Forestry
Best Management Practices

In Cooperation with:

Illinois Department of Natural Resources

Illinois Forestry Development Council

SIU CARBONDALE Southern Illinois University

University of Illinois

ACKNOWLEDGMENTS

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This information is also available as a PDF file on the following website:
http://mypage.siu.edu/eholzmue/index_files/ilbmp.htm

Printed by the authority of the State of Illinois 10/00.

First re-printing 06/07.
Revised and reprinted 07/12.

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INTRODUCTION

Clean water is essential to Illinois' economy and quality of life. Our forests play a vital role in purifying and maintaining clean lakes, rivers, streams, and groundwater.

Maintaining or restoring forest cover protects the site, preserves and improves the quality and integrity of stream waters flowing within and out of the area. Forested lands are effective in maintaining erosional processes to normal, geological rates. Forests are also effective in shading streams, thereby maintaining relatively cool waters in our forested streams. Forests tend to act as a sink and take up and recycle nutrients. Trees, associated vegetation, and the litter-covered forest floor absorbs the impact of rainfall and allows the rain to infiltrate without surface flow. Sediments and debris carried in from other areas are usually trapped and held by the forest vegetation and leaf litter.

Forestry Best Management Practices (BMPs) are practices that protect our forest, soil, and water resources while allowing appropriate use of the resources. The following voluntary guidelines for BMPs will help to ensure that Illinois' forested sites are not degraded, that the waters associated with these forests are of the highest quality compatible with natural processes, and that our forest resources are wisely utilized. The Illinois Department of Natural Resources strongly encourages their use by everyone involved with growing, managing, and harvesting trees.

The actual cutting of trees has little impact on site degradation or stream water quality. However, those activities associated with moving the product from the stump to the mill have the potential for causing substantial site and water quality degradation problems. In general, the most serious problems involve erosion, the transport of the eroded material, and the deposition of this material. Since site disturbance and site and water quality degradation may be directly related to erosion and sedimentation problems, the majority of the BMPs will focus on measures to minimize site disturbance. The logger will benefit with lower costs through more efficient operations; the forest owner benefits by reducing the need for site reconditioning; and society benefits from less degradation of soil and water on the harvested area.

This manual can help guide you when making decisions about management activities on your land. You can get professional advice on BMPs and all forest management activities from natural resource professionals.
See Appendix A.

Pollutant Types and Impacts from Forest Activities

Nonpoint source pollution occurs when rain and snowmelt runoff picks up and carries pollutants into streams and groundwater. Soil, including the organic debris and nutrients in it, becomes a nonpoint source pollutant when it is exposed and unprotected. Nationwide, three to nine percent of nonpoint source solution comes from forestry activities. Because Illinois is relatively flat, only about three percent of the states' nonpoint source pollution comes from forestry practices. While three percent sounds small, localized nonpoint source pollution can be significant, particularly in Illinois where many of our highest quality streams flow through forested watersheds.

Forest management activities can generate the following forms of nonpoint source pollution:

Sediment. Forest floor vegetation and (organic matter) protect the soil from the erosive action of falling raindrops and runoff. Forest activities, such as road building, can remove this protection. This can lead to erosion of the soil and movement of sediment. When sediment is carried away in runoff and deposited elsewhere, sedimentation occurs. Without using appropriate BMPs on exposed and sloping land, the soil may erode and wash into a body of water. Sediment is the primary pollutant associated with forest activities, especially at stream crossings for forest roads and skid trails.

Sedimentation is a naturally occurring process. However, human activities can speed it up. The result can be large amounts of sediment accumulating in lakes, streams, and wetlands that speed up the aging of lakes and bury fish spawning grounds and impact habitat for fish, mussels, and other aquatic organisms.

Accumulating sediment also constricts naturally flowing channels, leading to increased stream bank erosion and possible flooding. Suspended sediment clouds the water, making it difficult or impossible for sight-feeding fish to locate their prey. It can also clog the gills of fish and have detrimental effects on aquatic life, literally suffocating them. High sediment loads make it difficult for beneficial aquatic plants to grow, and silt deposited on a lake or stream bed can smother fish eggs and invertebrates important in the aquatic food chain.

Organic Debris. Leaves and large woody debris that naturally fall into streams can benefit aquatic ecosystems. Fallen trees 12" and larger with the root ball attached serve as prime fish habitat. However, too much organic debris deposited in a short time can harm water quality. This can occur during logging when tree tops and branches fall or wash into streams. Too much decomposing matter in streams decreases dissolved oxygen in the water, which fish need to thrive and reproduce. In extreme cases, logging waste can trap sediments and eventually interrupt streamflow and the movement of fish.

Nutrients. Nutrients such as nitrogen and phosphorus exist naturally in forest soil and enter waterbodies if the soil erodes into water. Also, if fertilizers are used in forest management, they can wash into runoff. Excessive amounts of nutrients may cause algal blooms in lakes and streams, which can reduce levels of dissolved oxygen below what fish and other aquatic species need to survive.

Temperature. Some sunlight filtering through trees is healthy for many streams. It can promote plant growth (food) in the water and foster healthy ground vegetation along shorelines. However, when trees and the shade they provide are removed along most small streams, peak mid-summer water temperatures climb as a result of increased sunlight. This can accelerate harmful algae growth, reduce dissolved oxygen, and eliminate sensitive species of fish and other organisms.

Chemicals. Fuel, oil, and coolants used in harvesting and road-building equipment must be handled carefully to avoid water pollution. Pesticides (herbicides, insecticides, and fungicides) help control forest pests and undesirable plant species. But when applied improperly, pesticides can be toxic to aquatic organisms. Read label directions before using these products.

Streamflow. If timber harvesting equipment compacts forest soil, water infiltration into the soil is reduced and surface runoff into streams increases. This also reduces water percolation through the soil to recharge groundwater. Groundwater provides cool, clean water to lakes and streams, maintaining steady streamflows and lake levels throughout the summer.

Our purpose in this manual is to help you protect Illinois' water quality. The Illinois Department of Natural Resources also encourages you to protect other natural resources on your forest land: wildlife, wetlands, endangered plants and animals, and timber. Recreational opportunities and scenic beauty are also natural resources worthy of protection. For information on financial incentive programs to manage and protect these resources, see Appendix A: Sources of Assistance.

II - PLANNING

Following a good forest management plan is the key to sustaining the integrity of the forest, soil, water, and the wildlife that depend on these resources. The plan outlines a schedule and guidelines for current and future management activities. Best Management Practices (BMPs) should be included in the plan.

The management plan should be developed in advance of any anticipated activity and should consider long and short term managerial objectives and the overall land use plan for the area. If you have other management plans on a farm, be sure to integrate these plans.

The plan's formality and detail should be appropriate to the project size, cost and environmental risk. The plan also should be flexible and adaptable to changing conditions.

Landowners and land managers should select the best forest management strategy to protect water quality specific to the site. A contractor (i.e., logger, road developer) working with the landowner and land manager, is usually responsible for implementing forestry BMPs.

Fundamental to any plan should be consideration of the future character of the forest stand, particularly in regard to forest type and species composition. Regeneration of desired species in the future stand depends on the management strategies implemented in the plan.

Professional foresters can work with you to develop a forest management plan. Cost-sharing assistance may be available for plans written by a consulting forester.

<u>Use the following guide when integrating BMPs into forest management activities:</u>

1. Make a list of site-specific forestry BMPs needed to protect water quality and include the list in all timber sale contracts, timber harvest plans and forest management plans.
2. Develop a forest management plan that states the management objectives for the site.
3. Plan operations should be designed to protect water quality by considering site conditions.

4. Identify on a map the following site conditions:
    - Verify property boundaries
    - Harvest unit boundary
    - Existing forest road system (roads, skid trails and landings)
    - Sensitive areas: streams, lakes, wetlands, floodplains, habitat areas for known threatened or endangered aquatic and terrestrial plants and animal species, steep slopes, and erodible soils
    - Streamside Management Zones (SMZs)
    - Stream crossings
    - Equipment maintenance and fueling areas, log landings

The following resources can be used to identify site conditions:

1. United States Geological Survey (USGS) topographic maps (7.5 min.), available from the Illinois Geological Survey. See Appendix A for contact information.
2. Aerial photographs, available from the USDA Farm Service Agency county offices.
3. GIS data including soil surveys and orthophotos, available from USDA Natural Resource Conservation Service. (http://datagateway.nrcs.usda.gov/)
4. Floodplain and Illinois Wetland Inventory Maps, may be reviewed at the local field office of the USDA Natural Resources Conservation Service.

Conduct on-site evaluations.

Stabilize bare soil as soon as possible after exposure to prevent erosion. This is especially important on steep slopes and erodible soils, in streamside management zones, and at stream crossings. Refer to the Soil Stabilization section in the in Chapter V, *Forest Roads* on page 25.

If you know of an endangered or threatened species existing on your area of operation, special considerations may be recommended to maintain suitable habitat. Contact your IDNR District Natural Heritage Biologist for more information. See Appendix A on page 46.

III - TIMBER HARVESTING

Most forest management plans include scheduled timber harvesting.

Harvesting includes felling trees and transporting logs on skid trails to a **landing** where products are sorted and loaded onto trucks for transportation to a mill. **Skid trails** are temporary travel-ways for logging equipment to transport felled trees or logs to a landing. They are not intended for off-road-vehicle use. Skid trails that require excavation need careful design and should follow BMPs in Chapter V - *Forest Roads.* Landings may be permanent or temporary features. If permanent, they may be used as parking areas or wildlife openings.

Planning

Limit the length and number of skid trails, and the number of landings and stream crossings to the minimum necessary to conduct the harvest.

For BMPs concerning skid trails and landings in wetlands see Chapter VIII-*Wetlands.*

Logging Equipment

The type and use of logging equipment should be appropriate for the operation to minimize site disturbance. This means using the correct equipment for each job.

Logging equipment should be operated during suitable ground moisture conditions in order to avoid excessive site damage. When avoidable, do not log in wet weather.

Harvesting

When harvesting near streams or lakes, follow BMPs in Chapter IV - *Streamside Management Zones*.

- Whenever possible, winch logs from steep slopes if conventional skidding could cause erosion that affects water quality.
- Avoid operating equipment where excessive soil compaction and rutting may cause erosion that affects water quality. The use of low ground pressure equipment may allow operations to continue.
- Fill in ruts, apply seed and mulch, and install sediment-control structures and drainage structures on skid trails and landings where needed to prevent erosion and sedimentation into surface waters. See the Drainage Structures and the Soil Stabilization section of Chapter V - *Forest Roads*.

- Inspect soil-stabilization practices during, and immediately after, harvest operations to insure they are successful and remain functional. Follow BMPs in the Road Maintenance section of Chapter V - *Forest Roads,* page 29.
- Do not pile slash into drainage areas where runoff may wash slash into streams, lakes, or wetlands.
- For winter harvesting, mark stream channels and existing culvert locations before snowfall.

Landings

Appropriately located landings are essential for a successful harvest operation. Landings are high use areas being the hub of the skidding trails and the terminus of a logging road. Special care must be taken to assure that the landing is adequate for its purpose and that construction and use of the landing is done with minimum disturbance to the area.

- Locate landings outside streamside management zones are described in Chapter IV - *Streamside Management Zones*.
- Locate landings on firm well-drained soils with a slight slope, or on ground shaped to promote efficient drainage. Landings may need a crown shape to allow for drainage.
- Use existing landings if possible. Close existing landings in streamside management zones unless construction of new landings will cause greater harm to water quality than using existing landings.
- Locate residue piles (sawdust, chipping residue, etc.) away from drainages where residue may wash into streams, lakes or wetlands.
- Retire and restore landings. The landing area should be cleaned, graded (and ripped if necessary), and sown to suitable, fast growing vegetation. Consideration should be given to plant species favoring wildlife. Plan to use this same landing for future harvest.

Skid Trails

Skid trails are used to move logs from the stump to the landing. This necessitates repeated trips over the same area and often over the same skid trail(s).

Skid trail restrictions in streamside management zones are described in Chapter IV - *Streamside Management Zones,* page 11.

- Where possible, keep skid trail grades less than 15%. Where steep grades are unavoidable, break the grade, install drainage structures, and use soil-stabilization practices (as described in Chapter V - Forest Roads) where needed to minimize runoff and erosion. Grades greater than 15% should not exceed 330 feet in length.

- Use existing trails if they provide the best long-term access. Consider relocating existing trails if both access and environmental impact can be improved.
- Consideration should be given to the number and layout of major skid trails. To the extent feasible, logs should be brought to a small number of major skid trails. Directional felling concentrates logs for a full "skid," minimizes trips and the extent of mineral soil exposure.
- While skidding logs, the lead end of the log(s) should be elevated to minimize gouging of the skid trail.
- Skid trail layout and design should be developed prior to the implementation of a harvest. Doing so improves the efficiency of the operation and reduces costs.

Stream Crossings for Skidding

- For skidding across streams, use permanent crossings as described in General BMPs for Stream Crossings section of Chapter V - *Forest Roads,* page 16.
- Pole fords may be used in small streams by placing poles (or small logs) side by side on the streambed (Figure 3-1). Pole fords should be removed immediately after use.
- Frozen fords are used in small streams when ice is thick enough, or the streambed is frozen enough, to protect the streambed.
- Install stream crossing structures at right angles to the stream channel.

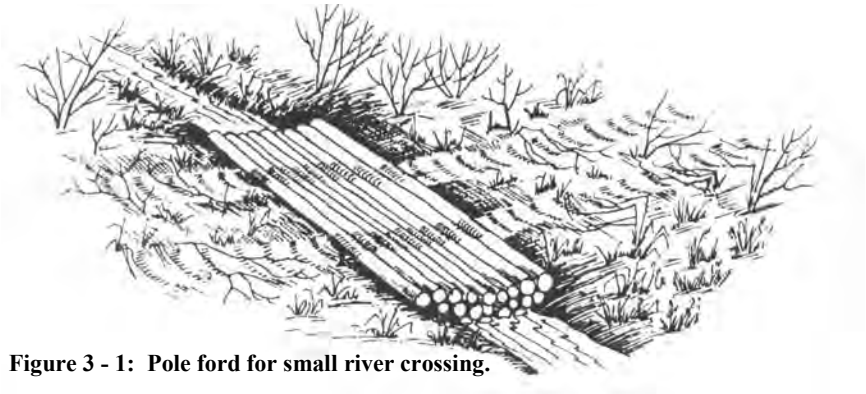


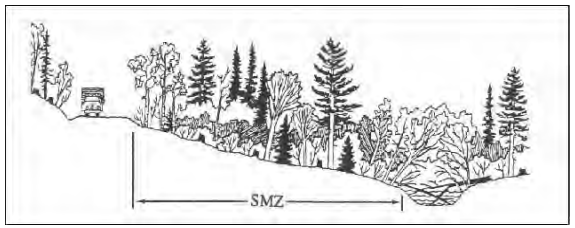
Figure 3 - 1: Pole ford for small river crossing.

Pole fords should be removed immediately after use, and must be removed before the upstream end becomes clogged with debris and impedes streamflow. (Adapted from VT Dept. of Forests, Parks and Recreation, 1987.)

IV - STREAMSIDE MANAGEMENT ZONES

Background: What is an SMZ?

Streamside management zones (SMZs) are land and vegetation areas next to lakes and streams where management practices are modified to protect water quality, fish, and other aquatic resources. These areas are complex ecosystems that provide food, habitat and movement corridors for both water and land communities. Also, because these areas are next to water, SMZs help minimize nonpoint source pollution to surface waters.



The width of a streamside management zone (SMZ) varies with slope, soils, and other conditions, as well as the stream's designation as intermittent or perennial.

Figure 4 - 1: Streamside Management Zone variation.

Streamside management zones help to:

Filter sediment and nutrients from runoff. As runoff water moves through plants and the organic matter, it slows and drops sediment that has been carried along. This settling process keeps sediment and nutrients from flowing into streams and lakes. It also allows plant roots to take up the nutrients that have dissolved in the runoff and soaked into the soil, further reducing the amount of pollution flowing into lakes and streams.

Allow water to soak into the ground. Trees and plants, leaves and twigs slow surface runoff, allowing the water to soak into the soil. This helps to reduce peakflow levels in streams and replenishes the groundwater that helps maintain lake levels and stream flows.

Stabilize streambanks and lakeshores. Trees and plants along streambanks and lakeshores reduce soil erosion because their roots hold the soil together, making it more difficult for waves, currents, and runoff to wash the soil away. Plants also lessen impact of raindrops on exposed soil, decreasing erosion.

Shade streams. In most cases, plants and trees along streambanks are necessary to shade streams, keeping the water from becoming too warm for aquatic life in the summer.

Provide food and habitat for aquatic organisms. Fallen leaves, twigs, and other organic debris from trees are the base of the food chain for aquatic organisms in small forest streams. Aquatic invertebrates which graze and shred these materials are eaten by small fish, which are in turn eaten by larger fish as well as mink, kingfishers and other wildlife. Large woody debris provides hiding cover for fish, both predator and prey.

Depending on its location, large woody debris affords shelter from excessive currents and forms scour holes valuable to sport fish species such as bass, crappie and catfish.

Agricultural and Urban Areas

Streamside zones are as valuable in agricultural and urban settings as they are in the forest. Runoff from cultivated fields, as well as city streets and lawns, contain sediment, pesticides, and fertilizer. Plants in streamside zones filter out these contaminants, reducing the amount of pollutants entering waterbodies. All streamside zone landowners should maintain or restore streamside management zones. Do not allow livestock to graze in SMZs.

Definitions

Lake: A still waterbody that is navigable, has an ordinary high-water mark, and has a bed that indicates "reasonably permanent" surface water.

Stream: A watercourse that has an ordinary high-water mark (bank full condition), has bed and banks, flows at least periodically, has an easily identifiable beginning and end, and does not lose its character as a watercourse even though it may break up and disappear temporarily and reappear downstream.

For the purpose of this document two types of streams are recognized.

Perennial streams flow throughout most of the year.

Intermittent streams usually flow only during wetter periods and are therefore pooled or dry much of the year. Intermittent streams must be protected because they import nutrients and food organisms into perennial streams and lakes and may become important spawning habitats during wetter times of the year.

The **ordinary high-water mark** is the point on the bank or shore up to which the presence and action of the water is so continuous as to

leave a distinct mark whether by erosion, destruction of land vegetation, or other easily recognizable characteristic. It is the bank full condition.

Note: Lakes and streams (perennial and intermittent) are identified on current USGS topographical maps (7.5 minute/1:24,000 scale).

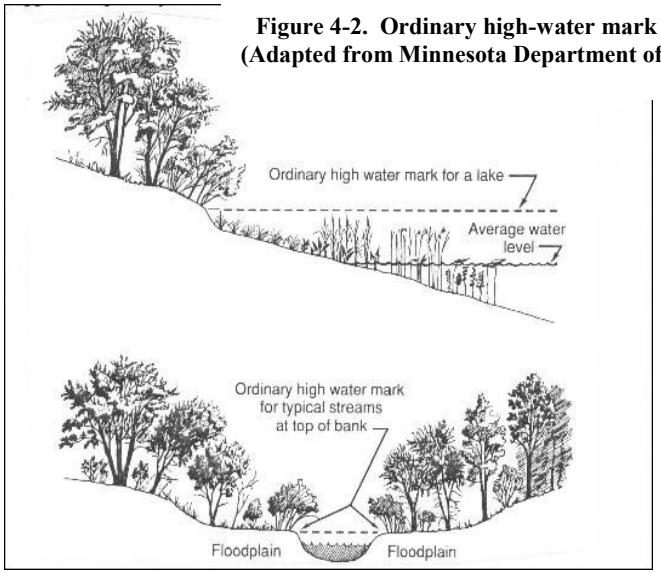


Figure 4-2. Ordinary high-water mark for a lake and a stream. (Adapted from Minnesota Department of Natural Resources, 1989.)

Best Management Practices for Streamside Management Zones

- Locate roads outside the SMZ unless necessary for stream crossings. For stream crossings, follow recommendations in the Stream Crossings section of Chapter V - *Forest Roads*.
- Locate landings outside the SMZ.
- Do not move slash into or pile slash within the SMZ. Keep slash out of lakes and stream channels and away from areas where it may be swept into the water.
- Minimize soil exposure and compaction to protect ground vegetation and the leaf layer.
- Harvesting should be done so as to purposefully regenerate the forest while maintaining adequate vegetative cover to protect the site.
- Operate wheeled or tracked harvesting equipment within the SMZ only when the ground is dry or frozen. If the ground is not dry, restrict equipment use to roads and stream crossings while working within the SMZ.

BMPs for Lakes and Perennial Streams

The SMZ for these waters is a strip of land running along the shoreline of lakes and on each side of streams. It begins at the ordinary high-water mark and extends a minimum of **50 feet** landward, and to a greater distance on steeper slopes.

BMPs for Intermittent Streams

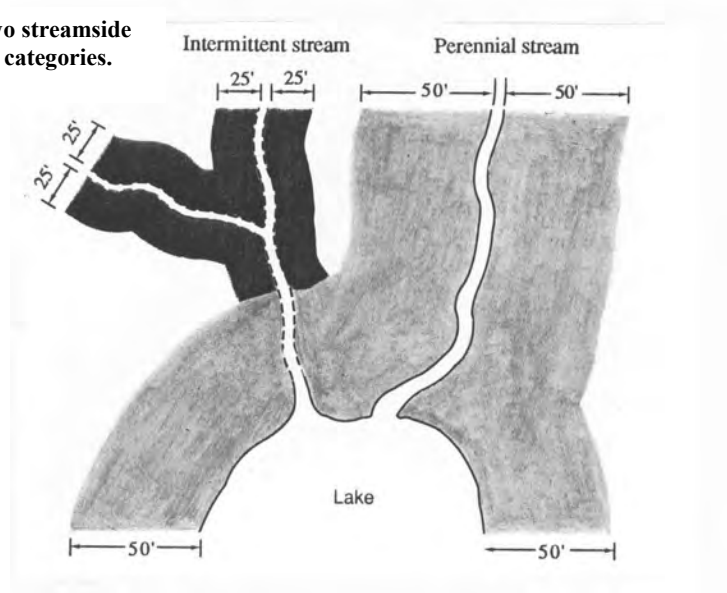
The SMZ for these streams is a strip of land on each side of the stream, beginning at the ordinary high-water mark and extending a minimum of **25 feet** landward.

Recommended minimum streamside management zone widths between disturbed areas and water courses.

Slope of land between disturbed area and stream (Percent)	Minimum SMZ width in feet	
	Intermittent	Perennial
0	25	50
10	45	90
20	65	130
30	85	170
40	105	210
50	125	250
60	l45	290

Note: On steep slopes or areas of highly erodible soils, you should widen the SMZ. Source: Tennessee's BMP Guide.

Figure 4-3. The two streamside management zone categories.



V - FOREST ROADS

Background:

Roads, skid trails, and landings are all part of a forest transportation system. (Skid-trail and landing BMPs are covered in Chapter III: *Timber Harvesting*). Roads connect the forest land to existing public roads. They provide forest access for such activities as managing timber, improving fish and wildlife habitat, fighting fires, and recreation.

Forest roads that are poorly located, constructed or maintained are the largest source of nonpoint source pollution from forest management activities. Roads over steep slopes, erodible soils or stream crossings old the greatest potential for degrading water quality.

There are three types of forest roads. Identify the type of road system you need during your planning phase.

1. **Temporary roads.** These are the most common type of forest road, designed and constructed for short-term use during a specific project such as timber harvesting. These roads are used only when the ground is frozen or firm. When the project is done, the temporary road is closed, all stream crossing structures are removed, and the road is naturally revegetated or replanted. Waterbars are constructed and maintained where needed, and should be retained after the road is retired.
2. **Permanent seasonal roads.** These are maintained as part of the permanent road system but are designed for use only when the ground is frozen or firm. These roads are generally narrower than permanent all-season roads, are built to lower engineering standards, and have minimal surface gravel. Waterbars are constructed and maintained where needed.
3. **Permanent all-season forest roads.** These roads usually have gravel surfaces and are designed for year-round use. However, there may be some limitations on use at various times of the year.

For specific information on roads in wetlands, see Chapter VIII: *Wetlands.*

Planning, Location, and Design

Decisions made at the planning stage will affect a road's construction costs, long-term maintenance needs, service life, and the amount of nonpoint source pollution it causes. Loggers and landowners should plan, locate, and design the road system together. This plan should be completed prior to the beginning of any construction or harvest activities.

- Plan road systems that minimize the number, width, and length of roads to limit the total area of site disturbance. Remember to consider future uses of the road system and coordinate development with adjoining landowners when possible.
- Use existing roads when they provide the best long-term access. Consider relocating existing roads if doing so improves access and reduces environmental impacts. Reconstruct existing roads to the extent necessary to provide adequate drainage and safety. Do not disturb stable road surfaces.
- Select road locations that allow for drainage away from the road and road ditches.
- Minimize the number of stream crossings, and make crossings at right angles to stream channels.
- Identify the best stream-crossing locations before locating the road. The best locations include straight and narrow stream channels with low banks and firm rocky soil. Roads should approach streams at the lowest slope possible.
- Where possible, locate roads on well drained soils.
- Locate roads outside streamside management zones except at stream crossings. For more information see Chapter IV: *Streamside Management Zones*.
- Road grades should not exceed 10% (Figure 5-1). If road grades greater than 10% are necessary, limit grade length to minimize erosion, or break the grade using drainage structures. See the Drainage Structures section on page 21. Graveling the road surface on steep grades can also help maintain stability. Note: Road grades should be less than 5%. Long steep slopes should be avoided. If unavoidable, they should be broken into short segments of grade separated by segments of reverse grade.
- Locate roads to follow natural contours and to minimize cut and fills. Balance cut and fills to minimize the need for fill or removing excess materials (Figure 5-2).

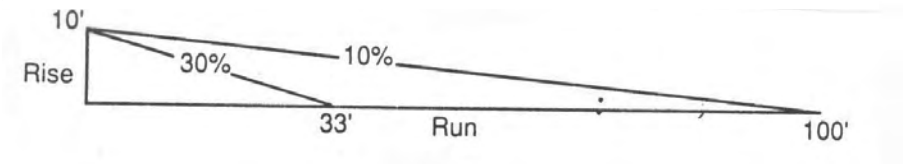


Figure 5-1. Road Grade % = Rise/Run x 100.

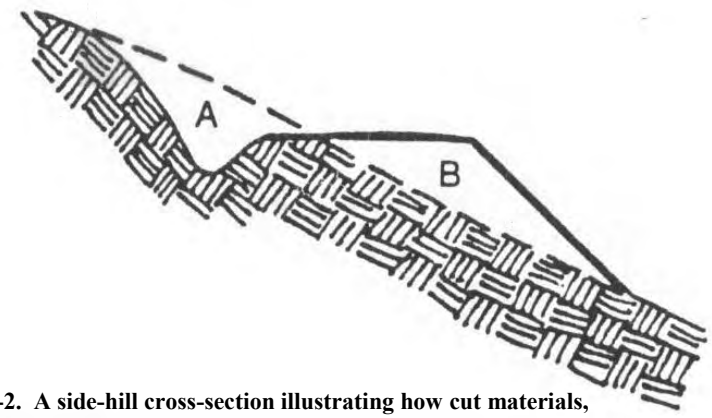


Figure 5-2. A side-hill cross-section illustrating how cut materials, A, equals fill materials, B.

Stream Crossing Design and Construction

Operating equipment in or near perennial or intermittent stream channels may add sediment directly to streams. Stream crossings that are poorly located or constructed may erode streambanks. Explore all alternatives before deciding to cross a stream.

As roads approach a stream crossing, proper drainage is critical to avoid sedimentation in streams. Three common stream crossing structures are culverts, bridges, and fords.

Stream crossings must be designed, constructed, and maintained to safely handle expected vehicle loads and to minimize disturbance of streambanks, channels and, ultimately, aquatic organisms. Consider streambed material, stream size, storm frequency, flow rates, intensity of use (permanent or temporary), and the passage of fish when planning crossings.

General BMPs for Stream Crossings

Before installing or constructing a ford, culvert, or bridge across any intermittent or perennial stream contact the Illinois Department of Natural Resources, Office of Water Resources. A permit is required for construction in a floodway of any stream if the drainage area exceeds 1 square mile in an urban area or 10 square miles in a rural area. IDNR-Office of Water Resources, Army Corp of Engineers, and EPA have a joint application form for this permit in Illinois. To receive a application form contact the IDNR-Office of Water Resources at (217) 782-3863.

For temporary stream crossings for skid trails, see the Stream Crossings for Skidding section in Chapter III. *Timber Harvesting.*

- Use soil stabilization practices at stream crossings. Use seed and mulch and install temporary sediment control structures, such as straw bales or silt fences, immediately following construction to minimize erosion into streams. Maintain these practices until the soil is permanently stabilized. Refer to the Soil Stabilization section on page 25.

- Design, construct, and maintain stream crossings to avoid disrupting the migration or movement of fish and other aquatic life. Bridges or arch culverts that retain the natural stream bottom and slope are preferred for this reason.

- Install stream crossings using materials that are clean, non-erodible and not-toxic to aquatic life.

- Install stream crossing structures at right angles to the stream channel.

- Minimize channel changes and the amount of excavation or fill needed at the crossing.

- Limit construction activity in the water to periods of low or normal flow. Keep use of equipment in the stream to a minimum.

- Construct a bridge or place fill directly over a culvert higher than the road approach to prevent surface runoff from draining onto the crossing structure and into the stream (Figure 5-3).

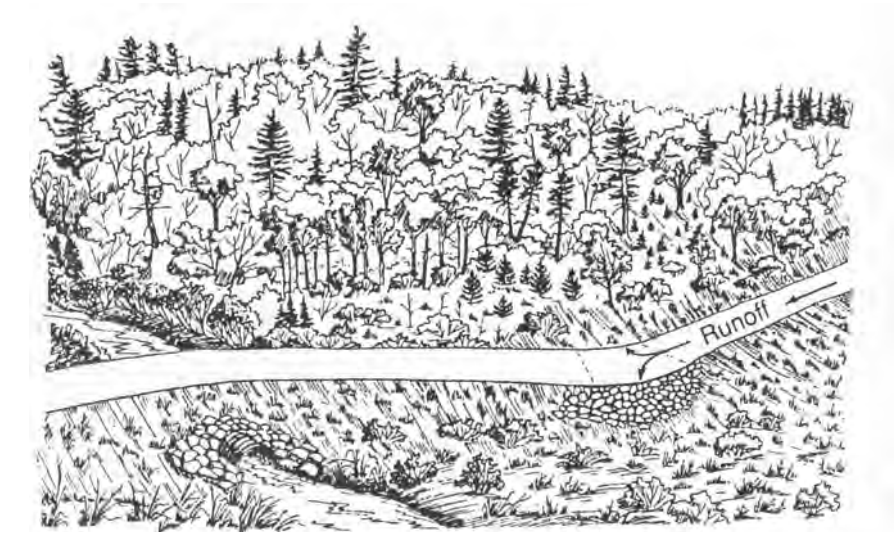


Figure 5-3. Place fill directly over a culvert higher than the road approach to prevent surface runoff from draining onto the crossing structure and into the stream.

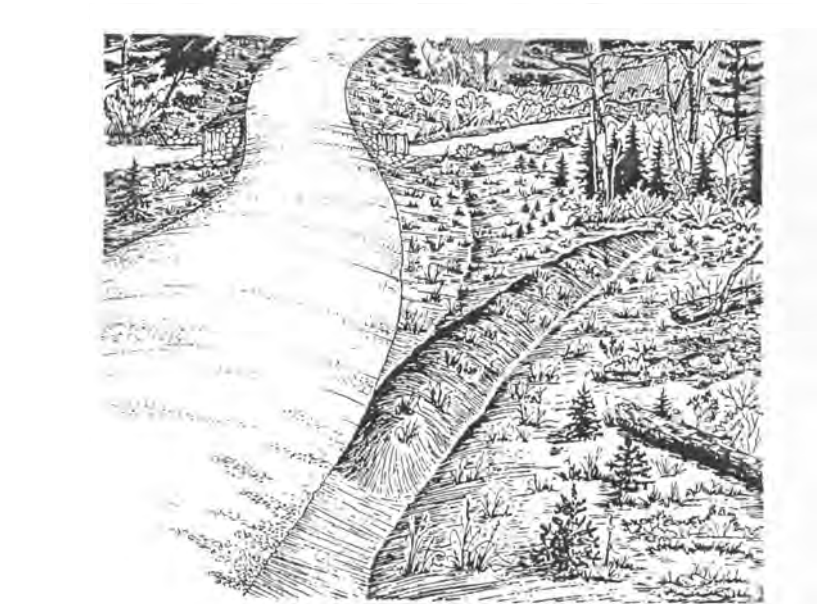


Figure 5-4. Diversion ditch.

- Divert road drainage into undisturbed vegetation, preferable outside the SMZ so that the drainage does not directly enter the stream (Figure 5-4). See Diversion Structures on page 25.

- Stabilize approaches to bridge, culvert, and ford crossings with gravel or other suitable material to reduce sediment entering the stream.

- Anchor temporary structures on one end with a cable or other device so they do not float away during high water. Install them so that they can be easily removed when no longer used, regardless of the season.

Pipe Culverts for Stream Crossings

- Install pipe culverts long enough so that road fill does not extend beyond the ends of a culvert.

- Install permanent culverts that are large enough to pass flood flows and are a minimum of 12 inches in diameter. Culverts that are too small can plug up with debris and result in the road washing out or in flooding upstream. See inside back cover for culvert sizing table.

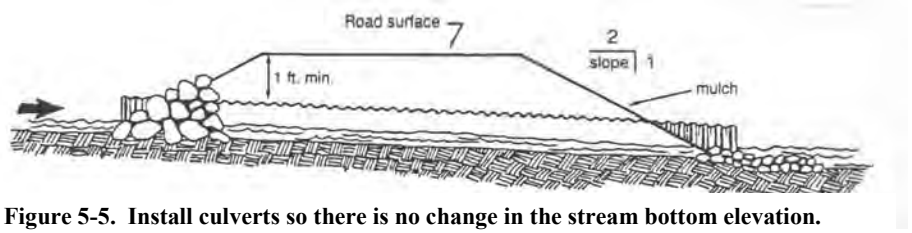


Figure 5-5. Install culverts so there is no change in the stream bottom elevation.

- Install culverts so there is no change in the stream bottom elevation (Figure 5-5). Culverts should not cause damming or pooling.

- Firmly compact fill material around culverts, particularly around the bottom half. Cover the top of culverts with fill to a depth of one-third of the pipe diameter or at least 12 inches, whichever is greater, to prevent crushing (Figure 5-6).

- Use riprap around the inlet of culverts to prevent water from eroding and undercutting the culvert (Figure 5-7). For permanent installations, use filter fabric under the riprap. In addition, consider using flared-end culvert sections for inlets. Keep culverts clear and free of debris so that water can pass at all times. This is especially important in areas where beaver are present.

- Keep culverts clear and free of debris so that water can pass at all times. This is especially important in areas where beaver are present.

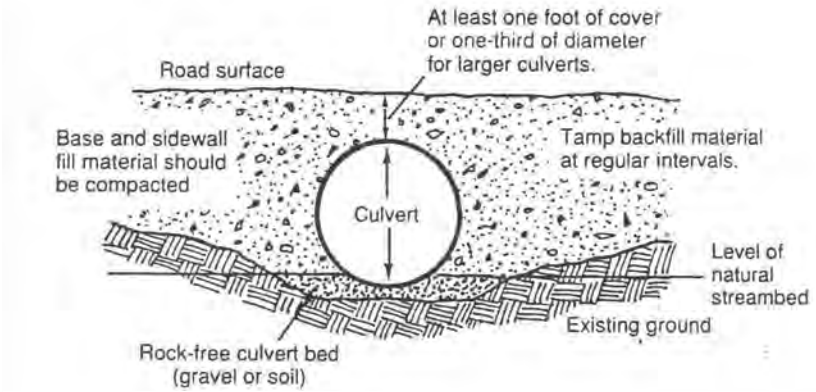


Figure 5-6. Installation of culverts.

(Adapted from Montana Department of State Lands, 1992.)

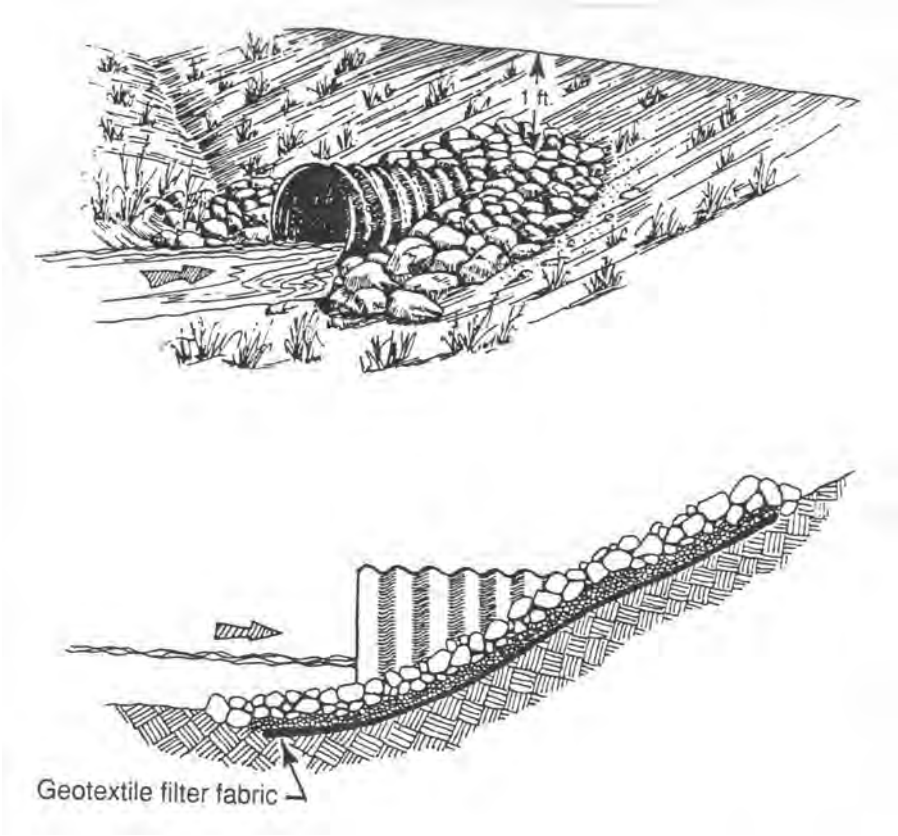


Figure 5-7. Use riprap around the inlet of culverts. Also use geotextile filter fabric for permanent installations.

Fords

- Use fords for crossing dry streambeds or where fording would cause minimal water quality impacts.
- Locate fords where streambanks are low.
- Streambed should have a firm rock or gravel base. Otherwise, install stabilizing material such as reinforced concrete planks, crushed rock, riprap or rubber mats on streambeds.

Road Construction

The most effective method to control erosion on forest roads is to keep water from accumulating on the road surface. Fast-moving water can easily erode soil from road surfaces and ditches, but road erosion can be controlled when water drains off the road surface and is dispersed into vegetation and ground litter.

- Design and construct roads to remove water from road surfaces to keep the road dry and structurally sound. Figure 5-8 shows three common road designs: crowned, outsloped, and insloped. Install insloped roads with ditches and adequate cross drainage. Outsloped roads (usually outsloped 2-4%) are less expensive to construct and maintain; use them on roads with moderate gradients and stable soils.

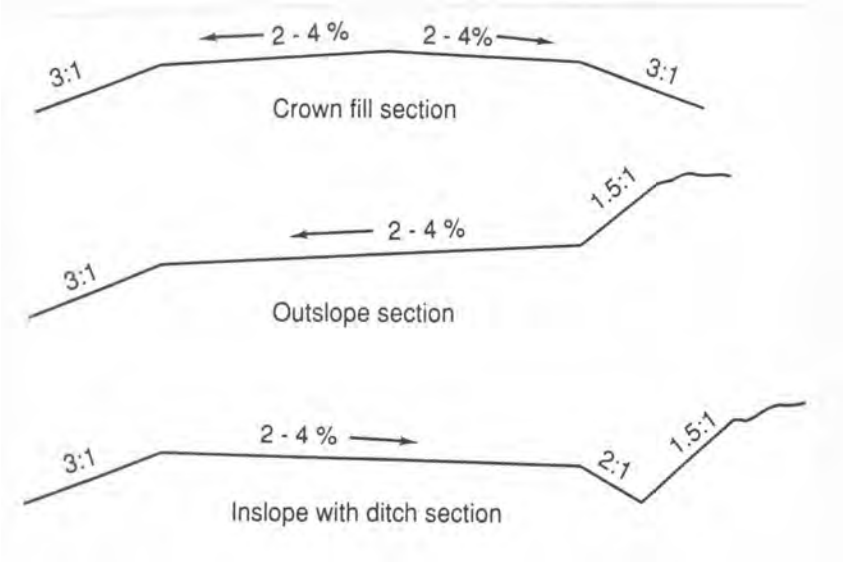


Figure 5-8. Typical road designs for drainage and stability.

- Construct stable cut-and-fill slopes that will revegetate easily, either naturally or artificially.

- Do not bury debris in the road base. It causes uneven settling that can lead to erosion and frost-heaving that creates mud holes.

- Compact the road base material or allow it to settle before using the road to reduce the amount of water that soaks into it. This will increase the road's carrying capacity, reduce road maintenance and reduce erosion.

- Surface the road with gravel where steep grades, erodible soils, or high traffic volume make the potential for surface erosion significant.

Drainage Structures

Road drainage structures include cross drains (pipe culverts, open-top culverts, broad-based dips, and water bars) and water-diverting structures. Cross drains allow water from roadside ditches to move from one side of the road to the other.

- Where necessary to protect water quality, install road drainage structures to remove storm water or seepage from the road surface and ditches. Space these structures at intervals close enough to minimize water flow volume and speed, avoiding ditch erosion. As road grades increase, use drainage structures more often. See Table 5-1 below.
- Where necessary, provide erosion protection for outflows from road drainage structures to minimize erosion and disperse the water, allowing it to soak into the soil. Riprap, mulch and/or seeding may be necessary. See the *Soil Stabilization* section on page 25.

Table 5-1. Recommended distances between drainage structures on forest roads and skid trails.

Road Grade %	Distance Between Waterbars (feet)	Distance Between Board-based dips and cross-drain culverts (feet)
1	400	500
2	250	300
5	130	180
10	80	150
15	50	130
20	45	120
25+	40	110

Pipe Culverts for Cross Drains

- Install pipe culverts to provide cross drainage on road grades at regular intervals immediately above steep grades, below bank seepages, and where water will run onto log landings or forest roads.

- Install pipe culverts long enough so that road fill does not extend beyond the end of a culvert.

- Install cross drain pipe culverts at grades at least 2% more than the ditch grade and angled 30 to 45 degrees to improve inlet efficiency (Figure 5-9).

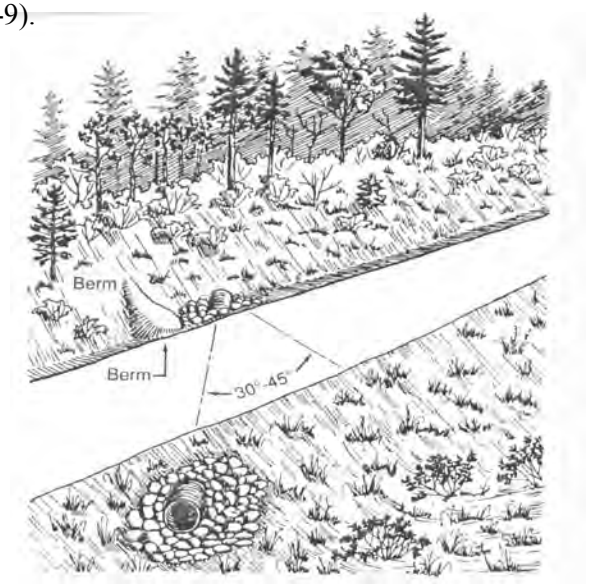


Figure 5-9. Cross-drain culvert.

- Select the size of cross-drain culverts according to the size of the road and area drained by the ditch. To avoid clogging, permanent culverts should be at least 12 inches in diameter.

- Install pipe culverts on a surface of compacted granular material. Firmly compact fill material around culverts, particularly around the bottom half. Cover the top of the culvert with fill to a depth of one-third of the pipe diameter, or at least 12 inches (whichever is greater) to prevent crushing (Figure 5-6, page 19).

- Use riprap around the inlet of culverts to prevent water from eroding and undercutting the culvert.

Open-Top Culverts

Open-top culverts provide cross drainage and road surface drainage (Figure 5-10) and are usually installed on seasonal or temporary roads.

- Install open-top culverts to provide cross drainage immediately above steep grades, below bank seepages, where water will run onto log landings or forest roads, and on road grades at regular intervals.

- Clean open-top culverts frequently since they easily fill with debris.

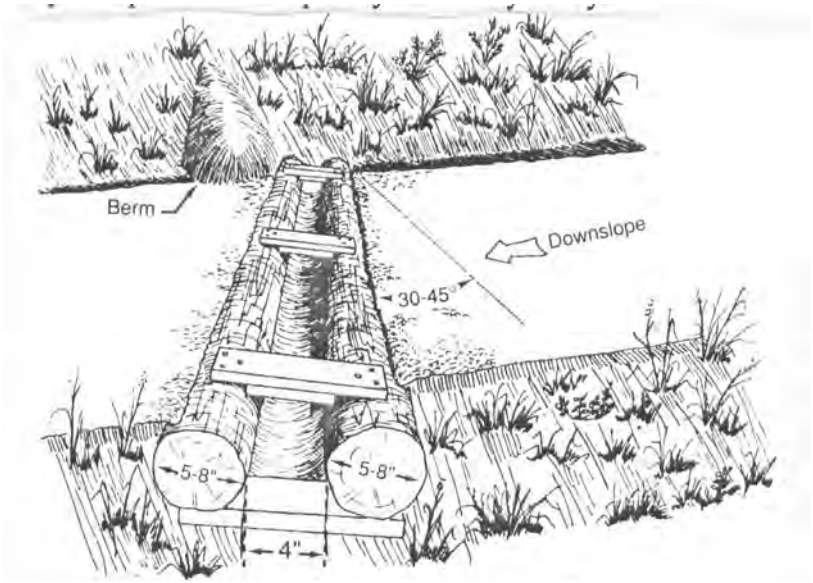


Figure 5-10. Open-top log culvert.

Broad-Based Dips

Broad-based dips can provide cross drainage and road-surface drainage for roads and skid trails with a gradient of 15% or less (Figure 5-11). Broad based dips can be used instead of culverts, usually at lower cost and with lower maintenance. Dips are not used for draining seeps, or for intermittent or permanent streams.

Broad-based dips are often used in conjunction with outsloped roads. That eliminates the need for ditching the upslope side of the road, thus eliminating costly road maintenance.

- Construct broad-based dips deep enough to provide adequate drainage and wide enough to allow trucks and equipment to pass safely.
- Place a surface of crushed stone or gravel on the dip and mound for soils and conditions where rutting may occur.

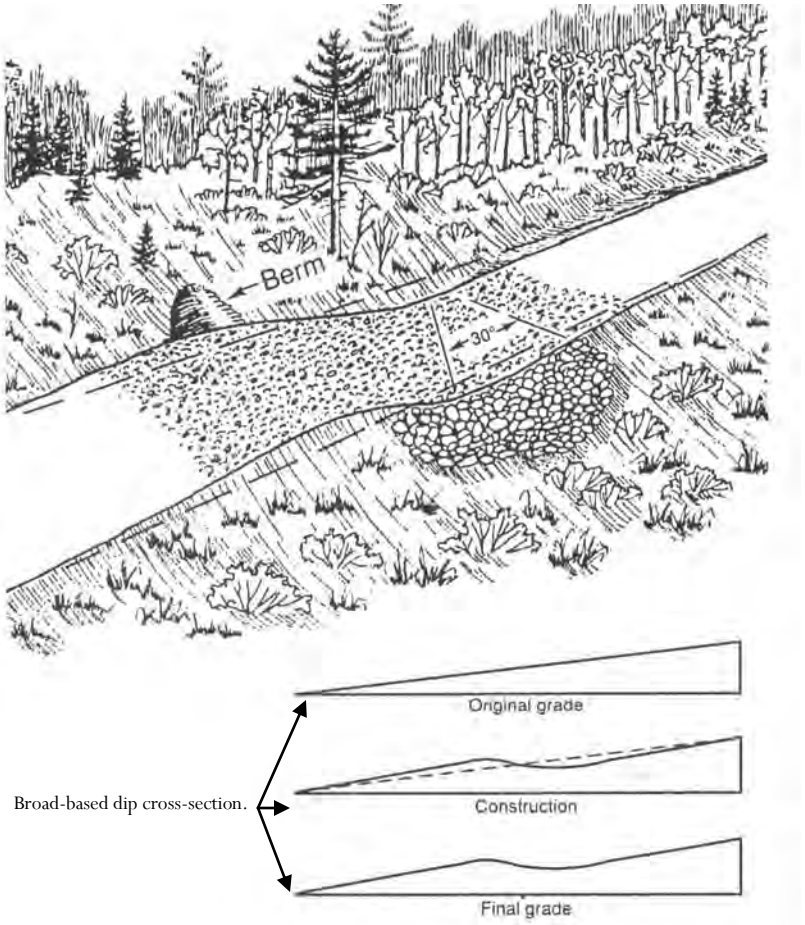


Figure 5-11. Broad-based dip.

Water Bars

A water bar is a shallow trench with a mound (or berm) which provides cross drainage and intercepts runoff from skid trails, recreational trails, firebreaks, or inactive or closed roads (Figure 5-12). Constructing a water bar will minimize erosion and provide conditions for natural or artificial revegetation.

- Place water bars at a 30 to 45 degree angle with a cross drainage grade of 2%.

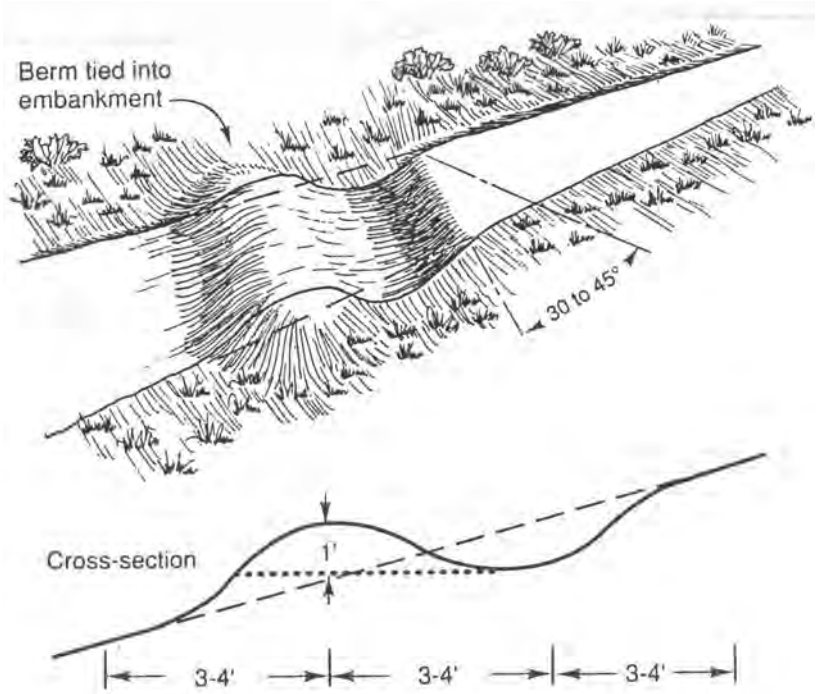


Figure 5-12. Water bar.

Diversion Structures

Diversion ditches, or berms, divert water away from roads and side ditches, and channel it into vegetation (Figure 5-4, page 17). These structures are often used before stream crossings to ensure that water will be diverted into vegetation and not directly into a stream, lake, or wetland.

- Construct diversion ditches so they intersect the roadside ditch at the same depth and are outsloped 1% to 3% (Figure 5-4, page 17).

Soil Stabilization

Soil stabilization practices are used where soil is exposed and natural revegetation in inadequate to prevent soil erosion and subsequent sedimentation into streams, lakes and wetlands. This occurs during road construction and when the road system is being used (active) or is closed (inactive). Practices include mulching, seeding, and installing sediment control structures.

It is always more efficient and cost effective to prevent erosion than it is to repair damage after the fact.

Mulching and Seeding

- Use mulch and/or seed where necessary to minimize soil erosion into streams, lakes, and wetlands.

Mulch, such as straw, woodchips or bark, retains soil moisture, important for seed germination, and protects the soil surface from erosion due to runoff and raindrop impact. Mulch can be used to promote natural revegetation and protect a seeded area. If you seed, apply mulch immediately afterward. Netting may be necessary to hold mulch in place on steep slopes or on areas where water flow concentrates.

Seed mixtures should include fast growing species for quick soil protection plus perennial species for longer soil protection until native vegetation returns to the site. Recommendations for seed mixes that are best for specific regions in Illinois are available at your local Illinois Department of Natural Resource office and USDA Natural Resources Conservation Service (NRCS) office. See Appendix E for NRCS recommended Critical Area Planting seeding rates.

Wildlife Enhancement

To ensure immediate vegetative cover, a generic "shotgun" wildlife mix is often recommended to account for differences in pH levels, soil types, and seasons of the year. Apply the mixture at approximately 14 lbs. of seed/acre.

Minimum seed combination rates:

Seed Type	Rate of Application
Orchard grass	3 lbs. / acre
Medium red clover	4 lbs. / acre
Ladino clover	1 lbs. / acre
Timothy	2 lbs. / acre
Korean lespedeza	4 lbs. / acre

Use a cover crop of Winter Wheat at 40 lbs./acre or Annual Rye at 10 lbs./acre to 12 lbs./acre. The time of the year will determine which seed is used. Use wheat in the fall only and rye throughout the summer months. Then use combined seed mixture in the spring.

A soil test is recommended for fertilizer and lime amounts needed.

Alternative wildlife seed mixture:

Seed Type	Rate of Application
Red Top	2 lbs. / acre
Timothy	2 lbs. / acre
Korean Lespedeza OR	5 lbs. / acre
Ladino Clover	3/4 lbs. / acre

A soil test is recommended for fertilizer and lime amounts needed.

Sediment Control Structures

- Install sediment control structures where necessary to slow the flow of runoff and to trap sediment until vegetation is established at the sediment source. Sediment control structures include straw bales, fencing, silt fencing, and sediment traps (Figure 5-13a, b, c).

- Maintain, clean, or replace sediment-control structures until areas of exposed soil are stabilized.

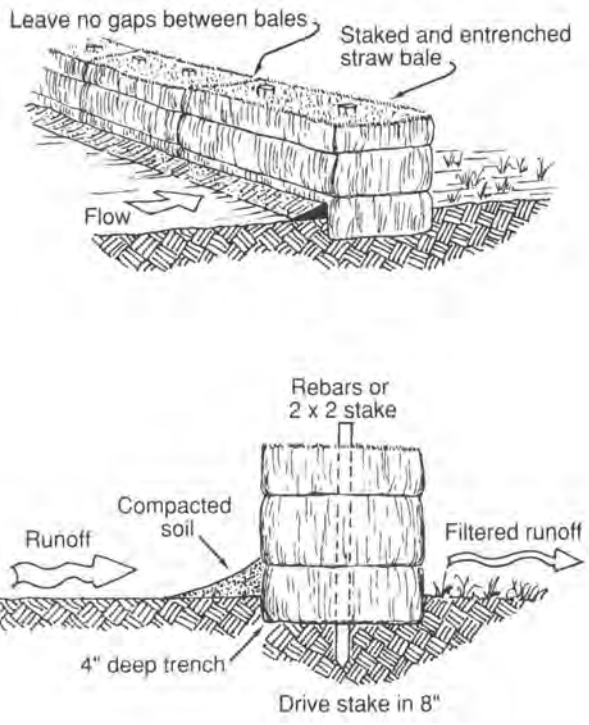


Figure 5-13 a.

Straw bale fencing to slow runoff and trap sediment for sheet flow or channelized flow.

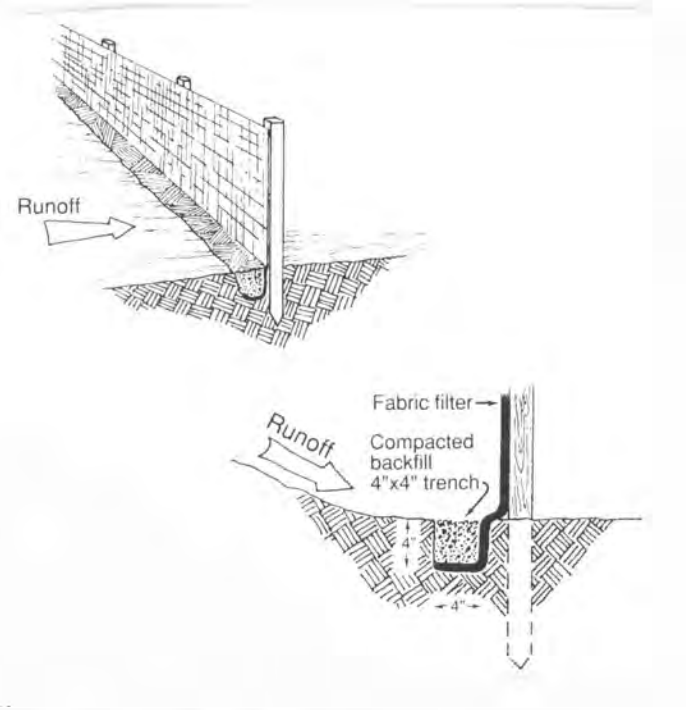


Figure 5-13 b.

Silt fencing to slow runoff and trap sediment primarily for sheet flow, not channelized flow.

Figure 5-13 c.

A sediment trap to slow runoff and trap sediment for channelized flow.

Road Maintenance

Roads must be well maintained or water quality protection structures quickly degrade. For both active and inactive roads, follow BMPs in the Soil Stabilization section on page 25.

Active Roads

- Inspect the road system at regular intervals, especially after heavy rainfall, to detect problems and to schedule repairs.
- Clear debris from culverts, ditches, dips and other drainage structures to decrease clogging that can lead to washouts. Place debris where it cannot be washed back into these structures or into open water.
- Keep traffic to a minimum during wet periods to reduce maintenance needs.
- Shape road surfaces periodically to maintain proper surface drainage. Fill in ruts and holes with gravel or compacted fill as soon as possible to reduce erosion potential.
- Remove berms along the edge of the road if they will trap water on the road.

Inactive Roads

When forest roads are inactive for extended periods, closing the system will help to protect the road surface and the water quality protection structures. Consider erecting a barrier to traffic such as a gate or berm, and post "Closed" signs at the entrance of temporarily closed roads. Stating the length of time and/or reason for closure, and inviting acceptable uses may be helpful to assure compliance.

- Remove all temporary drainage and stream crossing structures.
- Shape all road system surfaces to maintain proper surface drainage, if necessary.
- Install water bars where necessary. See the Water Bars section on page 24 - 25 and follow recommendations in Table 5-1 on page 21.
- Inspect and maintain road surfaces, permanent drainage and stream-crossing structures (ditches, culverts, bridges, etc.) to minimize erosion.

VI - MECHANICAL SITE PREPARATION AND TREE PLANTING

Site preparation prepares the land for planting, direct seeding or natural regeneration. Using machinery to prepare sites and plant trees exposes soil. Proceed carefully to maintain good water quality.

Common site preparation techniques includes scarifying, shearing, raking, disking, and roller chopping. Select a technique based on specific site characteristics including soil, topography, vegetation, access, and distance to surface waters. Prescribed burning and herbicides are also used for site preparation; BMPs for these management tools are listed in Chapters VII and IX.

- Avoid operating mechanical site-preparation and tree planting equipment on slopes greater than 30% where the slopes drain directly into a body of water.
- Operate mechanical site-preparation and tree-planting equipment on the contour where necessary to minimize erosion into water bodies.
- Minimize raking in areas, or under conditions, in which soil could erode and enter water bodies. Two preferred practices are (a) shearing and raking when the soil is frozen; and (b) raking lightly to remove slash only.
- Suspend operations during wet periods if equipment begins to cause excessive soil disturbance.
- Deposit site preparation residues in stable locations outside streamside management zones.
- Use patch scarification or low-intensity prescribed burns on sites that have steep slopes, erodible soils, and on sites that drain to surface water.
- Consider herbicide treatment instead of mechanical methods. The use of herbicides causes less disturbance to the soil. Be sure to follow all label recommendations on the product. See Chapter IX -*Chemical Use and Hazardous Materials Disposal*..

- On slopes utilize barrier zones, or undisturbed strips, to act as natural terraces, Figure 6-1. Install these at times and places as per the guidelines for water bars on pages 24 - 25.

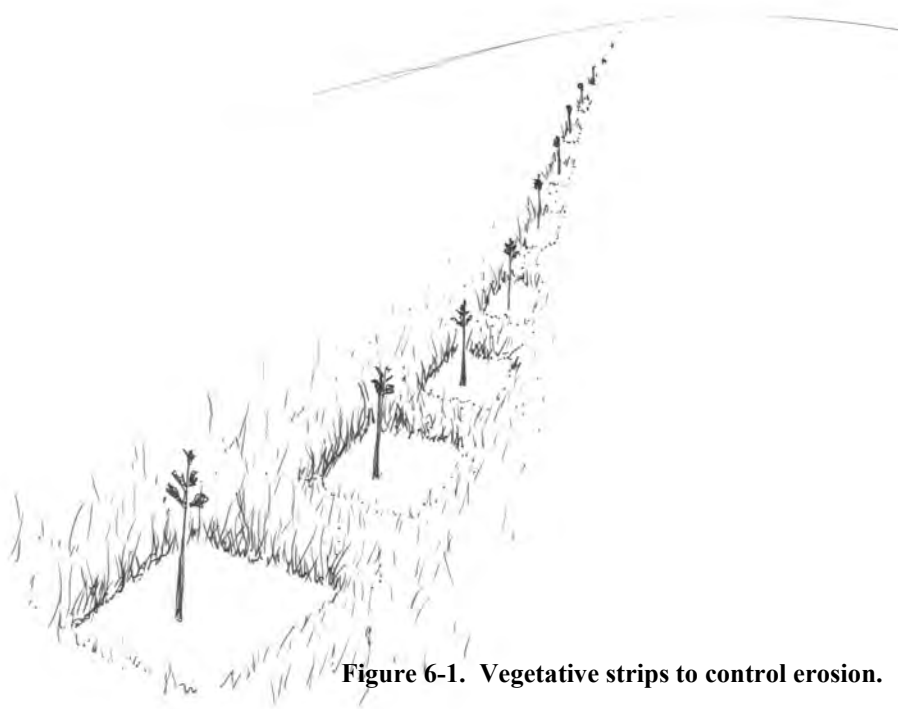


Figure 6-1. Vegetative strips to control erosion.

On slopes where band spraying is done, leave vegetative strips within the row by interrupting the spray of herbicide. Leave strips at intervals per guidelines for water bars page 28.

VII—PRESCRIBED BURNING AND WILDFIRE CONTROL

In forest management, prescribed burning may be used to reduce unwanted vegetation and debris. It may also be used for site preparation in reforestation practices, and to reduce fuel load to minimize potential wildfire damage.

Low-intensity fires have little effect on water quality. However, fires that burn intensely are likely to consume forest floor litter and expose soil, which can lead to erosion and harm water quality.

Burning Permits are required in southern Illinois during the months of February, March, April, October, and November. These permits are required by the Illinois Department of Natural Resources in the counties of Alexander, Hardin, Jackson, Johnson, Pope, Pulaski, and Union, due to the amount of forested acres on private and public lands. The free, five-day permits can be obtained from U.S. Forest Service offices, IDNR State Parks and other designated fire permit offices.

Always rely on trained and experienced personnel to plan and implement prescribed burns: the BMPs in this chapter are designed to complement professional training. Contact the Illinois Department of Natural Resources for more information.

Prescribed Burning

Planning

- Develop a prescribed burn plan. Example plans are available from IDNR or NRCS. An IEPA Open Burning Permit should be filed as well as any other applicable local permits.

- Carefully plan all prescribed burns. Clearly identify your objectives. Develop a plan that includes the following measures:

    1. Plan to control erosion after the burn to prevent sediment runoff to streams, lakes, and wetlands (See the After-Fire Maintenance section of this chapter).

2. Carefully select fireline locations and consider weather, fuel, soil, and topographic conditions in the burn area to minimize impacts on water quality.
3. Where prescribed burning is recommended, it should be seasonally timed so that rapid revegetation and development of trees and other plants is enhanced. This provides for rapid uptake of the readily available nutrients released by the fire.

Implementation

- Avoid intense burns that remove forest floor litter which may expose soil in streamside management zones and on slopes where eroded soil may drain to surface water.
- Avoid burning piles of slash in streamside management zones.
- Use natural or existing barriers (e.g., roads, streams, lakes) where possible, or wet lines for firelines where bladed or plowed firelines will erode soil and degrade water quality.
- Avoid plowed and bladed firelines in streamside management zones except where necessary to control wildfire.
- Where possible, locate bladed firelines on the contour. Construct water bars as needed to direct surface water off firelines and into undisturbed forest cover. Recommended specifications for building water bars and their spacing can be found in the Drainage Structures section in Chapter V: *Forest Roads* on pages 21 - 29.
- Avoid applying chemical fire retardants over surface water. Prevent chemical fire retardants from flowing into surface water.

Wildfire

Note: When fighting wildfires, preventing harm to people and property should be your top priority. After containing the fire, you need to address land rehabilitation to prevent or minimize nonpoint source pollution of lakes, streams, and wetlands.

- Whenever possible, avoid applying chemical fire retardants over surface water.

Prevention

- Use caution when smoking in the woods.
- All logging equipment should have appropriate spark arresters.
- Protective screens should be installed on all logging equipment to prevent trash from reaching hot parts of the engine or exhaust system. These hot areas should be periodically checked for combustible materials becoming lodged next to them. Immediately remove any such material.
- Equipment should be carried in vehicle or stored in a known central location in case of emergency. A fully charged fire extinguisher should be easily accessible. All personnel should be properly trained in the use of fire fighting equipment and in wildfire suppression.
- Proper handling of fuel in transport, storage, and refueling operations, is essential.

Remember: Preventing a wildfire is a lot easier than putting a fire out after it has begun.

After-Fire Maintenance for Prescribed Burns and Wildfire

- Do not clean chemical-application equipment in surface water, or in locations that drain directly into surface water.
- Use erosion control measures for firelines that could erode soil into lakes, streams and wetlands. Erosion control measures include revegetation (Soil Stabilization section, pages 25 - 26 in Chapter V: *Forest Roads*) and installing water bars (Drainage Structures section, pages 21 - 29 in Chapter V: *Forest Roads*). Placing sod back into plowed furrows at appropriate intervals can act as water bars.
- Maintain soil stabilization practices until the site is fully revegetated and stabilized.
- Use mowing or other practices that do not expose soil as alternatives to blading or disking for maintaining firebreaks where erosion may degrade water quality.

VIII - WETLANDS

The Corps of Engineers (Federal Register, 1982) and the EPA (Federal Register, 1980) jointly define wetlands as : Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetlands must have the following three characteristics: 1) Hydric Soil - Soil that has been classified as hydric and has anaerobic conditions in the upper part due to wetness. 2) Hydrology - Inundation or saturation sufficient to support hydrophytes. 3) Vegetation - The prevalent plants adapted to water or soils deficient in oxygen due to saturation.

Wetlands provide many functional values in the ecosystem, among them:

Shoreline Protection. Shoreline vegetation absorbs the force of waves and currents, protecting against erosion. Roots of wetland plants hold together lake shores and streambanks.

Flood Protection. By storing runoff from heavy rain and snowmelt, wetlands reduce flood damage.

Water Quality Protection. Wetlands store and filter pollutants such as sediment and the nutrients in sediment. Also, wetlands can transform some pollutants into non-polluting forms.

Groundwater Recharge and Discharge. Some wetlands recharge groundwater by moving surface water into the groundwater system. Groundwater discharge occurs when groundwater flows to the surface and into streams, lakes and wetlands. This discharge is especially important in summer, providing stream baseflows critical to aquatic life.

Animal and Plant Habitat. Many animals spend their lives in wetlands, while others use wetlands for feeding, breeding, resting, nesting, escape cover, or travel corridors. Wetland plants provide food and shelter for many animal species. Over 60% of vertebrate animal species listed as threatened or endangered in Illinois utilize wetlands for at least part of their life cycle.

Forestry BMPs in wetlands protect water quality from erosion and minimize changes to the surface and sub-surface water movement. Changing the surface and sub-surface water movement can affect the health of the wetland ecosystem and its flood protection function.

Activities in wetlands are often subject to municipal, county, state, and federal permit and regulatory requirements. Some of these requirements are listed in Appendix B: *Federal and State Regulations.* If you suspect your project may involve a wetland and want to know whether regulations apply, contact the USDA Natural Resources Conservation Service (NRCS) or U.S. Army Corps of Engineers (ACOE).

Many Illinois wetlands, particularly forested bottomlands, do not contain standing water much of the year and are therefore not obvious to the casual observer. Maps from the Illinois Wetland Inventory can help you make a preliminary definition as to whether your project will affect wetlands. Illinois Wetland Inventory maps may be reviewed at county NRCS offices.

General BMPs

- If at all possible, avoid locating roads and landings in wetlands; otherwise use extreme caution.
- Whenever possible, forest management activities in wetlands should occur on frozen ground during the winter to minimize rutting.
- For activities in wetlands, consider allowing more flexibility for completion dates in timber sale contracts to allow the logger time to complete logging activities during firm ground conditions.
- Identify streamside management zones along all streams and lakes. For more information, see Chapter IV: *Streamside Management Zones.*
- Do not move slash from upland sites into a wetland.
- Keep slash out of open water.
- Only use pesticides labeled for use in wetlands.
- Avoid equipment maintenance and fueling in wetlands. See Chapter IX: *Chemical Use and Hazardous Materials Disposal.*

Roads, Skid Trails, and Landings

Temporary roads, skid trails, and landings require firm or frozen ground. Permanent roads in wetlands that require road-fill material must follow existing regulations and be built carefully to avoid restricting the natural waterflow of the wetland under the road.

- Construct upland road approaches to wetlands so that surface runoff is diverted away from the road so the runoff does not enter the wetland. (See the Drainage Structures section in Chapter V: *Forest Roads*, pages 21- 29.)
- If landings are necessary in a wetland, build them to the minimum size required for the operation and to achieve the landowner's objective.

- Avoid operating equipment in areas of open water, springs, or seeps.
- Provide for adequate cross-road drainage to minimize changes to natural surface and subsurface flow in the wetland.

For permanent fill roads, use permeable fill material for at least the first layer of fill, and install culverts or bridges a minimum of 300 feet apart and at all natural drainage ways. Install at least one drainage structure at each wetland crossing.

For temporary roads, provide adequate cross-road drainage at all natural drainage ways. Temporary drainage structures include culverts, bridges and porous material such as corduroy. Temporary non-organic structures, such as metal culverts and bridges, should be removed promptly when work is complete.

- Equipment operations should cease before rutting becomes excessive.
- Use low-ground pressure equipment, such as wide-tire or tracked equipment, if necessary to minimize rutting.
- Minimize rutting in wetlands by operating on firm or frozen ground that can support the equipment used. To achieve this: 1) Operate equipment on a day-to-day basis depending on weather conditions; and 2) Consider using corduroy or rubber mats to improve the soils ability to support traffic.

In the winter:

To promote frost penetration, compact snow, grass and brush.

As air temperatures rise above freezing, equipment operation beyond late morning may create ruts. Soil frost begins to disappear when night temperatures stay above freezing for three or four consecutive nights.

In the summer:

Operate equipment only when soils are dry enough to support equipment.

Federal Requirements for Forest Roads in Wetlands

Section 404 of the federal Clean Water Act regulates the placement of fill (including roadbeds) into wetlands and waters of the United States. The following 15 BMPs must be implemented in order to qualify for the silvicultural exemption from a federal section 404 permit when building a temporary or permanent road or skid trail in a wetland (33 CFR part 323.4). The silvicultural exemption is only applicable when the primary purpose of the road is for normal silvicultural purposes. This listing is an attempt to explain the 15 BMPs in lay language. The exact language of the law may be obtained by contacting the Army Corps of Engineers.

1. Limit the number, length, and width of roads and skid trails to the minimum necessary to accomplish the landowner's objective.

2. Locate roads outside streamside management zones except at stream crossings. For more information, see Chapter IV: *Streamside Management Zones*.

3. Road fill must be bridged, culverted, or otherwise designed to prevent restriction of expected flood flows.

4. Properly stabilize and maintain road fill material during and after road construction to prevent erosion.

5. While building a road with fill material, minimize the use of road construction equipment in the wetland area that lies outside the boundaries of the road fill.

6. Minimize disturbance of vegetation while designing, constructing, and maintaining roads.

7. Correctly design, construct and maintain wetland road crossings to avoid disrupting the migration or movement of fish and other aquatic life.

8. Use fill from upland sources whenever feasible.

9. Place fill in a way that does not take or jeopardize the continued existence of a threatened or endangered species (as defined under the Endangered Species Act) or adversely modify or destroy the critical habitat of such species.

10. Avoid placing fill in breeding and nesting areas for migratory waterfowl, in spawning areas, and in wetlands if practical alternatives exist.

11. Fill shall not be placed near a public water supply intake.

12. Fill shall not be placed in areas of concentrated shellfish or mussel production.

13. Fill shall not be placed in waterbodies or on land regarded as part of the National Wild and Scenic River System.

14. Use fill, free of toxic levels of pollutants.

15. Completely remove all temporary fills and restore the area to its original elevation.

Photo by J. Zaczek, SIUC

IX—CHEMICAL USE AND HAZARDOUS MATERIALS DISPOSAL

Pesticides and Other Chemicals

Common chemicals used in forest land management are generally pesticides (insecticides, herbicides, and fungicides) and fertilizer. These chemicals are used to control pests - including insects, diseases, and unwanted vegetation - and to enhance tree growth.

When used properly, chemicals should not affect water quality. However, when improperly applied, chemicals can contaminate surface water or groundwater when they drift, flow overland as runoff, or leach through the soil into groundwater. Most water quality problems associated with pesticides and fertilizers are caused when they are spilled or improperly sprayed directly on surface water.

Some chemicals are labeled for use in or near streams, lakes, or wetlands. Still, use extra care when using chemicals in streamside management zones and wetlands.

Integrated Pest Management (IPM) uses a combination of manual, mechanical, biological, chemical and preventative techniques to minimize the impact of insects, diseases, and unwanted vegetation. IPM may reduce dependence on the use of chemicals.

The following best management practices describe techniques to avoid contaminating surface water and groundwater. These guidelines compliment local, state, and federal regulations governing the storage, sale, transportation, handling and application of chemicals.

By federal law, chemical users must follow the manufacturer's label on pesticide containers.

Employers have the responsibility of making Material Safety Data Sheets (MSDS) readily available to employees involved in chemical application.

General BMPs for Pesticide Use

- Licenses and permits are required for the purchase and application of certain chemicals in Illinois. Check with the Illinois Department of Agriculture for more information.
- Even those applying non restricted pesticides should be licensed. Obtaining a license provides some learning opportunities.
- Maintain a spill containment and cleanup kit appropriate for the materials on the operation and report all spills. For general guidelines, see the Spills section on page 44.
- Follow all EPA product label instructions on chemical containers.
- Apply chemicals only under favorable weather conditions.
- Calibrate spray equipment to apply chemicals uniformly and in the correct quantities.
- Prevent chemical leaks from equipment. Do preventative maintenance and repair on all equipment for leaking hoses, connections and nozzles.
- Use chemicals in streamside management zones with guidance from a trained natural resource professional.
- When applying chemicals not labeled for aquatic use in streamside management zones, use spot-injection or stump treatment methods.
- Avoid applying herbicides in areas where the chemicals can kill stabilizing vegetation on slopes, gullies, and other fragile areas subject to erosion that drain into surface water.
- Pesticides should only be used and applied by trained, licensed individuals or under their direct control.
- Special care should be exercised in the application of pesticides to prevent drift.
- Mix and load chemicals out of streamside management zones.

- Rinse spray equipment and discharge rinse water only in areas that are part of the application site.

- Dispose of chemical containers according to label instructions.

Aerial Application of Pesticides

- Hire a licensed aerial applicator.

- Identify and avoid streamside management zones and surface water to prevent chemicals not specifically labeled for aquatic use from drifting over open water, or from accidentally being applied directly on the water.

Fuels, Lubricants, and Waste

Logging requires large equipment which is subject to rigorous use, often under harsh conditions. Maintenance and repair frequently are done on-site.

Antifreeze, fuels, and lubricants used in machinery can potentially pollute lakes, streams, wetlands, and groundwater. Planning for forestry operations should include practices to handle solid and liquid wastes generated in the field.

- Maintain equipment regularly. Check hoses and fittings daily to prevent leaks or spills.

- Designate specific areas for equipment maintenance and fueling. Locate these areas on level terrain, a minimum of 100 feet from all streams and lakes.

- Collect all waste lubricants, containers and trash. Store them in leak-proof containers until they can be transported off-site for recycling, reuse, or disposal at an approved site.

  Note: It is illegal to dump fuel, lubricants, and used oil on the roads, land, or waters in Illinois.

- Separate all fluids and materials and keep in different labeled containers to avoid creating "hazardous waste" and expensive waste disposal.

Spills

Proper equipment maintenance will prevent many spills.

The following best management practices are general guidelines for spills of fuel and lubricants used in forestry operations. These practices complement specialized training given to persons using pesticides or other hazardous materials.

- Maintain a spill-containment and cleanup kit appropriate for the materials on the operation. At a minimum, a kit for petroleum products should include:
  1. plugs and clamps to control a hydraulic line break;
  2. a container to catch leaking fluid;
  3. a shovel; and
  4. absorbent material such as sawdust to absorb fluid, especially useful in the winter when soil is frozen.

If a spill should occur, do the following in order:

1. Protect yourself and others. Wear protective clothing and equipment appropriate for any hazardous materials on the operation. Avoid coming in contact with any toxic drift or fumes that may be released.

2. Stop the leak and attempt to control the spill.

3. Attempt to contain the spill; keep it from spreading. Shovel a dike around the spill. Use absorbent material, such as sawdust or loose soil, to soak up fluid. Place a bucket under a hydraulic hose break. Prevent the spill from flowing into lakes or streams.

4. Isolate the spill material.

5. Report all spills to the National Response Center (800) 424-8802

Appendix A: Sources of Assistance

The Illinois Department of Natural Resources (IDNR) offers free technical advice and services to landowners.

Division of Forest Resources
One Natural Resources Way
Springfield, IL 62702
(217) 785-8774

IDNR Regional Forest Resources Offices: Contact the nearest office to obtain information on the location of your District Forester.

Region I Office
2612 Locust Street
Sterling, IL 61081
(815) 625-2968

Region II Office
30550 S. Boathouse Road
Wilmington, IL 60481
(815) 476-0109

Region III Office
1556 State Rt. 546
Clinton, IL 61727
(217) 925-6860

Region IV Office
4521 Alton Commerce Parkway
Alton, IL 62002
(618) 462-1181

Region V Office
11731 State Highway 37
Benton, IL 62812
(618) 438-8138

Other Illinois Department of Natural Resources (IDNR) divisions that offer free technical advice and services to landowners. Contact the appropriate office to obtain information on the Resource Professional responsible for your county.

Division of Wildlife Resources
One Natural Resources Way
Springfield, IL 62702
(217) 782-6384

Division of Fisheries
One Natural Resources Way
Springfield, IL 62702
(217) 782-6424

Division of Natural Heritage
One Natural Resources Way
Springfield, IL 62702
(217) 785-8691

Office of Water Resources
524 South Second Street
Springfield, IL 62701-1787
(217) 782-3863

Other State Government Offices

- Illinois Department of Agriculture
  P.O. Box 19281
  State Fairgrounds
  Springfield, IL 62794-9281 (217) 785-2427
- Illinois State Geological Survey
  615 East Peabody Drive
  Champaign, IL 61820 (217) 333-4747
- Illinois Environmental Protection Agency (IEPA)
  2200 Churchill Rd.
  Springfield, IL 62706 (217) 782-3397
- Illinois Department of Transportation
  2300 S Dirksen Pky.
  Springfield, IL 62764 (217) 782-5597

Federal Government Offices

- United States Department of Agriculture
  Farm Service Agency
  P.O. Box 19273
  Springfield, IL 62794-9273 (217) 492-4180

- United States Department of Agriculture
  Natural Resources Conservation Service
  2118 West Park Court
  Champaign, IL 61821 (217) 353-6647

- U.S. Army Corps of Engineers
  www.mvr.usace.army.mil (309) 794-5373

Colleges and Universities

- Southern Illinois University Carbondale
  1205 Lincoln Drive, Room 184
  Mail code 4411
  Carbondale, IL 62901 (618) 453-3341

- University of Illinois at Urbana - Champaign
  Department of Natural Resources and Environmental Sciences
  W-503 Turner Hall
  1102 S. Goodwin Ave.
  Urbana, IL 61801 (217) 333-2770

Commercial Pesticide Training and Certification Clinics

- IL Department of Agriculture
  License Information (800) 641-3934
  For pre-registration and study material information call:
  (800) 644-2123

Appendix B: Federal and State Regulations

Below is a list of regulations relating to forest management and water quality that you should be aware of. Other regulations may also apply to your operations. For more information, contact U.S. Army Corps of Engineers. This is only a summary of laws and their provisions for your information. Please refer to actual law for their complete requirements to assure compliance.

Federal Regulations (As of October 2002)

Please refer to current federal statutes and laws pertaining to these sections.

Section 404 of the Clean Water Act:

Under section 404, the U.S. Army Corps of Engineers requires permits for the alteration of wetlands and for the discharge of dredged or fill material into the waters of the United States (33 CFR 323.3). (Waters of the United States includes wetlands). There is a general exemption from section 404 for "normal farming, silvicultural, and ranching activities including plowing, seeding, cultivating, minor drainage, and harvesting for the production of food, fiber, and forest products, or upland soil and water conservation practices" (33 CFR 323.4). This is not a blanket exemption. There are 15 BMP's for "construction and maintenance of farm roads, forest roads, or temporary roads..." These 15 BMP's are listed in Chapter VIII: *Wetlands* on pages 39 - 40. This exemption does not allow for activities that would convert a wetland from one use to another.

Section 319 of the Clean Water Act:

Section 319 of the Clean Water Act provides the state with the authority to assess nonpoint source pollution and introduce management programs for controlling pollution.

Occupational Safety and Health Standards:

Section 1910.120 - Hazardous waste operations and emergency response. Paragraph (q) covers competency levels people need to conduct various response actions to a spill.

State of Illinois Regulations (As of October 2002)

Please refer to current state statutes and laws pertaining to these sections.

PROTECTING ILLINOIS WATERS

A COOPERATIVE EFFORT: BY YOU AND ILLINOIS ENVIRONMENTAL PROTECTION AGENCY, ILLINOIS DEPARTMENT OF NATURAL RESOURCES AND U.S. ARMY CORPS OF ENGINEERS

PERMIT REQUIREMENTS FOR THE STATE OF ILLINOIS

JOINT APPLICATION PROCESS

Construction projects in Illinois waterways, floodplains and wetlands often require both State and Federal authorization. This application packet is designed to simplify the approval process for the applicant seeking project authorizations from the U.S. Army Corps of Engineers (USCOE), The Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) and the Illinois Environmental Protection Agency (IEPA). Please refer to the map in Appendix A for agency addresses and telephone numbers. Each of these agency's authorities and requirements are briefly explained in the following paragraphs. Application forms are available from any of the listed agencies.

Anyone proposing to construct, operate or maintain any dam, dock, pier, wharf, sluice, levee, dike building, utility crossing, piling, wall, fence or other structure in, or dredge, fill or otherwise alter the bed or banks of any stream, lake, wetland, floodplain or floodway subject to State or Federal regulatory jurisdiction should apply for agency approvals. The appropriate copy of the **joint application form, drawing, and copy of any additional support information** should be sent to each of the regulatory agencies. Approvals may be required by any or all of the agencies. Applications filed simultaneously with USCOE, IDNR/OWR, and IEPA will be processed concurrently, in an independent manner, and should result in expedited receipt of all agency determinations. If a permit is not required by one or more of the agencies they will inform the applicant and other agencies.

Coordination with the regulatory and other review agencies is recommended **as early as possible** during the project planning stage. This allows revisions or other measures necessary to meet agency requirements to be make before project plans are finalized.

AGENCY AUTHORITIES AND REQUIREMENTS

1. The basis for the **U.S. Army Corps of Engineers** regulatory function over public waterways was formed in 1899 when Congress passed the Rivers and Harbors Act of 3 March 1899. Until 1968, the Rivers and Harbors Act of 1899 was administered to protect only navigation and the navigable capacity of this nation's waters. In 1968, in response to a growing national concern for environmental values, the policy for review of permit applications with respect to Sections 9 and 10 of the Rivers and Harbors Act was revised to include additional factors (fish and wildlife, conservation, pollution, aesthetics, ecology, and general welfare) besides navigation. This new type of review was identified as a "public interest review."

The Corps of Engineers regulatory function was expanded when Congress passed the Federal Water Pollution Control Act Amendments of 1972 and then the Clean Water Act Amendments in 1977. The purpose of the Clean Water Act was to restore and maintain the chemical physical, and biological integrity of this nation's waters. The "waters of the United States" regulated by the Corps of Engineers under Section 404 of the Clean Water Act includes most wetland areas.

The Corps of Engineers is responsible for determining the jurisdictional limits of wetlands and other Waters of the United States. Applicants may, however, elect to have a qualified representative conduct the appropriate preliminary wetland delineation for submittal with the permit application. All such determinations are subject to verification and confirmation by the Corps of Engineers. Although applicants are not required to provide a wetland delineation, these can assist in reducing delays associated with normal permit processing. Contact the appropriate Corps District office for additional information.

With your help Illinois Waters can be protected for future generations.

2. The **Illinois Department of Natural Resources**, Office of Water Resources, regulatory authority is the Rivers, Lakes and Streams Act (615ILCS5, 1994). Under this authority, permits are required for dams, for any construction within a public body of water, and for construction within floodways. Generally, floodway projects also require local authorization. In addition, map revision approvals may be required by ID-

NR/OWR and by the Federal Emergency Management Agency (FEMA) for major projects. Information and specific project requirements may be obtained as follows:

For Lake Michigan - All projects in or along Lake Michigan are subject to the Regulation of Public Waters rules (92 Illinois Administrative Code, Part 704). Joint permits are required for any work in Lake Michigan from IDNR/OWR and IEPA. Contact the Lake Michigan Management Section, Illinois Department of Natural Resources, Office of Water Resources, 310 S. Michigan - Room 1606, Chicago, IL 60604, (312) 793-3123.

For Cook, Lake, McHenry, DuPage, Kane and Will Counties - All projects within designated floodways are subject to the Floodway Construction Rules (92 Illinois Administrative Code, Part 708). Dams are subject to the Rules for Construction and Maintenance of Dams (92 Illinois Administrative Code, Part 702). All projects in public waters are subject to the Regulation of Public Waters rules (92 Illinois Administrative Code, Part 704). All other floodway construction projects are subject to the Construction in Floodways of Rivers, Lakes and Streams rules (92 Illinois Administrative Code, Part 700). Contact the Illinois Department of Natural Resources, Office of Water Resources, 524 S. Second St., Springfield, IL 62701, (217) 782-3863.

For the remainder of the State - Dams are subject to the Rules for Construction and Maintenance of Dams (92 Illinois Administrative Code, Part 702). All projects in public waters are subject to the Regulation of Public Waters rules (92 Illinois Administrative Code, Part 704). All other floodway construction projects are subject to the Construction in Floodways of Rivers, Lakes and Streams rules (92 Illinois Administrative Code, Part 700). Contact the Downstate Regulatory Programs Section, Illinois Department of Natural Resources, Office of Water Resources, 524 South Second Street, Springfield, IL 62701-1787, (217) 782-3863.

The **Illinois Department of Natural Resources** is also responsible under Illinois statutes for conserving and preserving the State's natural resources.

Under the provisions of the Fish and Wildlife Coordination Act (16 U.S.C. 661-661) the Department is given permit review responsibilities relative to Corps of Engineers permit applications.

The Department also administers the Interagency Wetland Policy Act of 1989 which is applicable to State agency actions and the Illinois Endangered Species Protection Act (Section 341) which is applicable to state agencies and local governments. Consultation with the Department under these Acts may be necessary in addition to these permit requirements.

Questions pertaining to this portion of the Department's role should be addressed to the Illinois Department of Natural Resources, Office of Realty and Environmental Planning, Division of Natural Resource Review and Coordination, One Natural Resources Way, Springfield, IL 62702, (217) 785-5500.

3. The Illinois Environmental Protection Agency provides water quality certification pursuant to Section 401 of the Clean Water Act. This certification is mandatory for all projects requiring a Section 404 permit. In addition to determining that the proposed work will not violate the applicable water quality standards, the IEPA also makes a determination of additional permit requirements pursuant to the Illinois Pollution Control Board Rules and Regulations. Additional permits may be required for activities such as construction of sanitary sewers, water mains, sewage and water treatment plants, landfill and mining activities, special waste hauling and disposal (of dredged material), and other miscellaneous activities. Separate applications are necessary if it is determined that IEPA permit is required. For projects in Lake Michigan, a joint permit is required from the IEPA and IDNR/OWR in addition to the Section 401 certification and 404 permit. Application for any structure or work in Lake Michigan may be filed with appropriate agencies using this form.

Contact the IEPA, Division of Water Pollution Control, Permit Section #15, 1021 North Grand Avenue East, P.O. Box 19276, Springfield, IL 62794-9276, (217) 782-0610.

4. If the project involves the construction of a power plant, utility pipelines, electric transmission or distribution lines, **Illinois Commerce Commission** approval may be required.

5. Also, depending on the location and type of work to be performed, there may be additional local government approvals required.

Rivers, Lakes, and Streams Act 615 ILCS

5/5. Jurisdiction - Duties - List of waters

The Department of Natural Resources shall upon behalf of the State of Illinois, have jurisdiction and supervision over all of the rivers and lakes of the State of Illinois, wherein the State of Illinois or the people of the State have any rights or interests, and shall make a list by counties of all the waters of Illinois, showing the waters, both navigable and non-navigable, that are found in each county of the State, and if the same are lakes, the extent of the shore lines and the amount, extent and area of the water surface; and in a like way, if the same are rivers, and specifying whether the same are navigable or non-navigable, and whether they have or have not been meandered.

Interagency Wetlands Policy Act of 1989 20 ILCS

The Interagency Wetlands Policy Act established Illinois' goal of no overall net loss of wetlands due to state-supported activities. The act supports this goal by requiring the development of agency action plans and establishing mitigation policy.

The Interagency Wetlands Policy Act is the first regulatory program in Illinois that is dedicated solely to the protection of state wetlands. This act established the goal of no overall net loss of Illinois wetland acres or functional values due to state-supported activities. The act also required state agencies to preserve, enhance, and create wetlands as necessary in order to increase the quality of wetland resources in Illinois.

This act is implemented through the use of the State Wetlands Mitigation Policy and Agency Action Plans. The mitigation policy strongly encourages agencies to avoid impacting wetlands. If impacts are unavoidable, compensation must occur through a combination of creation, restoration, acquisition, or research projects on a least a one-to-one replacement ratio.

Agency action plans are required of all agencies on the Interagency Wetlands Committee. These plans provide a procedural guide for implementing this act, and must include provisions for conflict resolution, compensation plan development, and scientific monitoring. Action plans also provide procedures for minimizing wetland destruction, increasing wetland quantity and quality, coordinating with other state programs, acquiring wetlands, and ensuring minimal impact on historical and archaeological resources.

ILLINOIS CONSERVATION LAW

Fish and Aquatic Life Code

Article 5. Fish Protection

Fourth paragraph under 515 ILCS 5/5-5. Ownership and title; violations; penalties.

If any person shall abandon, deposit, or otherwise place any wire, can, bottle, glass, paper, trash rubbish, cardboard, wood cartons, boxes, trees, parts of trees, brush, or other insoluble material, including animal or vegetable material, into the waters or upon the ice of any waters of this State, or in any place on the bank of waters of this State where it shall be liable to be washed into the waters either by storms, floods, or other causes, the person shall be in violation of the offense of polluting. Employees of the Department, however, may place or direct the placement, in the waters of the State, of insoluble materials deemed suitable for the purposes of enhancing aquatic habitat. Any person who shall be found guilty under this Section shall be guilty of a petty offense, and the Court shall further order that the guilty person shell employ every practical means of removing the debris within a time specified by the Court. Failure to comply with an order under this Section shall constitute a Class B misdemeanor.

Appendix C: References

Guides that were adapted or partially reprinted:

- G.M. Aubertin, Associate Professor, Southern Illinois University, Department of Forestry, Carbondale, IL August 1992. Forestry Best Management Practices for Illinois and similar nearby areas.
- Wisconsin Department of Natural Resources. 1995. Wisconsin's Forestry Best Management Practices for Water Quality. Publication number FR093.
- Tennessee Department of Conservation, Division of Forestry. 1989. Best Management Practices For Silvicultural and Other Forest Activities In Tennessee
- Kentucky Division of Forestry. Best Management Practices at a Glance.
- Marvin E. Hubbell, Sharon E. Baum, and Tony D. Shaffer, Illinois Natural history Survey, Special Publication 16, June 1995. Selected Wetlands - Related Legislation and Programs Applicable to Illinois.
- USDA, NRCS, Illinois Conservation Scene, November 1998.

Related Publications:

- **A Guide to Logging Aesthetics**

  Practical Tips for Loggers, Foresters, and Landowners

  Northeast Regional Agriculture Engineering Service (NRAES)
  Cooperative Extension
  Publication # NRAES-60
  P.O. Box 4557
  Ithaca, NY 14852-4557

  (607) 254-8770 or via internet at http://www.nraes.org
  Cost: $7.00, plus shipping and handling

- **A Landowner's Guide to Woodland Stewardship**

  A three-ring binder reference manual, includes chapters on wildlife management, soil & water conservation, and alternative income opportunities

  Illinois Forest Resource Center.
  Rt. 1, Box 255
  Simpson, IL 62985 (618) 695-3383

  Cost: Minimum $20.00 donation, includes shipping.

Web Sites:

- Illinois Department of Natural Resources:
  http://www.dnr.illinois.gov

- University of Illinois, Forest Landowner
  http://web.extension.illinois.edu/forestry/home.html

- Southern Illinois University
  http://www.forestry.siu.edu

- USDA , NRCS, Field Office Technical Guide
  http://www.il.nrcs.usda.gov

Appendix D: Glossary

Anaerobic - Occurring in the absence of free oxygen.

Angle of repose - The maximum slope or angle at which a material, such as soil or loose rock, remains stable (stable angle).

Bank - The land surface abutting the bed of any navigable waterway which, either prior to any project or alteration of land contours or as the result of the proposed project or alteration, slopes or drains without complete interruption into the waterway.

Basal area - The cross-sectional area of a single stem, including the bark, measured at breast height (4.5 ft or 1.37 m above the ground). The cross-sectional area 41/2 feet above ground expressed in square feet per acre of all trees with a diameter of 5 inches and larger.

Baseflow - The portion of streamflow which comes from groundwater.

Best Management Practices (BMPs) - Practical and economically achievable practices for preventing or reducing nonpoint source pollution.

Broad-based dip - A surface drainage structure specifically designed to drain water from an access road while vehicles maintain normal travel speeds.

Brush barrier - A sediment control structure created of slash materials piled at the toe slope of a road or at the outlets of culverts, turnouts, dips and water bars.

Buffer area - A designated area around a stream or waterbody of sufficient width to minimize entrance of forestry chemicals (fertilizers, pesticides, and fire retardants) into the waterbody.

Check dam - A small dam constructed in a gully to decrease the flow velocity, minimize channel scour and promote deposition of sediment.

Clearcutting - A stand in which essentially all trees have been removed in one operation (depending on management objectives, a clearcut may or may not have reserve trees left to attain goals other than regeneration).

Contour - An imaginary line on the surface of the earth connecting points of the same elevation. A line drawn on a map connecting the points of the same elevation. The steeper the slope, the closer the contour lines.

Corduroy - A road built of logs laid side by side transversely.

Crown - A convex road surface that allows runoff to drain to either side of the road prism.

Culvert - A metal, wooden, plastic, or concrete conduit through which surface water can flow under or across roads.

Cumulative effect - The impact on the environment that results from the incremental impact of an action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such action.

Cut-and-fill - Earth-moving process that entails excavating part of an area and using the excavated material for adjacent embankments or fill areas.

DBH - Diameter at breast height; the average diameter (outside the bark) of a tree 4.5 feet above mean ground level.

Disking (harrowing) - A mechanical method of scarifying the soil to reduce competing vegetation and to prepare a site to be seeded or planted.

Drainage structure - Any device or land form constructed to intercept and/or aid surface water drainage.

Duff - The accumulation of needles, leaves, and decaying matter on the forest floor.

Erodible soils - Soils that are likely to have high soil loss when exposed to water runoff. Soils having a Natural Resources Conservation Service (NRCS) erosion hazard rating of "moderate" or "severe" should be considered erodible. Erosion hazard ratings for different soil types are listed in "Woodland Suitability" tables in NRCS soil survey manuals. Generally, forest soils occurring on 15 to 35% slopes have a moderate rating and soils occurring on greater than 35% slopes have a severe rating. Contact your local NRCS office for more information.

Erosion - The process by which the surface of the earth is worn away by the action of wind or water in the form of rain drops, surface runoff, and waves.

Felling - The process of cutting down standing trees.

Fill slope - The surface formed where earth is deposited to build a road or trail.

Firebreak - Naturally occurring or human-made barrier to the spread of fire.

Fireline - A barrier used to stop the spread of fire constructed by removing fuel or rendering fuel inflammable by use of fire retardants.

Fire retardant - Any substance except plain water that by chemical or physical action reduces flammability of fuels or slows their combustion rate.

Floodplain - Land which has been or may be covered by flood water during the regional flood (floods expected to occur once in every 100 years).

Ford - Submerged stream crossing where the streambed may need to be reinforced to bear intended traffic.

Forest filter strip - Area between a stream and construction activities that achieves sediment control by using the natural filtering capabilities of the forest floor and litter.

Forest road - A temporary or permanent road connecting the most remote parts of the forest land to existing public roads. They provide access to forest lands for timber management, fish and wildlife habitat improvement, fire control, and a variety of recreational activities.

Forwarding - The operation of moving timber products from the stump to a landing for further transport.

Geotextile - A product used as a soil reinforcement agent and as a filter medium. It is made of synthetic fibers manufactured in a woven or loose nonwoven manner to form a blanket-like product.

Grade (gradient) - The slope of a road or trail expressed as a percentage of change in elevation per unit of distance traveled.

Harvesting - The felling, skidding, processing, loading, and transporting of forest products.

Hydric soil - A soil that is wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants.

Hydrophyte - A plant that has evolved with adaptations to live in aquatic or very wet habitats, e.g., a cattail, water lily, or water tupelo.

Intermittent stream - A stream that flows only after rainfall or snowmelt and, therefore, is dry most of the year.

Invertebrate - animals lacking a spinal column.

Lake - A still waterbody which (1) is navigable, (2) has an ordinary high-water mark and (3) has a bed that indicates "reasonably permanent" surface water.

Landing (log deck) - A place in or near the forest where logs are gathered for further processing or transport.

Large woody debris - Large logs, generally at least 12 inches in diameter with an anchored root ball, that have fallen into streams creating stable structures and a diversity of cover conditions and habitat for aquatic organisms.

Logging debris - See slash.

Mulch - A natural or artificial layer of plant residue or other materials covering the land surface that conserves moisture, holds soil in place, aids in establishing plant cover, and minimizes temperature fluctuations.

Mulching - Providing any loose covering for exposed forest soils, such as grass, straw, bark, or wood fibers, to help control erosion and protect exposed soil.

Navigable - Capable of being used by humans for water-borne transportation.

Nonpoint source pollution - Occurs when rainfall or snowmelt runoff moves across the ground, carrying pollutants into streams, lakes, wetlands, and groundwater. For example, soil can become a pollutant when water runoff moves across a road and carries large amounts of soil into a waterbody.

Ordinary high-water mark - The point on the bank or shore up to which the presence and action of the water is so continuous as to leave a distinct mark either by erosion, destruction of terrestrial vegetation, or other easily recognized characteristic.

Organic debris - Particles of vegetation or other biological material that can degrade water quality by decreasing dissolved oxygen and by releasing organic solutes during leaching.

Outslope - To shape the road surface to cause drainage to flow toward the outside shoulder.

Perennial stream - A stream that flows throughout most of the year.

Prescribed burning - Skillful application of fire to natural fuels that allows confinement of the fire to a predetermined area and at the same time produces certain planned benefits.

Raking - A mechanical method of removing stumps, roots, and slash from a future planting site.

Regeneration - The process of replacing older trees removed by harvest or disaster with young trees.

Regional flood - A flood which is expected to occur on a particular lake, river or stream once in every 100 years (also called the 100-year flood).

Riprap - Rock or other large aggregate that is placed to protect streambanks, bridge abutments, outflow of drainage structures, or other erodible sites from runoff or wave action.

Rut - A depression made by the passage of a vehicle or equipment.

Scarification - The process of removing the forest floor or mixing it with the mineral soil by mechanical action preparatory to natural or direct seeding or the planting of tree seedlings.

Sediment - Solid material, both mineral and organic, that is in suspension and being transported from its site of origin by the forces of air, water, gravity, or ice.

Seepage - Water escaping through or emerging from the ground along an extensive line or surface, as contrasted with a spring where the water emerges from a localized spot.

Shearing - A site preparation method that involves the cutting of brush, trees, or other vegetation at ground level using tractors equipped with angles or V-shaped cutting blades.

Silt fence - A temporary barrier used to intercept sediment-laden runoff from small areas.

Silviculture - The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

Site preparation - A silvicultural activity to remove unwanted vegetation and other material, and to cultivate or prepare the soil for regeneration.

Skid - Short-distance moving of logs or felled trees from the stump to a point of loading.

Skid trail - A temporary, nonstructural travel way for logging equipment, called skidders, to drag felled trees or logs to the landing for further processing, loading, and transport.

Slash - Any tree tops, limbs, bark, abandoned forest products, windfalls or other debris left on the land after timber or other forest products have been cut.

Slope - Degree of deviation of a surface from the horizontal, measured as a numerical ratio, as a percent, or in degrees. Expressed as a ratio, the first number is the horizontal distance (run) and the second number is the vertical distance (rise), as 2:1. A 2:1 slope is a 50 percent slope. Expressed in degrees, the slope is the angle from the horizontal plane, with a 90 degree slope being vertical (maximum) and a 45 degree slope being a 1:1 slope.

Stand - A contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition to be a homogeneous and distinguishable unit.

Stream - A watercourse that: (1) has an ordinary high-water mark, (2) has bed and banks, (3) flows at least periodically, (4) has an easily identifiable beginning and end, (5) does not lose its character as a watercourse even though it may break up and disappear temporarily and reappear downstream.

Streamside Management Zone (SMZ) - Land and vegetation areas next to lakes and streams where management practices are modified to protect water quality, fish and other aquatic resources. These areas are complex ecosystems that provide food, habitat and movement corridors for both aquatic (water) and terrestrial (land) communities as well as helping to minimize nonpoint source pollution impacts to surface water. Also called Riparian Management Zone (RMZ).

Transpiration - Evaporation which enters the atmosphere from the soil through plants.

Turnout - A drainage ditch that drains water away from roads and road ditches.

Vertebrate - animals with a segmented spinal column.

Water bar - A shallow channel or raised barrier of soil or other material laid diagonally across the surface of a road or skid trail to lead water off the road and prevent soil erosion. Water bars are used to minimize erosion and provide conditions for natural or artificial revegetation.

Wetland - An area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic (water loving) vegetation and which has soils indicative of wet conditions.

Wet line - A line of water, or water and chemical fire retardant, sprayed along the ground, and which serves as a temporary fireline from which to ignite or stop a low-intensity fire.

Windrow - Logging debris and unmerchantable woody vegetation that has been piled in rows to decompose or to be burned; or the act of constructing these piles.

Yarding - Method of transport from harvest area to storage landing.

TABLE I - CRITICAL AREA PLANTING

All seeding rates are pure live seed

Seeding Mixture	Rate lbs. PLS/ Acre	Rate lbs. PLS/ 1000 Sqft.	Suitable pH	Site Suitability Drought-ty	Well Drained	Wet	Plant Suitability Zone	Seeding Period Spring 1/	Summer	Dormant
Smooth bromegrass							I	*ES-6/1	8/1-9/1	11/1-3/15
or tall fescue	24	.55		x	x		II	ES-5/15	8/1-9/10	11/15-3/1
Alfalfa or birdsfoot trefoil	8	.20	6.0-7.5				III	ES-5/15	8/1-9/20	11/15-3/1
Smooth bromegrass							I	ES-6/1	8/1-9/1	11/1-3/15
or tall fescue	24	.55		x	x		II	ES-5/15	8/1-9/10	11/15-3/1
Crownvetch	16	.40	6.0-8.0				III	ES-5/15	8/1-9/15	11/15-3/1
Tall fescue	12	.30					I	ES-6/1	8/1-9/1	11/1-3/15
Timothy or redtop	2.5	.06			x	x	II	ES-5/15	8/1-9/10	11/15-3/1
Birdsfoot trefoil	12	.30	5.5-7.5				III	ES-5/15	8/1-9/15	11/15-3/1
Reed canarygrass	12	.30					I	ES-6/1	8/1-9/1	11/1-3/15
Smooth bromegrass or					x	x	II	ES-5/15	8/1-9/10	11/15-3/1
Tall fescue	12	.30					III	ES-5/15	8/1-9/20	11/15-3/1
Ladino (optional)	2.5	.06	5.5-7.5							
Tall fescue	12	.30	4.5-6.0				I	ES-6/1	8/1-9/1	11/1-3/15
Redtop	2.5	.06		x	x	x	II	ES-5/15	8/1-9/10	11/15-3/1
Sericea lespedeza 2/	16	.40					III	ES-5/15	8/1-9/20	11/15-3/1
or alsike clover	8	.20								

TABLE I - CRITICAL AREA PLANTING (continued)

Seeding Mixture	Rate lbs. PLS/ Acre	Rate lbs. PLS/ 1000 Sqft.	Suitable pH	Site Suitability Drought-ty	Well Drained	Wet	Plant Suitability Zone	Seeding Period Spring 1/	Summer	Dormant
Sweet clover	8	.20	6.0-8.0				I	ES-6/1	8/1-9/1	11/1-3/15
Tall fescue	12	.30		x	x		II	ES-5/15	8/1-9/10	11/15-3/1
Redtop or	2.5	.06					III	ES-5/15	8/1-9/20	11/15-3/1
Smooth bromegrass	12	.30								
Switchgrass	8	.10	5.5-7.0	x	x	x	I	ES-6/10		11/1-3/15
							II	ES-6/1		11/1-3/1
							III	ES-6/1		11/1-3/1
Switchgrass	2	.04		x	x	x	I	ES-6/10		
Big Bluestem	6	.14					II	ES-6/1		
Indiangrass	6	.14					III	ES-6/1		
Temporary Seedlings										
A. 45 to 365 days										
Cereal Rye or	90	2.5		x	x	x	I	ES-9/30		
Wheat							II	ES-10/5		
							III	ES-10/10		
Oats	90	2.5					I, II, III	ES-6/1		

1 See map page 71; **2** Tall fescue not suitable for tree planting and forested areas.

TABLE I - CRITICAL AREA PLANTING (continued)

All seeding rates are pure live seed

Seeding Mixture	Rate lbs. PLS/ Acre	Rate lbs. PLS/ 1000 Sqft.	Suitable pH	Site Suitability Drought-y	Well Drained	Wet	Plant Suitability Zone	Seeding Period Spring 1/	Summer	Dormant
Perennial Ryegrass	24	.55	5.0-7.5	x	x	x	I	ES-9/30		
							II	ES-10/5		
							III	ES-10/10		
B. More than 365 days										
Perennial Ryegrass	12	30		x	x	x	I	ES-9/30		
Timothy	2.5	.06					II	ES-10/5		
							III	ES-10/10		
Tall Fescue	16	.40		x	x	x	II	ES-10/5		
Perennial Ryegrass or Timothy	2.5	.06					III	ES-10/10		

*ES Early Spring
1/ On non-topsoiled stripmine spoil - set date up 10 days.
2/ Use sericea only in So. 1/2 of Illinois.
Where a seeding mixture is needed or desired but not listed in the above table, submit proposed seeding mixture through channels for approval by the State Resource Conservationist.
Where a choice of grasses is indicated, both grasses may be used in proportionate amounts.
1 See map page 71 **2** Tall fescue not suitable for tree planting and forested areas.

TABLE II - CRITICAL AREA PLANTING

Site	* Fertilizer (lbs./acre) 1/ N	P205	K20	Companion Crop (per acre) Seed mixtures	Oats 2/	Rye or Wheat	Mulch 3/	Lime 4/	Remarks
Dams, dikes, borrow areas, road cuts and other construction sites	120	120	120	1-2-3-4	1 bu.	16 lbs./PLS	Yes	If needed	
Steep eroding land i.e. land formerly cropped or damaged, idle	120	120	120	1-2-3-4-7	1 bu.	16 lbs./PLS companion crop	Yes-if no	If needed	Apply strawy manure and incorporate if available
Blowouts in sandy soils	120	120	120	1-2-3-4	1 bu.	16 lbs./PLS	Yes-if no manure is used after seeding	If needed	Apply strawy manure and incorporate if available. Apply an additional 2 tons after seeding, if available and/` or use companion crop.
Ditch bank side slopes	120	120	120	1-2-3-4	1 bu.	16 lbs./PLS	Yes		.

Fertilizer Application

(Section IV-IL Tech Guide Critical Area Planting IL –342-8, IL-342-9)

TABLE II - CRITICAL AREA PLANTING (continued)

Site	* Fertilizer (lbs./acre) 1/ N	P205	K20	Seed mixtures	Companion Crop (per acre) Oats 2/	Rye or Wheat	Mulch 3/	Lime 4/	Remarks
Ditch berms and spoil banks	60	60	60	1-2-3-4-7	1 bu.	16 lbs./PLS	Yes-if no companion crop is used.	If needed	
Surface mined area	120	120	120	(pH 4.5-5.5) 5-7 (pH 5.5-7.5) 1-2-3-4-7 (pH 7.5) 2-6	1 bu.	16 lbs./PLS	Yes	If needed	
Temporary seedings	60	60	60	8			If needed	5/	
(Construction Sites)		5/							

1/ Soil test is preferred.
2/ Spring only.
3/ See Mulching
4/ If needed per soil test for species seeded.
5/

Protection Period	Lime	Fertilizer
45 to 90 days	No	No
45 to 365 days	If needed	Yes
More than 365 days	If needed	Yes

* FERTILIZER: N 360 lbs. of 34-0-0 per acre
P 275 lbs. of 0-46-0 per acre
K 200 lbs. of 0-0-60 per acre
LIME: 7 tons per acre

ILLINOIS PLANT SUITABILITY ZONES

These broad zones are based on certain plant growth factors including average January—July temperatures, frost-free days and annual rainfall.

These zones are used as a guide in selecting grasses, legumes, shrubs, trees and vines for planting.

TABLE FOR CALCULATING ACRES OF DISTURBED AREA

Disturbed Area Length (Ft.)	Width of Disturbed Area (Ft.)									
	20	40	60	80	100	120	140	160	180	200
20	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
30	0.01	0.02	0.04	0.05	0.06	0.08	0.09	0.11	0.12	0.13
40	0.01	0.03	0.05	0.07	0.09	0.11	0.12	0.14	0.16	0.18
50	0.02	0.04	0.06	0.09	0.11	0.13	0.16	0.18	0.20	0.22
60	0.02	0.05	0.08	0.11	0.13	0.16	0.19	0.22	0.24	0.27
70	0.03	0.06	0.09	0.12	0.16	0.19	0.22	0.25	0.28	0.32
80	0.03	0.07	0.11	0.14	0.18	0.22	0.25	0.29	0.33	0.36
90	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.33	0.37	0.41
100	0.04	0.09	0.13	0.18	0.22	0.27	0.32	0.36	0.41	0.45
110	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
120	0.05	0.11	0.16	0.22	0.27	0.33	0.38	0.44	0.49	0.55
130	0.05	0.11	0.17	0.23	0.29	0.35	0.41	0.47	0.53	0.59
140	0.06	0.12	0.19	0.25	0.32	0.38	0.44	0.51	0.57	0.64
150	0.06	0.13	0.20	0.27	0.34	0.41	0.48	0.55	0.61	0.68
160	0.07	0.14	0.22	0.29	0.36	0.44	0.51	0.58	0.66	0.73
170	0.07	0.15	0.23	0.31	0.39	0.46	0.54	0.62	0.70	0.78
180	0.08	0.16	0.24	0.33	0.41	0.49	0.57	0.66	0.74	0.82
190	0.08	0.17	0.26	0.34	0.43	0.52	0.61	0.69	0.78	0.87
200	0.09	0.18	0.27	0.36	0.45	0.55	0.64	0.73	0.82	0.91
210	0.09	0.19	0.28	0.38	0.48	0.57	0.67	0.77	0.86	0.96
220	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.01
230	0.10	0.21	0.31	0.42	0.52	0.63	0.73	0.84	0.95	1.05
240	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10
250	0.11	0.22	0.34	0.45	0.57	0.68	0.80	0.91	1.03	1.14
260	0.11	0.23	0.35	0.47	0.59	0.71	0.83	0.95	1.07	1.19
270	0.12	0.24	0.37	0.49	0.61	0.74	0.86	0.99	1.11	1.23
280	0.12	0.25	0.38	0.51	0.64	0.77	0.89	1.02	1.15	1.28
290	0.13	0.26	0.39	0.53	0.66	0.79	0.93	1.06	1.19	1.33
300	0.13	0.27	0.41	0.55	0.68	0.82	0.96	1.10	1.23	1.37
310	0.14	0.28	0.42	0.56	0.71	0.85	0.99	1.13	1.28	1.42
320	0.14	0.29	0.44	0.58	0.73	0.88	1.02	1.17	1.32	1.46
330	0.15	0.30	0.45	0.60	0.75	0.90	1.06	1.21	1.36	1.51
340	0.15	0.31	0.46	0.62	0.78	0.93	1.09	1.24	1.40	1.56
350	0.16	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60
360	0.16	0.33	0.49	0.66	0.82	0.99	1.15	1.32	1.48	1.65
370	0.16	0.33	0.50	0.67	0.84	1.01	1.18	1.35	1.52	1.69
380	0.17	0.34	0.52	0.69	0.87	1.04	1.22	1.39	1.57	1.74
390	0.17	0.35	0.53	0.71	0.89	1.07	1.25	1.43	1.61	1.79
400	0.18	0.36	0.55	0.73	0.91	1.10	1.28	1.46	1.65	1.83

TABLE FOR CALCULATING SKID TRAL OR HAUL ROAD

Length of Skid Trail or Haul Road (Ft.)	Width of Skid Trail or Haul Road (Ft.)									
	8	10	12	14	16	20	25	30	35	40
50	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.04
100	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.08	0.09
150	0.02	0.03	0.04	0.04	0.05	0.06	0.08	0.10	0.12	0.13
200	0.03	0.04	0.05	0.06	0.07	0.09	0.11	0.13	0.16	0.18
250	0.04	0.05	0.06	0.08	0.09	0.11	0.14	0.17	0.20	0.22
300	0.05	0.06	0.08	0.09	0.11	0.13	0.17	0.20	0.24	0.27
350	0.06	0.08	0.09	0.11	0.12	0.16	0.20	0.24	0.28	0.32
400	0.07	0.09	0.11	0.12	0.14	0.18	0.22	0.27	0.32	0.36
450	0.08	0.10	0.12	0.14	0.16	0.20	0.25	0.30	0.36	0.41
500	0.09	0.11	0.13	0.16	0.18	0.22	0.28	0.34	0.40	0.45
550	0.10	0.12	0.15	0.17	0.20	0.25	0.31	0.37	0.44	0.50
600	0.11	0.13	0.16	0.19	0.22	0.27	0.34	0.41	0.48	0.55
650	0.11	0.14	0.17	0.20	0.23	0.29	0.37	0.44	0.52	0.59
700	0.12	0.16	0.19	0.22	0.25	0.32	0.40	0.48	0.56	0.64
750	0.13	0.17	0.20	0.24	0.27	0.34	0.43	0.51	0.60	0.68
800	0.14	0.18	0.22	0.25	0.29	0.36	0.45	0.55	0.64	0.73
850	0.15	0.19	0.23	0.27	0.31	0.39	0.48	0.58	0.68	0.78
900	0.16	0.20	0.24	0.28	0.33	0.41	0.51	0.61	0.72	0.82
950	0.17	0.21	0.26	0.30	0.34	0.43	0.54	0.65	0.76	0.87
1000	0.18	0.22	0.27	0.32	0.36	0.45	0.57	0.68	0.80	0.91
1050	0.19	0.24	0.28	0.33	0.38	0.48	0.60	0.72	0.84	0.96
1100	0.20	0.25	0.30	0.35	0.40	0.50	0.63	0.75	0.88	1.01
1150	0.21	0.26	0.31	0.36	0.42	0.52	0.66	0.79	0.92	1.05
1200	0.22	0.27	0.33	0.38	0.44	0.55	0.68	0.82	0.96	1.10
1250	0.22	0.28	0.34	0.40	0.45	0.57	0.71	0.86	1.00	1.14
1300	0.23	0.29	0.35	0.41	0.47	0.59	0.74	0.89	1.04	1.19
1350	0.24	0.30	0.37	0.43	0.49	0.61	0.77	0.92	1.08	1.23
1400	0.25	0.32	0.38	0.44	0.51	0.64	0.80	0.96	1.12	1.28
1450	0.26	0.33	0.39	0.46	0.53	0.66	0.83	0.99	1.16	1.33
1500	0.27	0.34	0.41	0.48	0.55	0.68	0.86	1.03	1.20	1.37
1550	0.28	0.35	0.42	0.49	0.56	0.71	0.88	1.06	1.24	1.42
1600	0.29	0.36	0.44	0.51	0.58	0.73	0.91	1.10	1.28	1.46
1650	0.30	0.37	0.45	0.53	0.60	0.75	0.94	1.13	1.32	1.51
1700	0.31	0.39	0.46	0.54	0.62	0.78	0.97	1.17	1.36	1.56
1750	0.32	0.40	0.48	0.56	0.64	0.80	1.00	1.20	1.40	1.60
1800	0.33	0.41	0.49	0.57	0.66	0.82	1.03	1.23	1.44	1.65
1850	0.33	0.42	0.50	0.59	0.67	0.84	1.06	1.27	1.48	1.69
1900	0.34	0.43	0.52	0.61	0.69	0.87	1.09	1.30	1.52	1.74

CULVERT SIZING

Stream Size/Site Condition Method

Procedure:

1) Measure bottom channel width (W) and channel depth (D) from bottom to top of bank.

2) Determine whether slope upstream is flat, moderately or extremely hilly and refer to appropriate Table (A-C). For areas with no perceptible change in elevation upstream of the culvert area, choose (FLAT) slope. In moderately hilly areas, such as a rise of two (2) feet for every 100 feet of run, choose Moderate (MOD) slope. In extremely hilly areas, with an approximate rise of the (10) feet or more for every 100 feet of run, choose critical (CRIT) slope.

3) Read corresponding culvert size based on width and depth of stream channel.

Assumptions:

Roughness factors:	**Slope:**
n = 0.030 for channel	FLAT = 0.05%
n = 0.024 for CMP culvert	MOD = 2.00%
	CRIT = 10.00%

Calculations assume Corrugated Metal Pipes (CMP) which project slightly out of fill.

Table A: Culvert Diameters (Inches) for Flat Conditions Slopes Upstream 0-0.05%

Stream Width (Ft.)	Stream Depth (Ft.)							
(Ft.)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
1	12	12						
2	12	12	18	24				
3	12	15	18	24	30	36		
4	12	18	21	27	33	36	42	
5	12	18	21	30	36	42	48	54
6	12	21	24	33	42	42	54	60
7	15	21	24	36	42	48	60	60
8	15	24	30	36	42	54	60	2-48
9	15	24	33	42	48	54	60	2-54
10	18	27	36	42	48	60	2-42	2-54

Table B: Culvert Diameters (Inches) for Moderate Hilly Condition Slopes Upstream 2-10%

Stream Width (Ft.)	Stream Depth (Ft.)							
(Ft.)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
1	12	21						
2	15	27	36	48				
3	18	33	42	54/2-42	54	3-54/4-42		
4	21	36	48	2-48/3-36	3-48/4-42	4-48	*	
5	27	42	54	2-48/3-42	3-48/4-42	4-54	*	*
6	30	42	60	2-54/3-42	4-48	*	*	*
7	30	48	60	3-48/4-42	4-54	*	*	*
8	33	54	2-54/3-48	3-54/4-48	4-54	*	*	*
9	36	54	2-54/3-48	3-54/4-48	*	*	*	*
10	42	60	3-48/4-42	4-54	*	*	*	*

Table C: Culvert Diameters (Inches) for Extreme Hilly Conditions Slopes Upstream > 10%

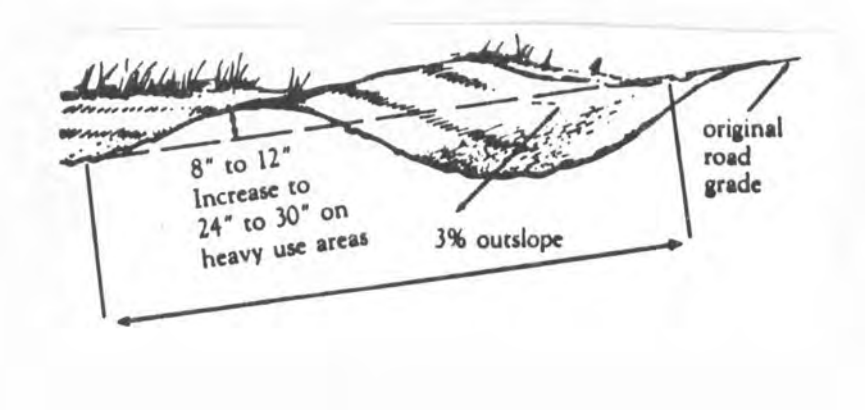
Stream Width (Ft.)	Stream Depth (Ft.)							
(Ft.)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
1	15	30						
2	21	42	54	2-54/3-42				
3	27	48	2-48/3-42	3-48	4-54	*		
4	33	54	2-54/3-42	3-54/4-48	*	*	*	
5	36	60	2-60/3-48	4-54/5-48	*	*	*	*
6	42	60	3-54/4-48	*	*	*	*	*
7	42	2-48/4-36	3-54/4-48	4-60	*	*	*	*
8	48	2-54/3-48	4-54/5-54	*	*	*	*	*
9	54	2-60/3-48	4-60/5-54	*	*	*	*	*
10	54	3-54/4-48	*	*	*	*	*	*

*Where flows were determined to cause the culvert size to exceed 4-60 inch pipes, no size is provided.

WATER BAR SPACING

Grade of Road (%)	Distance Between Water Bar (feet)
1	400
2	250
5	130
10	80
15	50
20	45
25+	40

WATER BAR SPACING



Place water bars at a 30 to 40 degree angle with a cross drainage grade of 2%.

Considering A Harvest?

Call Before You Cut

Your woods represent one of your most valuable resources. The decision to harvest, and how to do so, can either improve or set back the future value of your land, its potential for wildlife habitat, and as a source for you and your family.

There are several reasons why you might decide to sell timber.

- The timber represents a source of income.
- The health and vigor of your woods, and habitat for some species of wildlife, can be improved if you develop a harvesting approach that fits your needs.
- Trees that may be damaged due to ice, wind, snow, storm, fire, insects and disease can be salvaged to allow you to recover some of their value.

Whatever the reason for harvesting, a professional forester is uniquely qualified to assist you with a timber harvest that accomplishes your needs and expectations.

In Illinois call: 1-888-244-1706

How To Start

Know Your Objectives

Determine what you want your woodlands to provide. Is it wildlife, recreation, timber, or even a park-like setting? Maybe some of each? Depending on your goals, different trees may need to be harvested. A forester is trained to select the right trees for your intended goals. For example, if producing both income and good habitat for wildlife is a primary goal, a forester can design a harvest that will promote the future growth of higher value trees.

Inventory Your Woods

Having an inventory of your woods is like having an appraisal of your home's value. It's a key part of knowing your overall financial worth.

Keep Your Woods Healthy

Taking note of what you want your woods to look like, and the benefits it will provide now and in the future, provides a road map towards a healthier woodlot.

Working Together

A harvest plan designed and carried out by a knowledgeable forester working with a trained logger will help assure that the harvest meets your needs as a landowner. Planting more trees, removing invasive species, or conducting a harvest are just a few of the activities that might make up such a plan.

Select Trees Carefully

When a tree should be cut depends on many things, such as its age and maturity, its contribution to your woods' health, the market price of different timbers, and your own goals and needs. Make sure that the selection of the trees to be removed during your harvest is based on all these things and not just the current value of the tree.

Protect Your Interests

Market your timber properly to ensure you receive a fair value and oversee the implementation of your harvest plan carefully so your land is not damaged.