils

The importance of soil type in the harvest area is not always recognized when designing road systems. Some soils are excellent for road construction, while others quickly become impassable seas of mud.

General soil information and soil surveys are available at local conservation district offices. The soil survey contains specific information on soil types and soil features, such as drainage and suitability for road base, that may affect road location and construction.

Soil drainage is one of the most significant considerations in road construction. Soils classified as somewhat poorly drained to very poorly drained often cause problems because they may not support the weight of logging equipment during periods of soil saturation. Poorly drained and very poorly drained soils always cause problems during wet periods and could possibly be wetlands (See Table 1).

Do not interpret surface features such as stones as indicators of soil drainage. Several soil types in Pennsylvania appear from surface features to be well drained, when in fact, they are not. The extent and types of soils encountered on a logging site can be highly variable. The timber harvester must recognize the capabilities of a soil and be prepared to adjust the road design during construction to avoid problem areas, especially near streams, wetlands and flood plains.

Table 1. Descriptions and Use Limitations of Soil Drainage Classes

Drainage Class	Description	Degree of limitation*
Well Drained	Water is removed readily from the soil. Wetness does not inhibit plant growth. Commonly medium textured.	Slight
Moderately Well Drained	Water is removed slowly from the soil during some periods. Wet for only short periods during the growing season, but periodically long enough to affect most dry site plants.	Slight
Somewhat Poorly Drained	Water is removed slowly enough that soil is wet for significant periods during the growing season.	Moderate
Poorly Drained	Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water commonly at or near the surface.	Severe
Very Poorly Drained	Water is removed from soil so slowly that free water remains at or on the surface during most of the growing season. Very poorly drained soils are found in level or depressed areas and are frequently ponded.	Severe

*Slight – indicates that use of equipment is not limited to a particular kind of equipment or time of year.

Moderate – indicates a short seasonal limitation or a need for some modification in management or equipment.

Severe – indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

B. Waters of the Commonwealth

All surface waters, lakes, ponds, streams and wetlands in Pennsylvania are protected. It is illegal to damage wetlands or to allow eroded sediment to enter streams and lakes without authorization from DEP. Certain activities may require permits from DEP and all timber harvest operations require a written Erosion and Sediment Control Plan.

1. Streams and Stream Crossings

A stream is any channel having defined bed and banks, whether natural or artificial, with perennial or intermittent flow of surface water. Perennial streams normally flow throughout the year, whereas intermittent streams

normally flow in the wetter parts of the year (i.e., October through May) or after a major storm.

Stream crossings are a major concern in the construction and use of haul roads, and skid trails. The potential for sediment to enter a stream at crossing points is great.

The installation of stream crossings in drainage areas 100 acres or greater requires a permit. Permits can be obtained through an authorized county conservation district office or DEP Regional Office.

The installation of stream crossings in a drainage area 100 acres or less does not require a general permit if the crossing will not impact a wetland. (Wetland impacts require a permit.) However, even though the stream crossing may not require a general permit, it still requires federal authorization from the US Army Corps of Engineers. Obtaining this federal authorization can take many weeks.

Temporary crossings on nonpublic roads that will be used no longer than one year can be permitted through General Permit No. 8 (GP-8). This permit allows streams to be crossed using a culvert, a series of culverts, a bridge or a ford. The purpose of the permit is to facilitate completion of temporary projects, such as a timber harvest that can be completed in one year or less. Information and applications for GP-8 may be obtained from any conservation district office. There is no application fee for GP-8.

Culverts are perhaps the most common method of crossing streams. Culverts used in stream crossings should be placed in the natural drainage channel on the same grade as the streambed. The bottom of the culvert should be located below the streambed, not above it. Cover the top of the culvert with clean stone material to a minimum depth of one foot or one-half the culvert diameter, whichever is greater.

Pay attention to both stream and road alignment when selecting the site for a stream crossing. The road should cross the stream at right angles. The streambed should be straight and of uniform profile so as not to obstruct the flow of water.

Fords are sometimes used for haul road stream crossings, but they are not acceptable for skid roads or trails. When skid roads or trails must cross streams, culverts or temporary movable bridges can be used. Stream sections suitable for ford crossings must have low banks and solid streambeds. Ford crossings cannot be used in High Quality (HQ) or Exceptional Value (EV) streams. For specific design information, refer to GP-8.

2. Wetlands and Wetland Crossings

In order to avoid confusion, the term *wetlands* has been given a specific legal definition in both federal and state law. Wetlands are defined under Section 404 of the Federal Clean Water Act and Chapter 105 regulations issued pursuant to Pennsylvania's Dam Safety and Encroachments Act as:

Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas.

This means that during the growing season, a wetland is an area having **sufficient water supply**, to create **soil conditions that lack oxygen**, and to support **plant life adapted to a wet environment**.

Although "wetlands" is a collective term that includes a diverse group of wet natural environments, wetlands share three basic characteristics that make them unique components of the environment:

- **the presence of water** (hydrology) at or near the surface for a portion of the year,
- **plants that are adapted to wet conditions** (hydrophytic vegetation), and
- **soils that result from wet conditions** (hydric soils).

These three characteristics are interrelated, and, while normally found together, the presence of only one of these is usually sufficient to identify a wetland for planning purposes. **Of the three, the presence of water is the driving force that creates and maintains wetlands, and the types of plants and soils reflect that presence.**

3. Wetland Indicators

Standing water is the most obvious sign of a wetland, but many wetland types are dry at the surface during periods of the year. When water is not present or signs of water are not obvious, the examination of either the vegetation or soils or a combination of both can generally provide a good indication of whether a site is a wetland. Plant and soil characteristics can be used to indicate a wetland site.

First look closely at the **types of plants** growing in the immediate area of interest. **Are they wetland-associated species?** A plant community dominated by these species is a wetland.

Common Wetland Indicator Plants *

Trees

- willows
- silver maple
- box elder
- black or green ash
- sycamore

Shrubs

- high-bush blueberry
- bush-type dogwoods
- alders
- button bush
- spicebush

Herbs

- cattails
- sedges
- iris
- arrowheads
- joe pyeweed
- jewelweed
- rushes
- sensitive fern
- skunk cabbage

* See Appendix B for a more comprehensive list

If wetland plants are not present, **examine the soil characteristics**. Soils high in organic matter, soils classified as poorly drained, and soils that are streaked or mottled within 18 inches of the surface reflect long-term wetness at or near the surface.

The **boundary of a wetland** can be established approximately at the point at which none of these plant and soil indicators are found.

4. Wetland Soil Indicators

On the surface (one or more may be present):

- dark brown layer of organic matter over 2 inches thick
- sphagnum moss covering the site
- composed primarily of peat

6-18 inches below the surface (one or more may be present):

- gray, gray-blue or gray-green appearance
- spots, streaks or lines (mottles) of a different color
- presence of water
- a smell of rotten eggs (indicating sulfur)

5. Permits

There are three levels of permitting provided by Chapter 105: waiver of permit requirements, general permit coverage, and issuance of a Chapter 105 Water Obstruction and Encroachment Permit. Certain activities associated with timber harvest operations may qualify for a permit waiver, general permit or require a Water Obstruction and Encroachment Permit. The requirement to obtain a permit is waived for activities in streams and floodways with a drainage area of less than 100 acres. There is NO waiver of permit requirements for activities conducted in wetlands. The following is a partial list of activities that require permits from DEP:

- Permits are required for deposition of solid fill, gravel, soil, slate and other such material in wetlands, streams and floodways for the construction of temporary and permanent roads. Fill material may be required to be “clean” or washed stone or gravel depending upon permit conditions.
- Permits are required for construction, operation, maintenance and modification, enlargement or abandonment of any dam, water obstruction or encroachment (i.e. culverts, fills, ditching).
- Permits are required to clear and grub, dig ditches and conduct other similar activities in wetlands.
- Permits are required for constructing roads over streams and wetlands.
- Permits are required to deposit fill for skid trails over streams, watercourses, floodways and wetlands.

These activities do not require permits:

- Permits are not required to cut timber and other vegetation, including cutting in wetlands.
- Permits are not required to place support mats, corduroy and other temporary fabricated roads in wetlands for use as skid trails provided they are removed at the end of operation. This does not include the placement of fill material in the wetland or on the mat surface.

a. Waiver of Permit Requirements

There are 16 waivers contained in Chapter 105. The waiver that would most often apply to forestry practices is found at 105.12(a)(2). Permits are waived for “water obstructions” in streams and floodways with drainage areas of less than 100 acres. This waiver does not apply to wetlands, which are often located in the floodways adjacent to these headwater streams. The term “water obstruction” refers to structures

such as culverts, bridges, dikes, etc. Some waivers, numbers 1, 2 and 14 for example, may require a federal Section 404 permit to conduct these activities. The appropriate U.S. Army Corps of Engineers (USACOE) District should be contacted to find out if a federal permit is required.

b. General Permits

The DEP has developed various general permits to cover certain types of activities that present no danger to public health and safety and do not pose a serious threat to the environment. Each general permit contains specific conditions i.e., size of structures, drainage areas, time of year restrictions for wild and stocked trout waters, and species of special concern, that must be followed by the applicant. The general permits most often used in timber harvesting activities include GP-7 for Minor Road Crossings and GP-8 for Temporary Road Crossings and are briefly explained in the text box. Updated versions of the general permits can be obtained through DEP offices (see Appendix D, Contact Directory, for addresses of DEP field offices), conservation district offices and via the Web at (www.depweb.state.pa.us, Keyword: "General Permits"). At the time of general permit registration, the registrant will be informed of any additional requirements necessary to obtain a federal Section 404 permit. Currently, all general permit registrations, except GP-3 (gravel bar removal portion) and GP-15 (Private Residential Construction in Wetlands), are not forwarded to the USACOE for review. The federal Section 404 authorization will be attached to your state general permit registration acknowledgment.

General Permits for Forestry Operations

GP-7 – Minor Road Crossings

Key Conditions: Single impacts to wetlands and small streams may not exceed 0.10 acres; total wetland impacts for all minor road crossings on an individual project may not cumulatively exceed 0.25 acres; roads are limited to 100 ft. in length; wetland replacement is required.

GP-8 – Temporary Road Crossings

Key Conditions: Can be used when wetland impact is less than 200 feet in length; requires the use of clean/washed rock or gravel as fill; valid 12 months from date of acknowledgement; can be extended by DEP at the request of the permit user; wetland replacement is not required, but restoration of the site including wetlands is required after use.

c. Water Obstruction and Encroachment Permit

Activities that do not qualify for a permit waiver or a general permit must obtain a Water Obstruction and Encroachment Permit from DEP. The application for such a permit may result in one of the two application processes outlined below. Both forms of the application serve as a joint application for the Chapter 105 Water Obstruction and Encroachment Permit and when applicable, the federal Section 404 permit issued by the USACOE. After an application is filed, DEP will inform the applicant of any additional requirements necessary to obtain a federal Section 404 permit. Currently, most activities qualify for inclusion and are not forwarded to the USACOE for independent review. In this case the federal Section 404 authorization would be attached to your Chapter 105 Water Obstruction and Encroachment Permit upon issuance. Should a separate federal review be required, you will be informed concerning the additional processing and information required for the separate federal review and/or issuance of a federal Section 404 permit.

i. Small Project Application

Small project applications are available for activities in small watercourses and floodways that are not appropriate for a general permit and do not impact wetlands. Typically, small project applications are generally processed for the removal, installation, maintenance or abandonment of bridges, culverts and other minor types of crossings such as fords and activities in Exceptional Value (EV) and High Quality (HQ) streams and floodways that are not covered by a waiver or general permit. The small project application is a subset of the application package required for the joint permit application.

ii. Joint Permit Application

Joint permit applications are used for all other regulated activities that are not authorized by waivers, general permits and small project applications.

Chapter 105 permits, including general permits, are issued with the provision that adequate erosion and sedimentation (E&S) control measures will be implemented by the permittee. It is imperative that operators always implement and maintain adequate E&S controls for all facilities and comply with Chapter 102 of DEP's regulations.

C. Haul Roads

Every haul road system should be planned and developed as if it will be a permanent road. Many haul roads initially considered to be temporary, are often used again and again. Therefore, the entire haul road system should be designed before any haul road construction begins. This

process may seem to take more time, but the haul road system will be more efficient, less costly and easier to maintain.

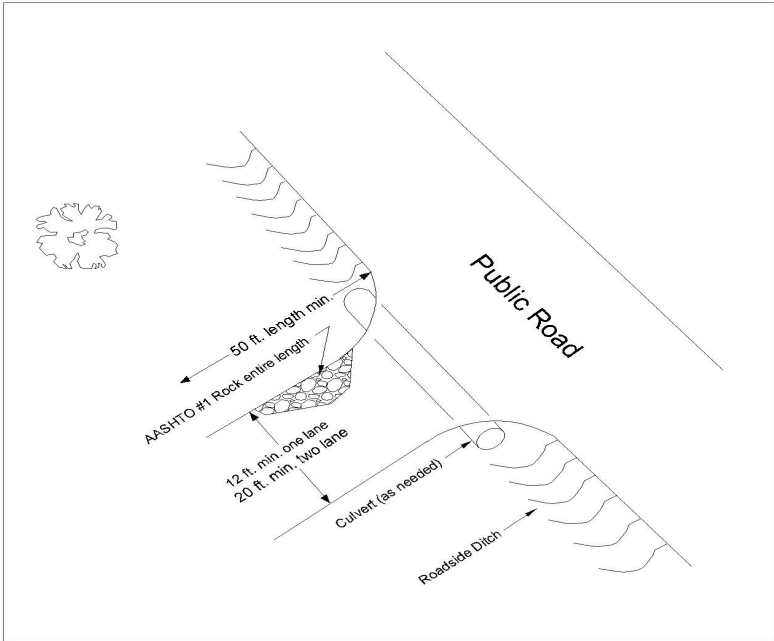
Consider the following points when building a haul road system:

- **Terminal points** – Locate the beginning and end of the road system using the best access from public roads. Locate landings away from streams and wet areas.
- **Grades** – Roads with a maximum slope of 10 percent and a minimum of 2 percent are usually the easiest to maintain. Where absolutely necessary, grades exceeding 10 percent can be used for short distances.
- **Topography** – Roads on moderate side hills are easiest to build and drain.
- **Obstacles** – Design the road system to go around springs, seeps, wetlands, poor drainage areas, ledges and rocky areas.
- **Soils** – Be aware of soil texture, drainage class and slope position. Some soils are poorly drained or seasonally wet and are difficult to log.
- **Distances from streams** – Vegetated buffer areas and filter strips can provide effective E&S Control. Maintain a minimum buffer distance of 50 feet from streams and wetlands. This distance should increase about two feet for each percent increase in slope. Double the total calculated buffer distance if logging around High Quality or Exceptional Value waters.
- **Stream crossings** – Cross at a 90-degree angle and approach the stream from as gentle a slope as possible. Keep the number of crossings to a minimum and consider them temporary.
- **Old roads** – It is often possible to use existing roads and thereby lessen soil disturbance. To avoid problems, carefully evaluate the road's suitability for upgrading.
- **Size and duration** of the sale and the anticipated season of harvest.
- **Water control structures** – Carefully plan the use of broad-based dips, water bars, culverts, ditches and barriers.
- **Flood Plains and Wetlands** – Identify their location and the potential for impact. Avoid flood plains and wetlands if possible.

When properly located, constructed and maintained, haul roads will have a minimal impact on water quality, hydrology, erosion, wildlife and fish habitat. Particular care should be exercised in avoiding permanent changes in water levels and drainage patterns.

- Avoid wetlands and stream crossings through known rare, threatened and endangered species habitat, and through headwaters of public water supplies.
- Avoid road construction through wild trout streams during spawning season.
- Avoid road construction during wet periods.
- Minimize rutting through the proper construction and frequent maintenance of roads. This should include road crowning, in-sloping or out-sloping as necessary and avoidance of road use during spring thaw or wet periods.
- Minimize road width to the size necessary to carry traffic, typically 12 feet wide.
- Consider use of fabric mats or pads under fill to minimize disturbance and facilitate removal of temporary roads.

Figure 1. Road Entrance



D. Skid Trails

The primary difference between a skid road and a skid trail is the degree of preparation for use. Main skid roads should be flagged, cleared and graded. Skid trails, which are used for transporting logs from stump to main skid road, are usually not graded and need only minimal clearing. In developing a skid road and trail system, pay special attention to proper drainage and soil stabilization, and be sure to consider the following points:

- Locate landings in relation to the main haul road. Then lay out the skid road and trail approaches on a low grade to the landings.
- Keep grades as low as the topography will permit. Do not go straight up the slope; proceed across the hill as much as possible.
- Avoid streambeds, rocky places and steep grades.
- Construct bridges or install culverts at stream crossings.
- If trails must go straight up and down hills, give extra consideration to waterbars.
- Never skid through or across stream channels, spring seeps or temporary ponds.
- Avoid equipment entry into small wetlands.
- In large wetlands requiring entry by skidding equipment, schedule the harvest during the drier seasons of the year or during time when the ground is frozen. Skidding should cease if excessive rutting occurs.
- Skidding should be confined to a few primary trails regardless of season to minimize the area affected.
- Concentrate skidding in defined corridors and use cable skidding when possible. Minimize skid trails by maximizing winch and choker cable lengths.
- Avoid grapple skidders unless the material is gathered by a swinging head feller-buncher located outside of the wetland.
- Use low ground pressure equipment when possible, and in wettest areas consider using tracked vehicles. Use brush or corduroy to minimize soil compaction and rutting when skidding in wet areas.
- Reduce skid volumes when skidding through wetland areas.

E. Log Landings

Few erosion problems are associated with a properly located landing. Problems will occur when water control is not considered in selecting a location. Allow adequate filter strips between the landing and streams. (Use the recommendations in Table 5 to determine filter strip width.)

A common error is to place landings at the end of a long, downhill skid road or trail with no provision for turning water off the skid road or trail above and away from the landing. This error allows the road drainage water to accumulate in one area, often causing muddy conditions. Always take care to locate landings away from low or wet areas and lay out roads so that road drainage does not accumulate or concentrate on landings.

Disturb only the area needed for actual operations. If the topography warrants, use a diversion ditch above the landing to keep upslope surface water and subsurface water from flowing onto the landing. The ditch in Figure 2 should be adequate to handle normal storm runoff from the upland watershed.

Heavy equipment quickly compacts soils on landings, preventing water from penetrating the soils. For such compacted soils, slope the landing to direct the surface water and seep flow to a sedimentation filter area before the water is discharged from the site.

Proper water control measures, location, and size of landings will limit soil erosion and compaction that can occur from concentrated heavy equipment use.

- Avoid locating landings in wetlands.
- If no other locations are practical, place landings on the highest ground possible within the wetland.
- Keep landings to a minimum size and number.
- Use proper erosion and sediment control standards.
- Avoid spills of oil and other hazardous material and store operating supplies of such materials away from wetlands.
- Consider use of fabric mats and pads at landing sites to minimize soil erosion and compaction.
- Place landings as far from streams and wetlands as possible. Landings within 50 ft. of a stream require permitting action by DEP.
- Remove temporary fill or pads used for landings located in wetlands upon completion of the operation.

V. SITE MANAGEMENT

A. Recommended BMPs

Haul roads, skid trails and landing areas, have the potential to affect water quality and hydrology. Extra care must be taken when carrying out these forestry operations. Harvesting should be done with regard to season, soil type, soil moisture, and type of equipment used. Good planning and supervision will protect site integrity and enhance regeneration. Careful implementation of BMPs will protect and enhance important wetland functions while allowing cost-effective timber harvesting.

1. Cross-Drains and Culverts

Four types of culverts are commonly used in Pennsylvania:

Open-top box culverts and **open-top pole** culverts – Usually installed on new roads after logging and on old roads that need culverts. Continuous maintenance is required to keep the culvert free of obstructions such as leaves, rocks and soil.

Box culvert – An alternative to more expensive pipe culverts. These culverts are not as durable and do not self-clean as easily as pipe culverts.

Pipe culverts – Usually installed on permanent roads at the time of construction. Pipe culverts are commonly used where vehicle traffic will be relatively heavy after logging activities. These structures are the most expensive type of cross-drain, but they are very effective in controlling water. In some areas, steel well casing, PVC or corrugated metal pipe have proven to be cost-effective alternatives.

Table 2 shows suggested spacing for culverts used to drain roadside ditches that collect water from in-sloping roads or from seeps. These culverts should be placed with a slope of 2 to 4 percent. Culverts used as cross-drains should be placed across the road on a 30 degree down slope angle. Both of these measures will help keep the culvert clean and ensure water flow. The recommended minimum size for a culvert is 12 inches.

Table 2. Cross-Ditches Minimum of 12-inch culvert

Road grade (% slope)	Spacing (feet)
2	500
3	400
4	350
5-6	300
7-8	250
9-11	200
12-13	150
14+	100

Culverts should be long enough to extend at least one foot beyond the fill bank. The soil below the outlet should be protected with stone riprap or similar material to dissipate the impact of the falling water. Construct a “headwall” around the inlet of culverts to help prevent crushing.

In bringing a culvert up to grade, avoid filling under it. Instead, set the culvert on firm ground and compact the earth at least halfway up the side of the pipe to provide adequate support and to prevent water from leaking around it. Cover with a minimum fill of one foot or half the culvert diameter, whichever is greater (Figures 2 and 3). Deeper cover gives added protection.

Figure 2. Culvert Cross Section

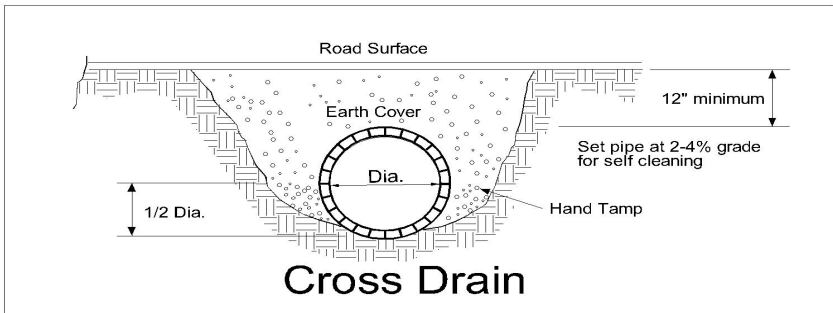
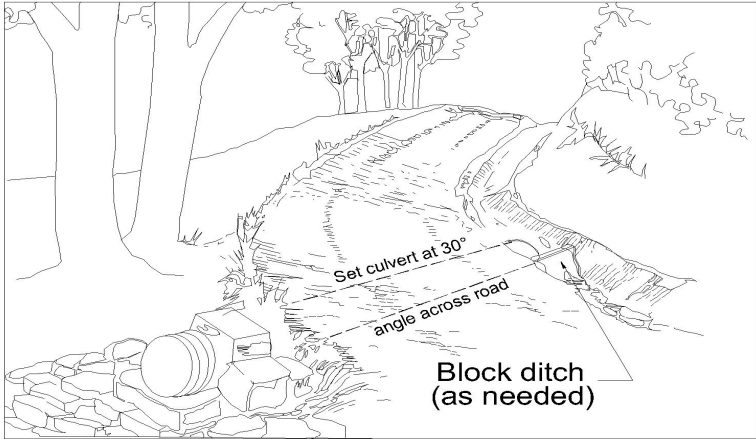


Figure 3. Culvert



2. Broad-Based Dips

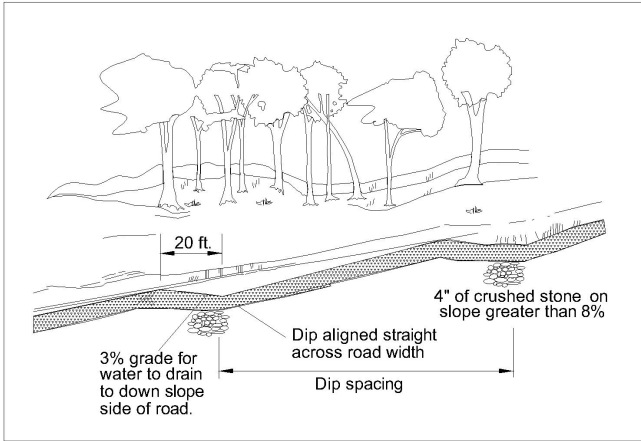
Broad-based dips, installed after the basic roadbed is constructed, can be used instead of culverts for cross-drainage where no intermittent or perennial streams are present. They can be used effectively on both skid roads and truck roads where road grades do not exceed 10 percent.

The dip should be at least 20 feet long and should be spaced as indicated in Table 3. The bottom of the dip should be aligned straight across the road rather than sloped 30 degrees downhill, and the dip should be out-sloped to ensure drainage. Stoning the bottom of the dip with three-inch diameter crushed stone applied to a depth of four inches works well. The outlet should be protected with stone riprap or similar material to dissipate the impact of falling water.

Table 3. Broad-Based Dip Spacing

Road grade (%)	Spacing (feet)
2	300
3	250
4	200
5	180
6	170
7	160
8	150
9-10	140

Figure 4. Broad-Based Dip



3. Waterbars or "Thank-you-ma'ams"

Waterbars (Figures 5 and 6) are used on skid trails where the water volume or velocity is great enough to cause erosion. These waterbars and their outlets need to be maintained throughout the harvesting operation. Use deeper waterbars for skid trails constantly being disturbed. When the harvesting is completed, all the waterbars and their outlets need to be reestablished. Refer to Table 4 for suggested waterbar spacing.

Figure 5. Waterbar

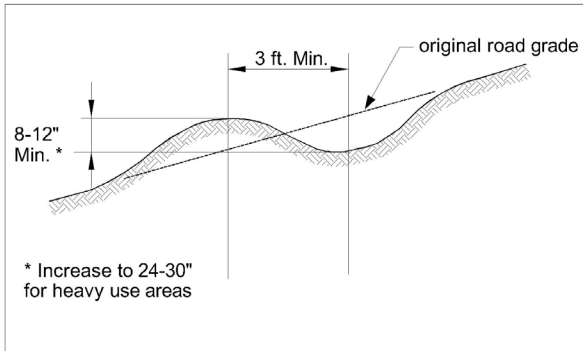


Figure 6. Waterbar

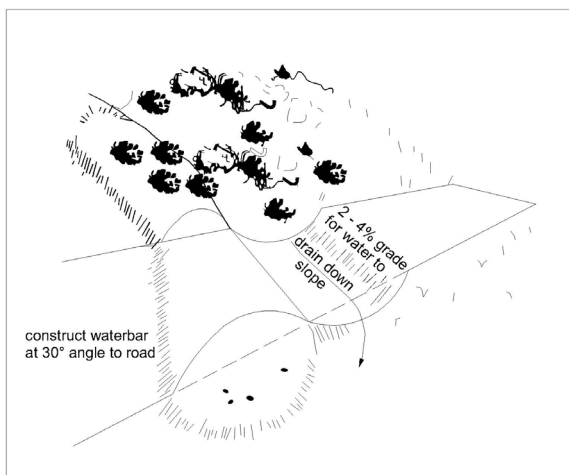


Table 4. Waterbar Spacing for Skid Trails

Grade of road (%)	Waterbar spacing (feet)
2	250
5	135
10	80
15	60
20	45
25	40
30	35
40	30

4. Buffer Zones

Allow for an adequate buffer zone (Figure 7) where roads, skid trails, or log landings will be located near streams or wetlands. The width of the buffer zone depends on the slope between the forestry activity and the stream/wetland. Use Table 5 to determine the required widths. Keep soil disturbance in the buffer zone to a minimum. When an area of soil is exposed and is likely to cause sedimentation, additional measures may be necessary. Suitable measures may include straw bale barriers, seeding and mulch and or filter fabric fences.

Figure 7. Buffer Zone

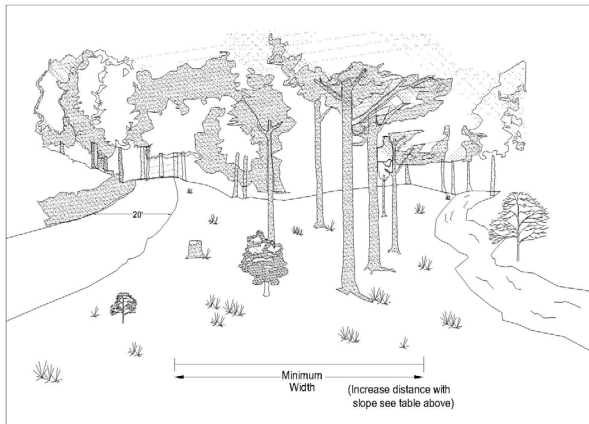


Table 5. Buffer Zone Widths by Slope of Land Between Roads and Perennial Streams

Slope of land between road and stream (%)	Minimum width of buffer zone (feet)*
0	25‡
10	45‡
20	65
30	85
40	105
50	125
60	145
70	165

* Widths should be doubled when the harvesting activity is located on municipal water supplies or where receiving waters have a designated use/existing use of High Quality or Exceptional Value.

‡ Earth disturbances within 50 feet from a stream require a Water Obstruction and Encroachment Permit from the DEP Regional Office.

Buffer zones are land areas adjacent to both flowing and nonflowing water bodies where specific management strategies should be applied. Buffer zones protect wetlands, streams, lakes and ponds by helping to:

- **protect water quality** by filtering sediments and other pollutants from surface runoff;
- **maintain proper water temperatures and degree of shading** for both aquatic plant and animal life; and
- **help retain sources of food and cover for wildlife species** that use forested wetlands.

The preferred width of the zone is variable depending on the soil type, slope, vegetative cover, and stream character. A buffer zone that is too narrow can be as ineffective as no buffer zone at all. Table 5 can be used to determine minimum buffer zone width. Using adequate buffer zones will help protect water resources and forest productivity, and maintain a variety of wildlife habitats. Special management practices should be applied when conducting silvicultural activities inside buffer zones.

- Buffer zone width should be at least 25 ft. or as described in Table 5.
- Fell trees away from ponds, streams, wetlands, flood plains and spring seeps.
- Remove tree tops from streams, wetlands, ponds, flood plains and spring seeps.
- Do not harvest trees within 10 ft. of spring seeps, streams or pond banks.
- Do not skid through ponds, streams, wetlands or spring seeps.
- Avoid disturbing the soil around these areas to minimize sedimentation and disturbance of leaf litter.
- Harvest when soil is frozen or dry to minimize rutting and disturbance of leaf litter.
- When possible, winch logs out of buffer zones rather than entering the buffer with equipment.
- Forest floor disturbance with equipment should be kept to a minimum.
- Roads and trails should be located outside of the buffer zone except where stream crossing is necessary.
- Maintain at least 50% crown cover as a residual stand to prevent an increase in water and ground surface temperature.

5. Silt Fence

When sediment is being moved by water, it is important to slow the velocity of the water so that the sediment can be deposited before it reaches any stream. This is the function of filter strips and of stone riprap, brush, filter fabric and straw bale barriers (see Figures 8 and 9).

Figure 8. Silt Fence

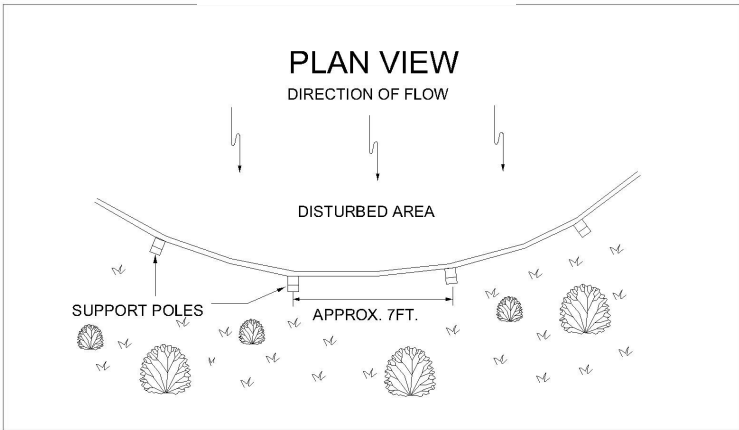
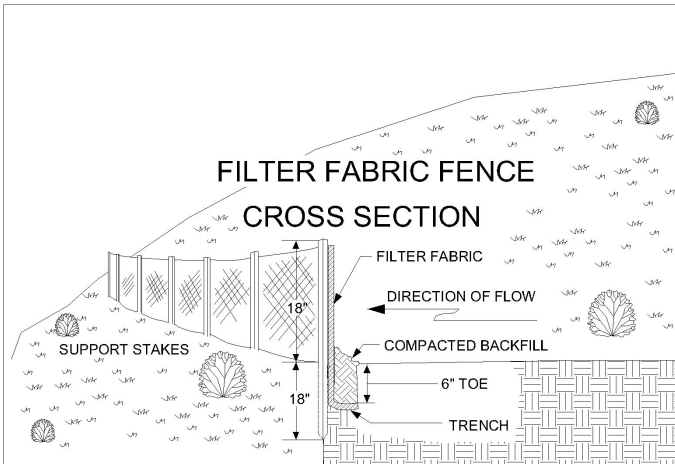


Figure 9. Silt Fence



B. Site Maintenance

Controlling erosion on logging road systems is a water control problem. The first requirement is to build a functional drainage system of culverts, dips, bridges, turnouts, and out-sloping or in-sloping roads to carry water away. After that, the road must be kept reasonably free of ruts, curbs and logging debris that may prevent water from moving freely into drainage structures. But the basic principal is to get the water off the road as soon as possible.

The need for maintenance may be reduced if the haul roads are allowed to settle a few months between construction and use, and if overhanging trees are removed to enable sunlight and wind to dry the haul roads.

Inspect drainage structures frequently. Immediately make necessary repairs and clear any obstruction.

Grade occasionally with a motor grader, bulldozer or road drag to maintain haul road surfaces. Proper grading will reshape dips, improve and reestablish side ditches and remove ruts from the haul road surface.

Reducing or eliminating traffic on haul roads, skid trails and landings during unfavorable weather is important. Controlling erosion on unsurfaced roads is impossible if the roads are used during excessively wet weather. The most likely time for excessive road damage is when a frozen road surface thaws. Suspending or minimizing hauling operations during this period helps to avoid severe damage to the road surface.

A durable gate to control access is one of the most important structures for protecting a haul road system.

VI. SITE RETIREMENT

Haul Road and Log Landing Retirement

The erosion and sediment pollution control plan should show how to retire haul roads, skid roads, and landings. Follow these guidelines to retire a system:

- Smooth and shape all road and landing surfaces so that water drains properly.
- Remove culverts and replace them with waterbars, broad-based dips or ditches. If culverts are covered by more than two feet of fill, leaving them in place is often better and less costly than removing them. Properly size any culverts left in place and make provisions for their continued maintenance.
- Remove all temporary stream crossings installed in accordance with General Permit No. 8.
- Seed, mulch, lime and fertilize critical areas where significant potential exists for erosion and sediment to be deposited in a stream or off the property. Protect areas where erodible soils or slippage threaten roads, road banks, or ditches. Table 6 contains seeding mixtures and rates of application for use under various conditions.
- Consider employing alternative methods of soil stabilization such as brush mulching, stone surfacing or waterbars.

Where seeding is planned, a soil test should be done to determine fertilization and liming rates. If a soil test has not been taken, apply one ton of lime and 300 lbs. of 10-10-10 fertilizer per acre to critical area. Work lime and fertilizer into the soil wherever possible. Prepare the seedbed by scarifying the area. Use hay or straw mulch at a rate of 2.5 to 3.0 tons per acre (a layer ¾" to 1").

Native plants soon re-establish newly disturbed areas so seeding is often only necessary in areas of severe erosion risk. These areas include approaches to stream crossings and skid and haul roads whose slope exceeds the BMP, or areas with less slope on highly erodible soils.

For further recommendations on liming, fertilization and seeding, refer to the most recent Penn State Agronomy Guide, available from your county Penn State University Cooperative Extension Office.

Table 6. Suggested Seeding Mixes for Landings, Haul Roads and Skid Trails

Seeding Mix	Seeding rate (pounds/acre)
Birdsfoot trefoil	8
Redtop	3
Creeping red fescue*	30
Perennial ryegrass	10
Annual Ryegrass	10
Redtop	10
Birdsfoot trefoil	5
Birdsfoot trefoil	8
Timothy	4
White clover	1
Kentucky bluegrass	6
Timothy	2

*Recommended for somewhat poorly and poorly drained soils in partial shade to full sunlight.

VII. RECOMMENDED BEST MANAGEMENT PRACTICES FOR WETLANDS

A. Appropriate Silvicultural Practices Can Be Used In Forested Wetlands

Access systems, which include haul roads, skid trails and landing areas, can affect water quality and hydrology. Extra care must be taken when carrying out forestry operations in wetlands because of their vulnerability to soil compaction, accelerated erosion, reduced site productivity, habitat destruction and disturbance of their water systems. Harvesting should be done with regard to season, soil type, soil moisture, and type of

equipment used. Good planning and supervision will protect site integrity and enhance regeneration. Careful implementation of BMPs will protect and enhance important wetland functions while allowing cost-effective timber harvesting.

B. Relationship to Erosion and Sediment (E&S) Requirements

Wetlands are considered waters of the Commonwealth. Although activities that change the hydrology of a wetland are regulated by Chapter 105, the potential for sediment pollution to wetlands must be minimized as required by Chapter 102.

C. Relationship of BMPs to Wetland Regulations

The following recommended forest practices are consistent with the existing silvicultural exemptions contained in Section 404 (t) of the Clean Water Act. In addition, timber harvesting operators should meet many of the requirements of DEP's general permits for road crossings in wetlands by following these BMPs.

D. Other Recommended Practices

1. Haul Roads

When properly located, constructed and maintained, roads will have limited impact on water quality, hydrology, erosion, and wildlife and fish habitat. Particular care should be exercised to avoid making permanent changes in water levels and drainage patterns.

- Avoid wetlands and stream crossings through areas known to provide habitat for rare, threatened and endangered species, and avoid crossing through headwaters of public water supplies.
- Avoid building crossings over wild trout streams during spawning season.
- Allow roads time to settle between construction and use.
- Avoid road construction during wet periods.
- Minimize rutting through proper construction and frequent maintenance of roads. This should include road crowning, insloping or outsloping as necessary and avoidance of road use during spring thaw or wet periods.
- Minimize road width to the size necessary to carry traffic, typically 12 feet wide.
- Consider use of fabric mats or pads under fill to minimize disturbance to wetlands and facilitate removal of temporary roads.
- Construct haul road entrances to prevent mud on truck tires from getting on paved road surfaces (see Figure 1 on page 12).

**THESE BMPs ARE
KEY CONDITIONS OF DEP BDWM-GP-7**

Minor Road Crossings

- **Avoid crossing wetlands if an alternate location is possible. If the crossing cannot be avoided, locate the crossing at the minimum point of disturbance, usually at the narrowest practicable point of the wetland, and do not allow the crossing to exceed 100 feet in length and/or 0.10 acre of disturbance.**
- **The total combined wetland impacts for all minor road crossings on any ownership should not exceed 0.25 acres.**
- **Wetlands impacted through use of a minor road crossing permit must be replaced. The replacement should be adjacent to or in the immediate proximity of the minor road crossing and at a ratio of 1:1 for area, function and value.**

General Permits 7 and 8 have specific requirements that must be followed by the applicant (size of structures, drainage areas, trout waters, species of concern, etc.). Complete listings of conditions and updated versions of general permits can be obtained through DEP Regional Offices.

**THESE BMPs ARE
KEY CONDITIONS OF DEP BDWM-GP-8**

Temporary Road Crossings

- **Roads should cross all watercourses at a right angle to the stream or wetland.**
- **If the streambed at the site of a ford does not have a rock bottom, provide a layer of clean rock, taking care not to obstruct the stream flow. (Note: Fords cannot be used for skidding.)**
- **Maintain all stream approaches in a firm and stable condition. Stream crossing approaches should not exceed 10% slope within 50 feet of the crossing.**
- **Culverts should provide a waterway area sufficient to adequately discharge the normal flow of the watercourse or stream, and should be of sufficient length to extend beyond the toe of the clean rock fill. Refer to Section V of this handbook for recommended culvert sizes and placement.**
- **Stabilize the site of a wetlands crossing by any appropriate means, including but not limited to using removable, temporary mats, pads or other similar devices to insure minimization of impact on the wetland's ecology.**
- **Crossings of wetlands should be avoided if an alternate location is possible. If this cannot be avoided, the crossing is permissible if it is located at the narrowest practicable point of the wetland and the length of the crossing within the wetland is less than 200 feet.**
- **Restoration of the site including wetlands is required after use.**

2. Felling

Proper precautions should be taken when logging near a **wetland** or stream. Slash left in these areas uses oxygen needed by aquatic animals. Slash can also limit access for certain species to wetlands. Felling trees into water bodies can cause habitat damage and disturb breeding and spawning areas of aquatic species and amphibians.

- Avoid felling into standing water.
- Keep slash out of streams and wetlands with standing water.

- Leave tops in the wetland if felling into standing water cannot be avoided.
- Avoid felling into temporary ponds.
- Clearcutting in wetlands should be used with caution because it may raise the water table and inhibit regeneration.

3. Skidding

Soil disturbance, which leads to accelerated erosion, can be minimized by well designed and located skid trails.

- Avoid equipment entry into wetlands.
- Skidding should be confined to a few primary trails regardless of season to minimize the area affected.
- If skidding equipment is required to enter wetlands, schedule the harvest during the drier seasons of the year or during time when the ground is frozen. Skidding should cease when surface rutting occurs.
- Concentrate skidding in defined corridors and use cable skidding when possible. Minimize skid trails by maximizing winch and choker cable lengths.
- Avoid grapple skidders unless the material is gathered by a swinging head feller-buncher located outside of the wetlands.
- Use low ground pressure equipment when possible, and in wettest areas consider using tracked vehicles. Use conventional tires on skidders only when the ground is dry or frozen.
- Use brush or corduroy to minimize soil compaction and rutting when skidding in wet areas.
- Do not skid through temporary ponds, spring seeps, or stream channels.
- Reduce skid volumes when skidding through wetland areas.

4. Landings

Proper water control measures, location, and size of landings will limit soil erosion and compaction that can occur from concentrated heavy equipment use.

- Do not locate log landings in wetlands.
- If no other locations are practical, place landings on the highest ground possible within the wetlands.
- Use landings in the dry season only.

- Keep landings to a minimum size and number.
- Use proper erosion and sedimentation control BMPs.
- Avoid spills of oil and other hazardous material and store operating supplies of such materials away from wetlands and waterways.
- Consider the use of fabric mats and pads at landing sites to minimize soil erosion and compaction.
- Place landings as far from stream and wetlands as possible (within 50 feet of stream requires permitting action by DEP).
- Remove temporary fill or pads used for landings located in wetlands upon completion of the operation.

E. Special Management Considerations: Vernal Ponds and Spring Seeps

Vernal ponds and spring seeps provide quality wildlife habitat and should be protected from the impacts of timber harvesting. Special management practices should be applied when operating around ponds and seeps.

Vernal Ponds and Spring Seeps

- Use buffer zones around ponds and seeps.
- Fell trees away from ponds or seeps.
- Leave tops in the wetland if felling into standing water cannot be avoided.
- Do not remove trees that are within 10 feet of seep or pond.
- Do not skid through ponds, seeps or wetlands.
- Avoid making ruts deeper than 6 inches within 200 feet of a vernal pond. Harvesting under frozen or snowy conditions is advisable to minimize rutting and disturbance of leaf litter.
- Where property boundaries permit, locate haul roads at least 150 feet downstream from the head of a seep, and avoid road building within 150 feet uphill from seeps.
- Concentrate skidding on defined corridors and use cable skidders when possible. Minimize skid trails by maximizing cable lengths to reduce erosion and sedimentation.

**APPENDIX A
CHECKLIST
FOR
WETLANDS PROTECTION ON TIMBER
HARVESTING SITES**

**REFER TO TOPOGRAPHICAL MAPS, NATIONAL WETLAND INVENTORY
MAPS AND SOIL SURVEYS**

_____ note any areas that indicate the presence of wetlands or hydric soils

CONDUCT AN ON-SITE INSPECTION

_____ determine the boundaries of any wetlands indicated on the maps

_____ look for additional wetlands - not all show up on the maps

_____ determine the approximate boundaries of any additional wetlands;
include stream locations

_____ consult your DEP Regional Office if you have questions

INCORPORATE WETLANDS INTO HARVESTING PLAN

_____ follow Pennsylvania's erosion and sediment control requirements

_____ avoid crossing wetlands and stream channels

_____ consult your DEP Regional Office if wetland and stream crossings
cannot be avoided

**DEVELOP A WORKING KNOWLEDGE OF FEDERAL AND STATE
REGULATIONS**

_____ know regulations prior to start-up of operations

_____ understand the permitting process to determine if any permits are
required

_____ avoid wetlands and streams to minimize regulatory permit requirements

USE BEST MANAGEMENT PRACTICES

_____ to maintain forest productivity

_____ to protect valuable wetlands

_____ to ensure compliance with state and federal regulation

_____ to improve public acceptance of forest management and harvesting

APPENDIX B

LIST OF COMMON PENNSYLVANIA WETLAND PLANTS

LIST OF TREES AND SHRUBS

Common Name	Scientific Name
alder	<i>Alnus rugosa</i>
arrow-wood, northern	<i>Viburnum recognitum</i>
ash, green	<i>Fraxinus pennsylvanica</i>
birch, river	<i>Betula nigra</i>
blueberry, highbush	<i>Vaccinium corymbosum</i>
dogwood, red-osier	<i>Cornus stolonifera</i>
dogwood, silky	<i>Cornus amomum</i>
elderberry, common	<i>Sambucus canadensis</i>
elm, American	<i>Ulmus americana</i>
leatherleaf	<i>Chamaedaphne calyculata</i>
maple, silver	<i>Acer saccharinum</i>
maple, box elder	<i>Acer negundo</i>
meadowsweet, broad-leaved	<i>Spirea latifolia</i>
meadowsweet, narrow-leaved	<i>Spirea alba</i>
oak, pin	<i>Quercus palustris</i>
oak, swamp white	<i>Quercus bicolor</i>
spicebush, northern	<i>Lindera benzoin</i>
steeple-bush	<i>Spirea tomentosa</i>
sumac, poison	<i>Toxicodendron vernix</i>
sycamore	<i>Platanus occidentalis</i>
willow, black	<i>Salix nigra</i>
willow, silky	<i>Salix sericea</i>

LIST OF HERBACEOUS SPECIES

Common Name	Scientific Name
arrow arum	<i>Peltandra virginica</i>
arrowhead, broad-leaved	<i>Sagittaria latifolia</i>
blue vervain	<i>Verbena hastata</i>
boneset, common	<i>Eupatorium perfoliatum</i>
bulrush, green	<i>Scirpus atrovirens</i>
button bush	<i>Cephalanthus occidentalis</i>
bur-reed, eastern	<i>Sparganium americanum</i>
cardinal flower	<i>Lobelia cardinalis</i>
cattail, broad-leaved	<i>Typha latifolia</i>
common reed	<i>Phragmites australis</i>
fern, sensitive	<i>Onoclea sensibilis</i>
grass, bluejoint	<i>Calamagrostis canadensis</i>
grass, manna	<i>Glyceria canadensis</i>
grass, reed canary	<i>Phalaris arundinacea</i>
grass, rice cut-	<i>Leersia oryzoides</i>
grass, wool	<i>Scirpus cyperinus</i>
iris, blue flag	<i>Iris versicolor</i>
jack-in-the-pulpit	<i>Arisaema triphyllum</i>
jewelweed, spotted	<i>Impatiens capensis</i>
Joe-Pye-weed, spotted	<i>Eupatorium maculatum</i>
lily, yellow pond	<i>Nuphar lutea</i>
lily, white water	<i>Nymphaea odorata</i>
marsh marigold	<i>Caltha palustris</i>
nettle, false	<i>Boehmeria cylindrical</i>
pickerelweed	<i>Pontederia cordata</i>
pitcher plant, northern	<i>Sarracenia purpurea</i>
Pondweeds	<i>Potamogeton spp.</i>
rush, soft	<i>Juncus effusus</i>
sedge, three-way	<i>Dulichium arundinaceum</i>
sedge, tussock	<i>Carex stricta</i>
skunk cabbage	<i>Symplocarpus foetidus</i>
smartweed, arrow-leaved tearthumb	<i>Polygonum sagittatum</i>
smartweed, mild water pepper	<i>Polygonum hydropiperoides</i>
sphagnum moss	<i>Sphagnum spp.</i>
spikerush, blunt	<i>Eleocharis obtusa</i>
Sundews	<i>Drosera spp.</i>
sweetflag	<i>Acorus calamus</i>
water shield	<i>Brasenia schreberi</i>
water calla	<i>Calla palustris</i>
wild rice	<i>Zazania aquatica</i>

**APPENDIX C
CLEAN WATER ACT**

Key Federal Regulations for

Section 404 of The Clean Water Act

33 C.F.R. 323.4 **Silvicultural operations are exempt from the permit process if there is no discharge of dredged or fill material which contains toxic pollutants and no conversion of a wetland to a non-wetland.**

323.4(a)(1)(i): **Normal silvicultural activities** such as seeding, cultivating, minor drainage and harvesting of fiber and forest products **are not prohibited or otherwise subject to regulation in wetlands.**

323.4(a)(6): **Construction or maintenance of forest roads** must be constructed in accordance with best management practices (BMPs) to assure that the flow and circulation patterns and chemical and biological characteristics of waters of the United States are not impaired, that the reach of waters of the United States is not reduced and that any adverse effect on the aquatic environment will be otherwise minimized. These BMPs which must be applied to satisfy this provision shall include the following baseline provisions:

(i) Permanent roads (for farming or forestry activities), temporary access roads (for mining, forestry, or farm purposes) and skid trails (for logging) in waters of the U.S. **shall be held to the minimum feasible number, width, and total length** consistent with the purpose of specific farming, silvicultural or mining operations, and local topographic and climatic conditions;

(ii) 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;

(iii) The road fill **shall be** bridged, culverted, or otherwise **designed to prevent the restriction of expected flood flows;**

(iv) The **fill shall be properly stabilized and maintained** during and following construction to prevent erosion;

(v) Discharges of dredged or fill material into waters of the U.S. to construct a road fill **shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment** within waters of the U.S. (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;

(vi) In designing, constructing, and maintaining roads, **vegetative disturbance** in the waters of the U.S. **shall be kept to a minimum;**

(vii) 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;

(viii) **Borrow material shall be taken from upland sources** whenever feasible;

(ix) The discharge **shall not take or jeopardize** the continued **existence of threatened or endangered species** as defined under the Endangered Species Act or adversely modify or destroy the critical habitat of such species;

(x) **Discharges** into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands **shall be avoided if practical alternatives exist**;

(xi) The discharge **shall not be located in the proximity of a public water supply intake**;

(xii) The discharge **shall not occur in areas of concentrated shellfish production**;

(xiii) The discharge **shall not occur** in a component of the **National Wild and Scenic River System**;

(xiv) The discharge of material **shall consist of suitable material** free from toxic pollutants in toxic amounts; and

(xv) All **temporary fills shall be removed** in their entirety **and the area restored** to its original elevation.

APPENDIX D
CONTACT NAMES AND ADDRESSES

STATE

PA Department of Environmental Protection - Central Office

Bureau of Watershed Management
Division of Waterways, Wetlands and Stormwater Management
PO Box 8775
Harrisburg, PA 17105-8775
(717) 787-6827

Regional offices of the Permitting and Technical Services Section process all permits, register general permits, handle enforcement and coordinate with county conservation districts.

PA Department of Environmental Protection - Regional Offices

Southeast Region

2 East Main Street
Norristown, PA 19401
484-250-5970

Counties: Bucks, Chester, Delaware, Montgomery and Philadelphia

Northeast Region

2 Public Square
Wilkes-Barre, PA 18711-0790
570-826-2511

Counties: Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne & Wyoming

Northcentral Region

208 W. Third Street, Suite 101
Williamsport, PA 17701
570-327-3574

Counties: Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union

Southwest Region

400 Waterfront Drive
Pittsburgh, PA 15222-4745
412-442-4000

Counties: Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland

Northwest Region

230 Chestnut Street
Meadville, PA 16335-3481
814-332-6984

Counties: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren

Southcentral Region

909 Elmerton Avenue
Harrisburg, PA 17110
717-705-4707

Counties: Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York

Additional Bureaus and Agencies of State Government

Bureau of Forestry

PO Box 8552
Harrisburg, PA 17105-8552
(717) 787-3444

- Administers PA natural diversity inventory

PA Game Commission

2001 Elmerton Ave.
Harrisburg, PA 17110-9797
(717) 787-4250

- Regulates the harvest and control of wild animal species and manages their habitat, comments on major permit applications

PA Fish and Boat Commission

PO Box 67000
Harrisburg, PA 17106
(717) 705-7800

- Enforces Clean Stream Law, conducts waterways conservation, comments on major permit applications

LOCAL AND OTHER

County Conservation Districts

- Distributes county soil survey reports, Offices generally located in the county seat, consult the local telephone directory

Cartographic Information Research Center

102-D Hasbrouck Lab
University of Massachusetts
Amherst, MA 01003
(413) 545-0359

- Distributes NWI maps for PA

GLOSSARY

best management practices - work guidelines designed to minimize the impact of timber harvesting on wetlands and water quality.

buffer zone - an area of vegetation adjacent to both sides of a stream or surrounding wetland which protects water quality from the impacts of nearby land use activities by slowing and spreading surface water flow, trapping and filtering out suspended sediment and providing shade and wildlife habitat (also referred to as a streamside management zone or a filter strip).

body of water - a natural or artificial lake, pond, reservoir, swamp, marsh, or wetland.

delineation - the process of determining a wetland's physical boundaries.

encroachment - any structure or activity that changes, expands, or diminishes the wetlands.

endangered species - any species in danger of extinction throughout all or a significant portion of its range.

erosion - the process by which soil particles are detached and transported by water, wind, and gravity to some downslope or downstream point.

felling - the process of cutting down standing trees.

harvesting - the felling, skidding, loading, and transporting of timber products.

hydric soils - soils that are characterized by the presence of water.

hydrology - the degree of flooding or soil saturation.

hydrophytic vegetation - plant life that is adapted to living in wet conditions.

inundation - a condition in which water from any source temporarily or permanently covers a land surface.

jurisdictional - falling under the authority of a given law.

landing (or deck) - a place where logs or tree-length materials are assembled for loading and transport.

litter layer - the layer of fallen leaves, twigs, and decaying woody material that provides a sponge-like mat covering forest soils.

minor drainage - (1) the discharge of dredged or fill material incidental to connecting upland drainage facilities to waters of the U.S., adequate to effect the removal of excess moisture from upland croplands;

(2) is limited to drainage within areas that are part of an established farming or silvicultural operation, and does not include

drainage associated with the immediate or gradual conversion of a wetland to a non-wetland, or conversion from one wetland use to another;

(3) does not include the obstruction of any ditch, canal, dike or other waterway obstruction which drains or otherwise significantly modifies a stream, lake, swamp, bog, or any other wetland;

(4) any discharge of dredged or fill material into the waters of the U.S. incidental to the construction of any such structure or waterway requires a permit.

mottles - spots or blotches of different color or shades of color interspersed within the dominant matrix color in a soil layer.

organic soils - mucks and peats that have organic soil materials in more than half of the upper 32 inches or that are of any thickness of overlying rock; also referred to as *histosols*.

skidding - moving of logs or felled trees along the surface of the ground from the stump to the point of loading.

skid trail - a temporary, frequently used pathway to drag felled trees or logs to a log deck.

slash - unusable woody material such as large limbs, tops, cull logs, and stumps that remain after timber harvesting.

watercourse - a channel or conveyance of surface water having defined banks, whether natural or artificial, with perennial or intermittent flow (a stream).

water obstruction - a dike, bridge, culvert, wall, wingwall, fill, pier, wharf, embankment, abutment, or other structure located in, along, across, or projecting into a watercourse, floodway, or body of water.

waters of the Commonwealth – shall be construed to include any and all rivers, streams, creeks, rivulets, impoundments, ditches, water courses, storm sewers, lakes, dammed water, ponds, springs and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

waters of the United States -

(1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of tide;

(2) All interstate waters including interstate wetlands;

(3) All other waters such as intrastate lakes, rivers, streams, (including intermittent), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters

(i) Which are or could be used by interstate or foreign travelers for recreational purposes; or

(ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(iii) Which are used or could be used for industrial purpose by industries in interstate commerce;

(4) All impoundments of waters otherwise defined as Waters of the United States under the definition;

(5) Tributaries of waters identified in paragraphs 1-4;

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs 1-6.

REFERENCES

- Corps of Engineers Wetland Delineation Manual*. Environmental Laboratory Technical Report Y-87-1, US Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS, 1987, 169 pp.
- Fisher, J. E., and D. W. Taber. *Logging Road and Skid Trail Construction*. State University of New York, Applied Forestry Research Institute, Misc. Report No. 6, 1975.
- Garland, John J. *Planning Woodland Roads*. Oregon State University Extension Service, Circular 1118, 1983.
- Garland, John J. *Road Construction on Woodland Properties*. Oregon State University Extension Service, Circular 1135, 1983.
- Garland, John J. *Designing Woodland Roads*. Oregon State University Extension Service, Circular 1137, 1983.
- Garland, John J. *Maintaining Woodland Roads*. Oregon State University Extension Service, Circular 1139, 1983.
- Hartung, Robert E., and James M. Kress, *Woodlands of the Northeast--Erosion and Sediment Control Guides*. USDA Soil Conservation Service and Forest Service, 1978.
- Hausman, Richard F., and Emerson W. Pruett. *Permanent Logging Roads for Better Woodlot Management*. State and Private Forestry, Northeastern Area, USDA Forest Service, 1978.
- Kochenderfer, James N. *Erosion Control on Logging Roads in the Appalachians*. Research Paper NE-158, Northeastern Forest Experiment Station, USDA Forest Service, 1970.
- Kochenderfer, James N., G. W. Wendel, and H. Clay Smith. *Cost of and Soil Loss on "Minimum-Standard" Forest Truck Roads Constructed in the Central Appalachians*. Research Paper NE-544, Northeastern Forest Experiment Station, USDA Forest Service, 1984.
- Northeast Forest Resources Extension Council Series. *A Guide to Logging Aesthetics – Practical Tips for Loggers, Foresters, and Landowners*. Northeast Regional Agricultural Engineering Service, Cooperative Extension, 1996.

Pennsylvania Code, Title 25. Environmental Protection. Commonwealth of Pennsylvania, Dept. of Environmental Protection, Chapter 102. Erosion and Sediment Control. Effective January 1, 2000, 18 pp.

Pennsylvania Code, Title 25. Environmental Protection. Commonwealth of Pennsylvania, Dept. of Environmental Protection, Chapter 105. Dam Safety and Waterway Management. Effective October 12, 1991, 261 pp.

Pennsylvania Cooperative Extension Service. *Erosion Control and Conservation Plantings on Noncropland.* The Pennsylvania State University, College of Agricultural Sciences, 1997.

Pennsylvania Department of Environmental Protection. *Soil Erosion and Sediment Pollution Control Program Manual.* Technical Guidance No. 363-2134-008, Bureau of Watershed Management, April 2000.

Pennsylvania State University (PSU), College of Agricultural Sciences. *Best Management Practices for Pennsylvania Forests.* Forest Issues Working Group, PSU-School of Forest Resources, Pennsylvania Forest Stewardship Program, and Pennsylvania Hardwoods Development Council, 1996.

US Department of Agriculture (USDA), Natural Resource Conservation Service. *Engineering Field Manual for Conservation Practices,* March 1997.

US Environmental Protection Agency (USEPA). *Summary of Current State Nonpoint Source Control Practices for Forestry.* EPA-Office of Water, August 1993.

NOTES

For more information, visit
www.depweb.state.pa.us, Keyword: Erosion Control.

3930-BK-DEP4016 Rev. 7/2009

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