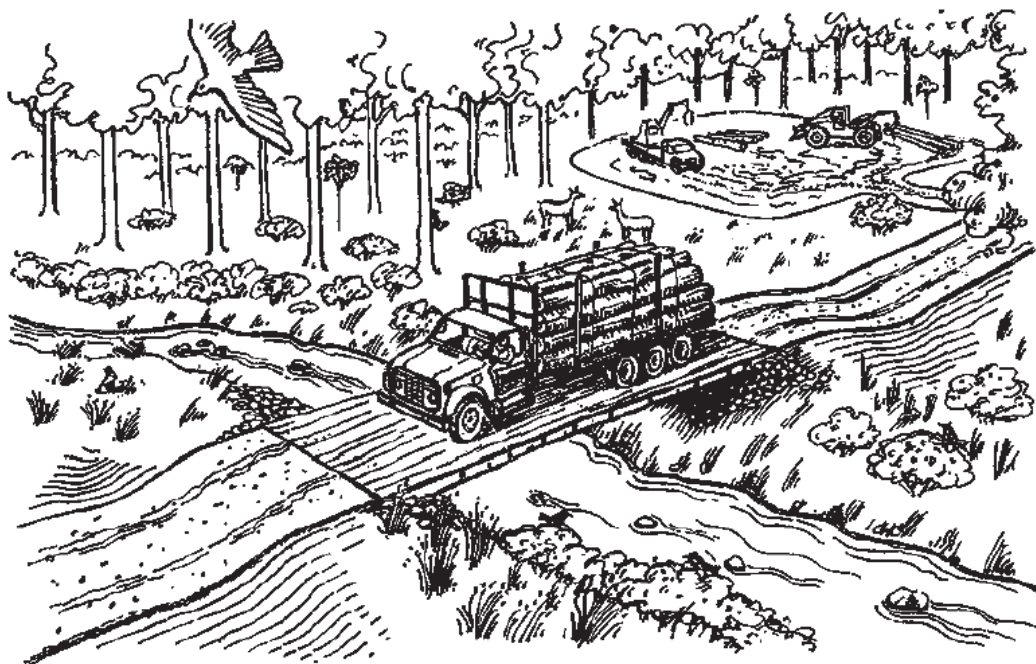


INDIANA LOGGING AND FORESTRY BEST MANAGEMENT PRACTICES

2005 BMP FIELD GUIDE



Acknowledgements

These guidelines for logging and forestry best management practices represent the cooperative effort of representatives from logging, sawmilling, forestry, environmental, university, and regulatory agencies and interests.

The original guidebook, published in January 1998, was compiled by the Forest Practices Working Group, a group organized by the Indiana Woodland Steward Institute under a grant from the Indiana Department of Environmental Management. These funds were matched by forest industry and conservation organizations, and public agency contributions. The guidebook was edited by Purdue Cooperative Extension Service and published by the Division of Forestry, Indiana Department of Natural Resources.

The second edition of the guidebook was published in September 1999 in which there were only minor technical changes to the title, water bar spacing, the Fire and Fire Control Lines section, and others. The second edition was left unchanged until now, but a compilation of comments and technical changes have built up in that time. In this edition we made minor changes to things like an Indiana Code that was referenced incorrectly, changing seed mixtures to reflect concerns about invasive plants in the forest, and things of that nature.

The evolution of the Indiana Logging and Forestry Best Management Practices; BMP Field Guide has been the result of the efforts of the forest community not only constructing them, but in constantly referencing them and giving feedback to the Indiana Division of Forestry as the technology used in forestry has changed and the practices outlined in the book have been used by the community and evaluated through different processes.

This is a substantial achievement of the forest community in Indiana and serves as a model for other land uses. It is hoped that others will undertake similar approaches to control soil erosion and non-point source pollution.

PREFACE

Activities carried on, in and around forests impact the forest environment in many different ways. The focus of these guidelines is the quality of the water flowing from forest lands. Because the reduction in water quality from soil disturbing activities can't be seen flowing from a single source, such as a pipe, but is spread across the land, the term non-point source (NPS) pollution is used. Forestry is a very minor NPS pollution contributor in Indiana. Forests have long been recognized as the best protector of watersheds. The fact that other land uses contribute more to total pollution, although true, is not important. Improvement of water quality requires reduction of NPS pollution from all sources—including forestry.

Additionally, these guidelines consider worker safety, aesthetics, and forest productivity concerns.

Logging has the greatest impact of the typical forestry activities. The use of Best Management Practices (BMPs) by loggers, landowners and land managers offers the greatest potential to reduce NPS, and reach water quality and other forest health goals. This guidebook summarizes BMPs for logging and forestry practices. The BMPs described in this book are guidelines, and as guidelines may need some modification to adjust to local woodland, soil and watershed characteristics.

Organization of this Guidebook

This guidebook does not contain all the specifics and background of each BMP. To be so detailed would require many more pages. The BMPs contained in Sections I through VII have been arranged logically in the sequence of a logging operation: 1) Pre-harvest Planning, 2) Forest Roads, 3) Skid Trails, 4) Stream Crossings, 5) Riparian Management Zones, 6) Log Landings, and 7) Fuel, Lubricants and Trash. Each of these aspects of a harvest operation is discussed from planning to construction to maintenance to closing. The BMPs in Section VIII covers non-logging BMPs, to include guidelines for: 1) Tree Planting and Natural Regeneration, 2) Forest Chemicals, 3) Fire and Fire Control Lines, 4) Woodland Grazing, and 5) Recreation Trails. The Glossary defines terms employed in this guidebook and the Appendices cover A) Guidelines for Seeding Disturbed Areas, B) Federal Requirements for Forest Roads in Wetlands, C) Sources of Help and Information, and D) Known Regulations.

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Section I: PLANNING THE FORESTRY OR LOGGING OPERATION

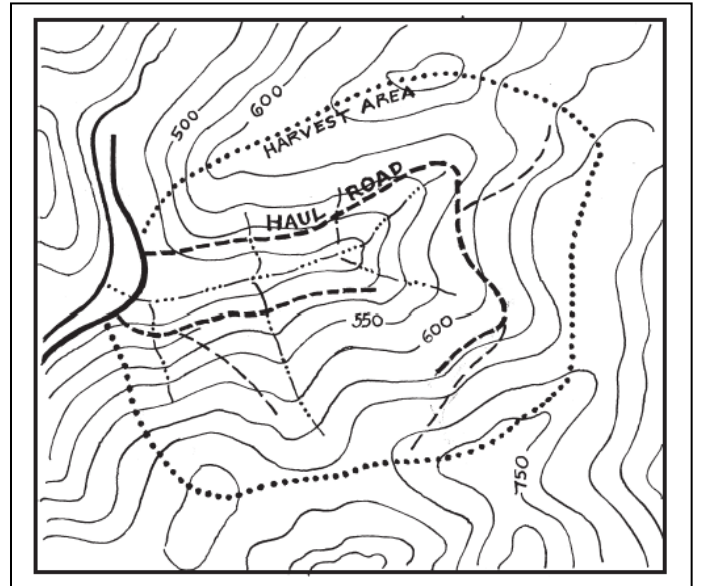
Maximize profit and minimize water pollution by pre-harvest planning.

Meet with the landowner and/or forester to locate roads, skid trails, and discuss BMPs to implement.

GENERAL GUIDELINES

Use maps and site tours to make note of:

- Property boundaries.
- Streams and drainage.
- Critical areas subject to rutting and erosion.
- Existing roads and trails.
- Proposed haul road and skid trails.
- Stream and drainage crossings.
- Log landing locations.
- Caution signs needed along public roads.
- Buffer zones for streams and other sensitive areas.

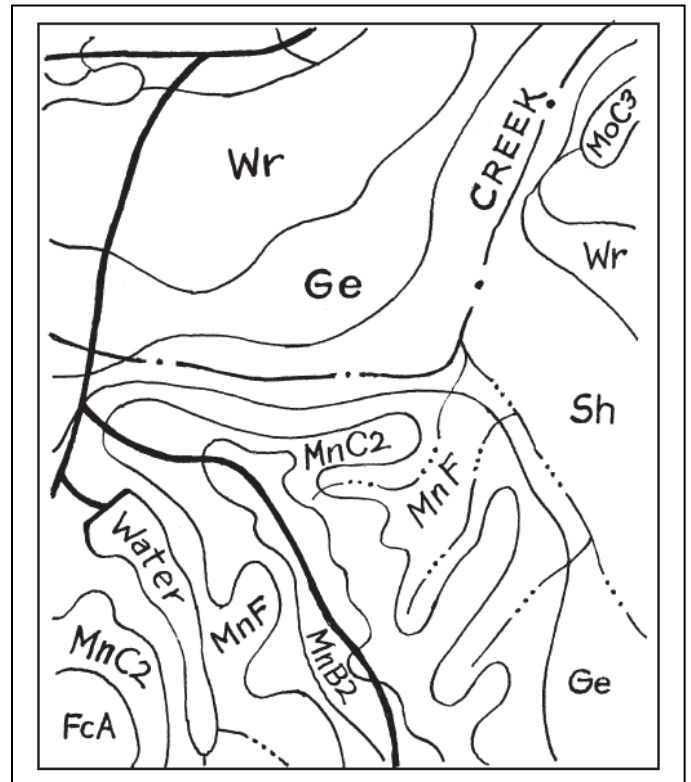


Also note:

- Road and trail specifications.
- Harvesting equipment needed.
- Best time of year to operate.
- Timber sale contract requirements.
- Special planning for wet areas.
- Obstructions and special areas to avoid.

For more information concerning pre-harvest planning and concerns about environmental regulations contact:

IDNR, Division of Forestry
402 W. Washington Street, Room W296
Indianapolis, IN 46204
317/232-4105



Use soil map to locate poorly drained, highly Erosive or wet areas to avoid with equipment.

DNR Division of Water

402 W. Washington Rm. 265
Indianapolis, IN 46204
317/232-4160

Natural Resources Conservation Service

6013 Lakeside Boulevard
Indianapolis, IN 46278-2933
317/290-3200

U.S. Geological Survey topographic maps can be obtained from the Indiana Department of Natural Resources, Map Sales, 402 West Washington Street, Room W160, Indianapolis, IN 46204-2742. 317/232-4180. They are also available at many sporting goods stores.

Soil maps may be viewed at the Natural Resources Conservation Service (NRCS) office in each county, or purchased from the NRCS state office.

Aerial photos may also be available or viewed at NRCS offices or county auditor's or surveyor's offices.

Section II: FOREST ROADS

Proper drainage is the single most important factor in controlling soil erosion and keeping a road in usable condition.

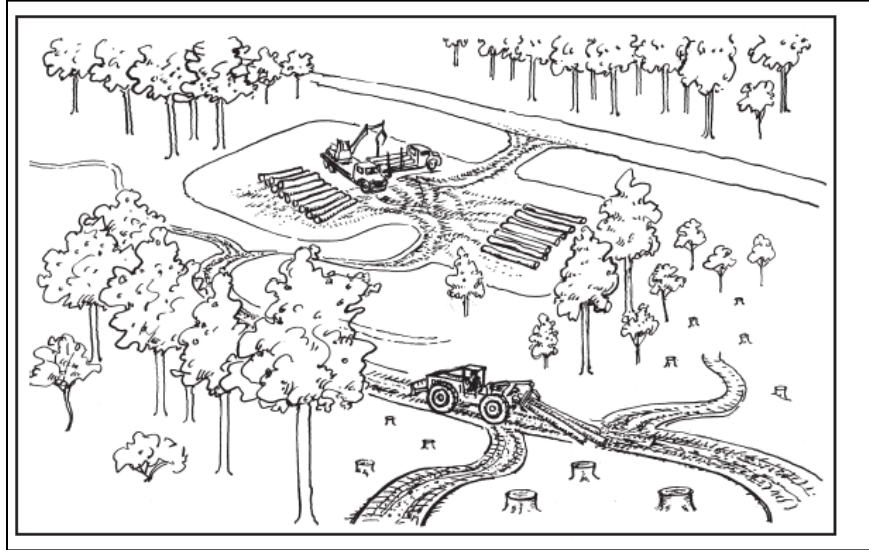
PLANNING FOREST ROADS

GENERAL GUIDELINES

Your plan should include:

- Lay out the road and its drainage system before equipment arrives.
- Use existing access routes if use will not aggravate an erosion problem.
- Apply the riparian management zone BMPs to road locations. See Section V.
- Minimize the number of stream crossings.
- Provide safe and visible access to public roads.
- Avoid or minimize disturbance to areas of high quality trees.
- Coordinate with utility companies and highway departments.
- Keep grades between 2% and 10% when possible.
- Maintain buffers between roads and waterways and other sensitive areas.
- Grades up to 15% can be used for distances up to 300'.

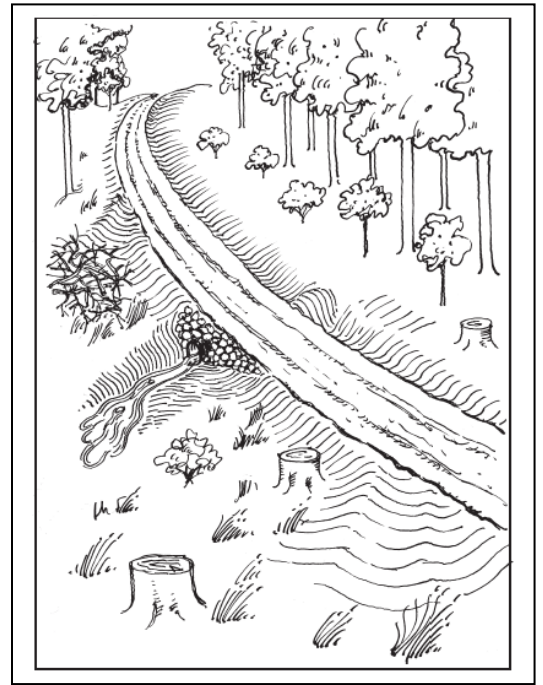
- Break road grades frequently to divert water from road surface onto stable areas of the forest floor.
- Use naturally stable sites such as ridge crests and well drained sites and contours.
- Avoid gullies, seeps and other permanently wet areas.
- Mark the locations of grade breaks, out slopes and diversions.
- Incorporate aesthetic considerations, especially in visually sensitive areas. Visually sensitive areas may include landings next to roadways, residences and property access points.



Forest roads connect the log landing to a public road:
They generally must handle heavy loads for a portion of their service life.

GENERAL GUIDELINES

- Construct only as much road as necessary.
- If possible, construct, stabilize, and seed in advance of use.
- Minimize clearing.
- Keep road width to the minimum necessary to operate safely.
- In winter, removal of leaf cover will allow road to freeze quicker.
- Keep blades off the ground when shearing and pushing debris.
- Minimize earth moving activities when soils are excessively wet or excessively dry, and before oncoming storms.
- Place crushed stone on highly erosive sites or when hauling during wet or muddy conditions where necessary.
- Add geotextile stabilizing fabric under the crushed stone on wet sites where necessary.
- When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety.
- Construct roads to drain well at all times. See Table 1 below for diversion spacing recommendations.



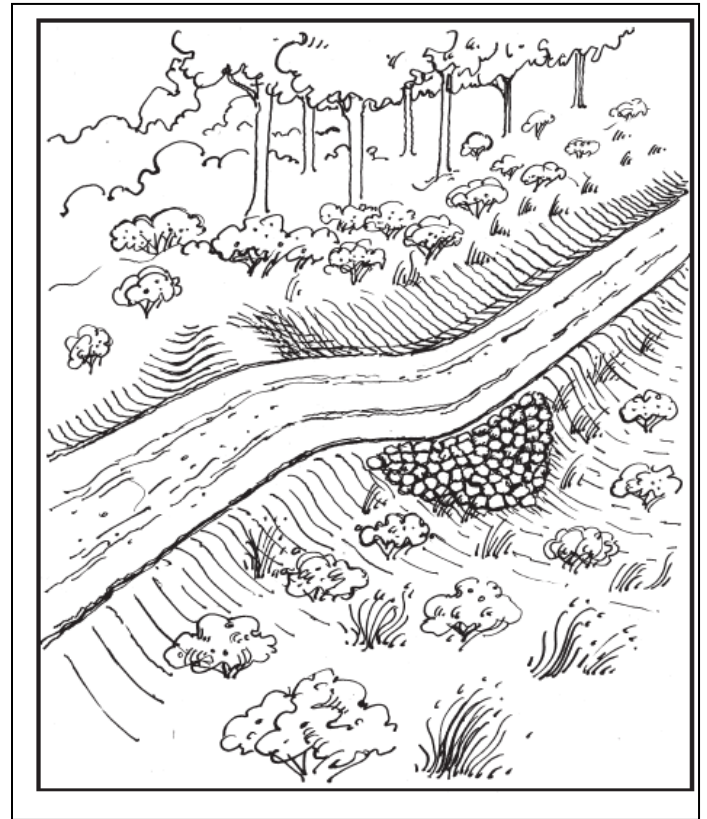
Space drainage structure according to slope and where runoff can be absorbed.

Table 1. Recommended Maximum Spacing for Drainage Structure

Slope (percent)	Broad-based Dips and Culverts (feet)	Turnouts and water bars (feet)
2	300	250
5	180	125
10	140	80
15	125	60
20	120	40
25	115	30

(See also page 22.)

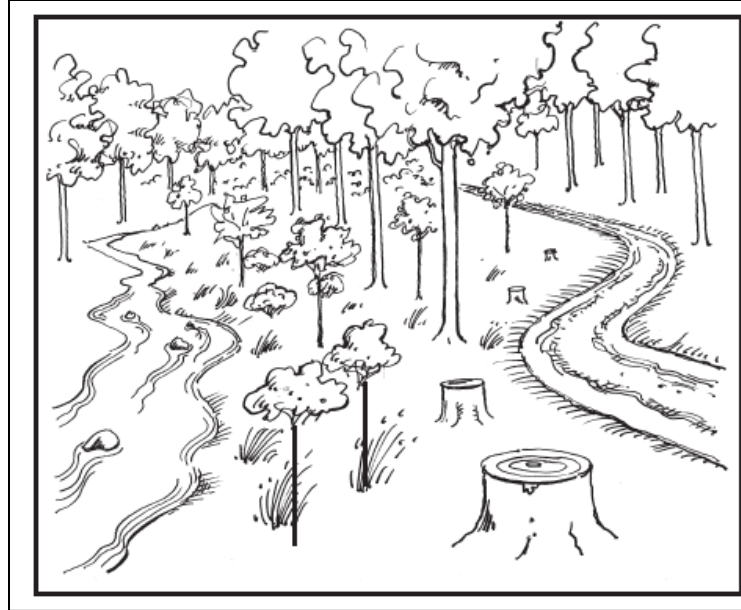
- Install culverts or other breaks at specified intervals on steep grades, where inside ditches are required. See Table 1.
- Drain water diverting structures and road runoff onto the undisturbed forest floor away from stream channels.
- Minimize cut and fill work, and keep slopes at stable angles.
- Maintain an undisturbed buffer strip between forest roads and streams. See Table 4, page 35.
- If sufficient buffer strip next to waterways is not possible, use temporary erosion and sediment control practices (e.g. silt fence).
- Install erosion control measures as road sections are completed.
- At culvert drain spout install sufficient energy dissipaters, such as brush or riprap, where necessary to prevent sediment delivery to the water course.
- Do not place fill material into open sink holes, waterways, wetlands, floodways or other sensitive areas.



Broad-based dips reduce potential for erosion.

- Do not leave felled or cleared material in major stream channels or where it may be washed into a channel during a flood event.
- Protect the public roadbed and drainage system when accessing public roads. Install a properly sized culvert when necessary. See Table 3. Apply crushed stone to public road access sites if needed to protect the public roadbed and prevent mud buildup.
- Install an entry gate or barricade to keep potentially damaging and unwanted traffic off the forest road.

CAUTION: The Flood Control Act requires that permanently flowing streams and streams with greater than a square mile watershed and their floodways must be kept clear of debris and fill. Additional federal, state and local regulations may also apply, such as Federal Emergency Management Agency flood areas. See Appendix D for known regulations.



Buffers between streams and roads prevent road runoff from entering directly into streams.

ROAD AND TRAIL MAINTENANCE

Water bars must be maintained to work.

Road maintenance should be done regularly. It usually can be performed with logging equipment, farm tractors and or hand tools. Inspect and maintain erosion control and water diversions frequently. **Your maintenance responsibility includes public road ditches affected by your activity. Make sure this maintenance is done even during periods of work shut down.**

GENERAL GUIDELINES

- Avoid using roads during wet periods if such use would likely damage the road drainage features or cause excessive rutting, erosion or other site damage.
- Keep public roadways clean of mud and logging debris.
- Clean dips, culverts, and crossdrains; repair ditches to prevent erosion and sediment delivery into waterways.
- Clear away even minor obstructions that may have accumulated in drainage structures (especially culverts).
- Smooth edges that develop on road surface if they will trap water.

CLOSING FOREST ROADS

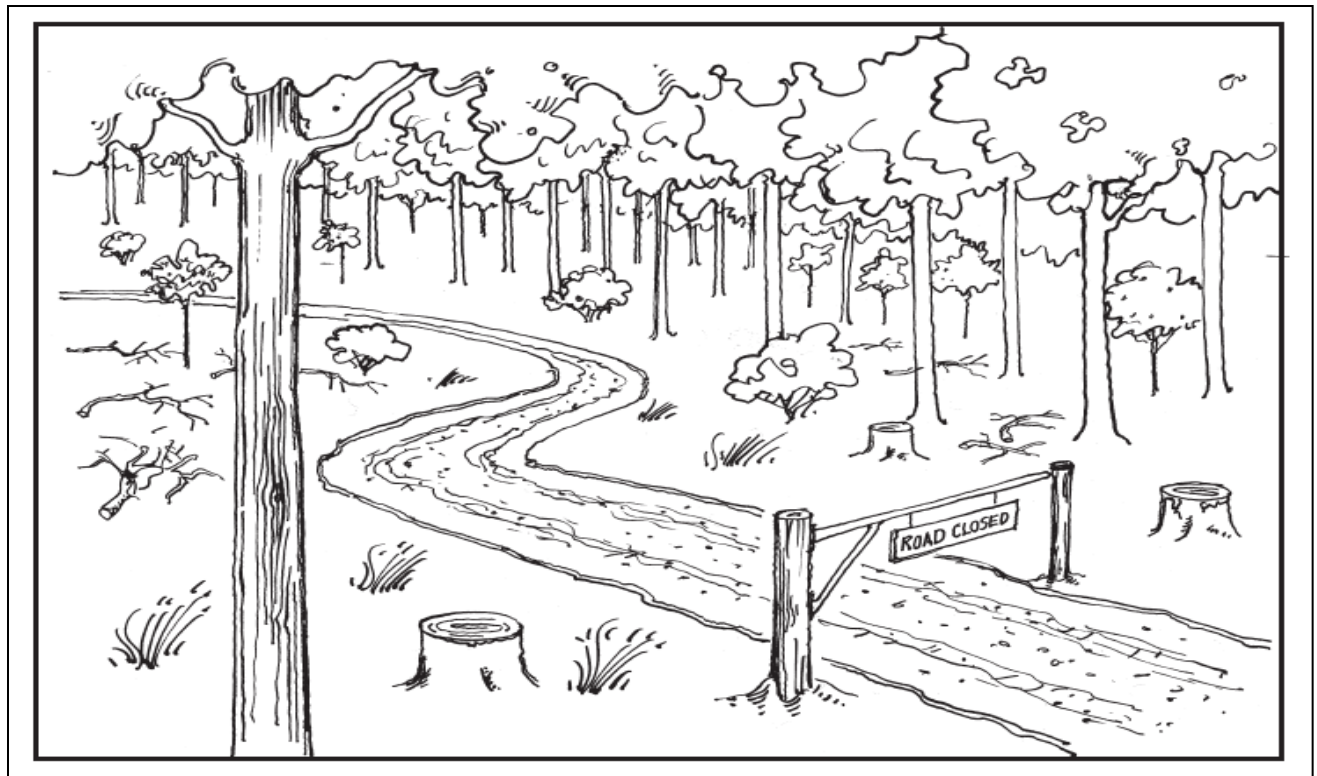
Using BMPs before and during operations will minimize the cost of closing.

Your operations will be judged by what you leave behind. Roads should be stabilized when the job is stopped for the season, as well as when logging is completed. As a rule of thumb, if a logging area is to be inactive for 30 days or more, forest roads and skid trails should be temporarily shut down.

The main purpose of closing forest roads is to prevent erosion. A properly closed forest road will improve aesthetics while providing access for recreation, wildlife and forest management, fire control and other activities. Closure should be accomplished as soon as the use of each section of the forest road is completed.

GENERAL GUIDELINES

- Stabilize forest roads and smooth water channeling ruts and outside berms as soon as possible after use.
- Insure that all erosion control and water management measures (e.g. water bars, drainage dips, culverts and ditches) are working. See spacing recommendations in Table 1.
- Seed road areas prone to erosion that will not quickly re-vegetate naturally. Fertilizer and lime may be needed in some cases. All unsurfaced roads exceeding 5% in grade should be seeded. See Table A-1 for recommended seeding mixtures and fertilizer and lime rates.
- Mulching may be necessary to reestablish ground cover on some difficult areas.
- Properly placed logging slash can help break the flow of water. It must be limbed to achieve good contact with the road surface.
- Forest owner should revisit the site periodically to determine if repair or maintenance is needed.



Install visible traffic barriers where appropriate to prevent off-road vehicle and other undesired disturbance to recently stabilized areas.

Section III: SKID TRAILS

Avoid skidding in streams.

First locate log landing and haul roads. Plan skid trails to reduce damage to the residual stand, reduce erosion and stream sedimentation, and provide an economical method for skidding products.

GENERAL GUIDELINES

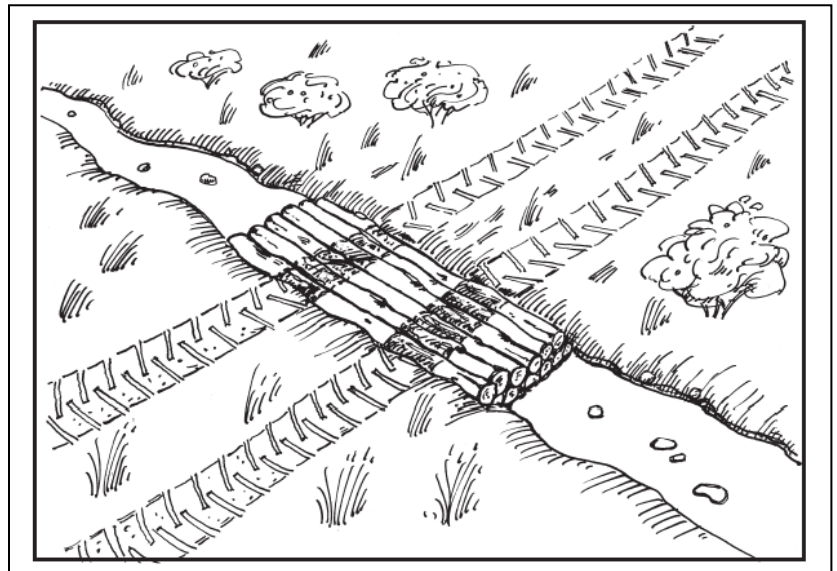
- Avoid long steep grades greater than 20%. Use steeper grades only for short distances and when large water bars or other diversions are installed and maintained.
- Locate to allow skidding at an angle to the slope, not straight up and down a hill.
- Avoid skidding through stream channels, springs, seeps, sinkholes and other wet areas.

Skidding Across Streams

- Cross streams as near to a right angle as possible. Utilize temporary bridges or install culverts where practical.
- Remove temporary crossings as soon as use is completed.
- Fords may be utilized where stable conditions exist and allow crossing without excessive soil movement into the stream (sedimentation).
- See stream crossing guidelines in Section IV.

- If necessary, install temporary crossings in small intermittent and ephemeral streams by placing logs or poles side by side in the streambed. Do so only if:

- Soil is not introduced into the stream,
- Stream flow is not blocked or diverted,
- Woody material is removed after use.



Temporary log bridge eliminates need to skid through streams.

CLOSING SKID TRAILS

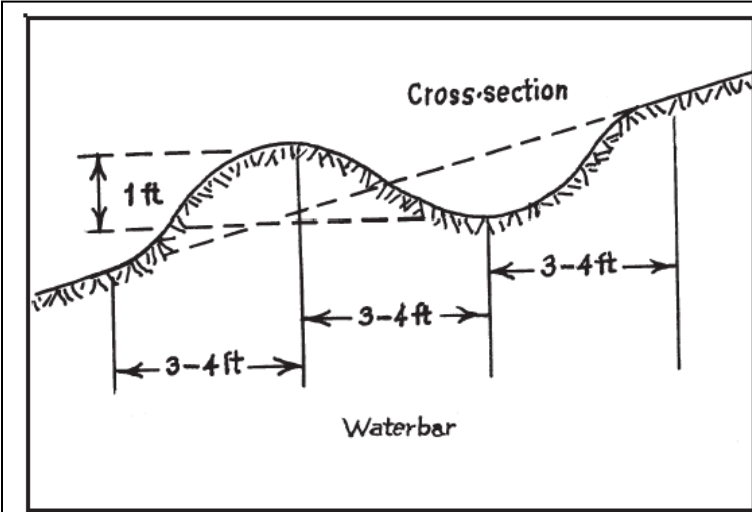
GENERAL GUIDELINES

- Smooth water channeling ruts and berms.
- Install appropriately spaced water bars and other diversions as each harvest section is completed or shut down—even temporary shutdowns. See Table 2.
- Divert water off skid trails before the trail enters a riparian management zone or crosses a stream. See Section V.
- Drain each diversion onto stable forest ground.
- Seed skid trails prone to erosion and slow to re-grow naturally.
- Mulch and fertilize seeded areas where necessary.
- Return disturbed recreation trails to pre-harvest condition or better.
- Install a visible traffic barrier to prevent use by off-road vehicles.
- Logging debris in combination with water bars or other diversions can be placed on skid roads for erosion control. Brush and logs need to be limbed sufficiently to allow ground contact.

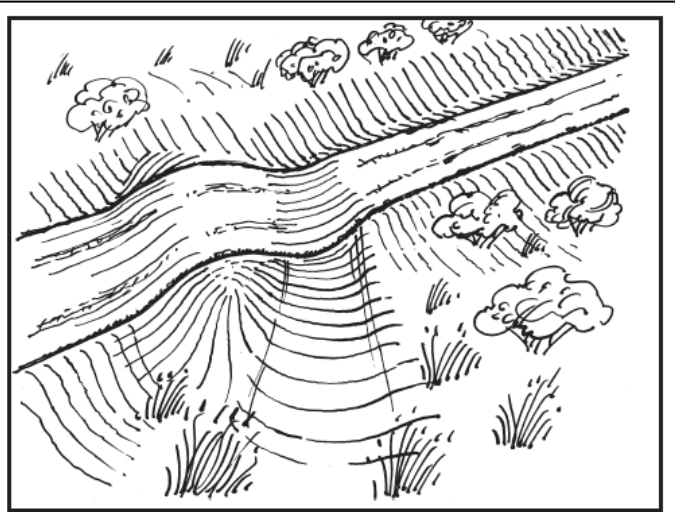
Table 2. Spacing of Waterbars

Skid Trail Grade (percent)	Approximate Distance Needed Between Waterbars (in feet)
1-2	500-250
3-5	250-125
5-10	125-80
11-15	80-60
16-20	60-40
21-30+	40-30

To properly construct a waterbar, you must consider waterbar location, angle, spacing, size and outlet.



Cross-section of waterbar.



Waterbars should extend off both sides of the road and direct water onto stable forest floor.

Section IV: STREAM CROSSINGS

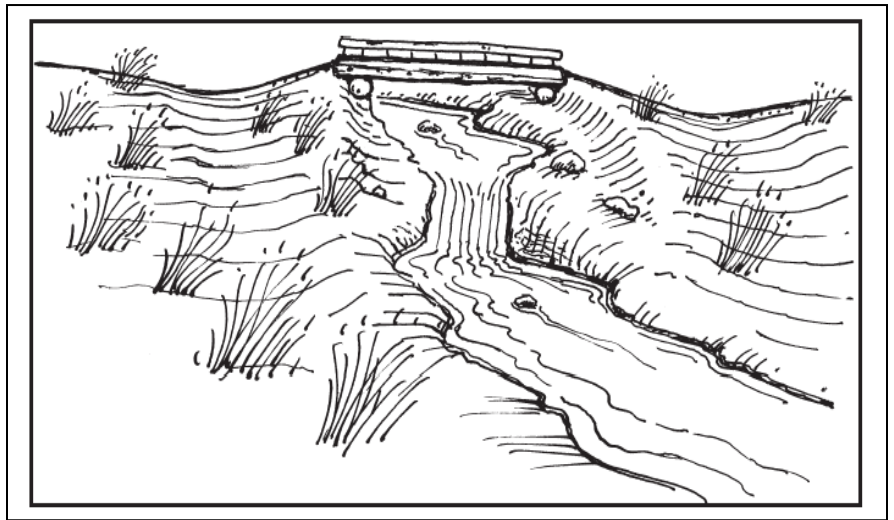
Avoid crossing streams when possible.

Plan operations to minimize stream crossings. If used, obtain appropriate permits from the Department of Natural Resources, Division of Water. A permit may be necessary to cross streams with watersheds greater than one square mile. Permits may also be required on Federal Emergency Management Agency regulated watercourses. These are generally issued through local city or county planning offices.

GENERAL GUIDELINES

- Cross at right angles at a point where the streambed is straight and uniform.
- Minimize the use of equipment in the streambed.
- Limit construction activity to periods of low or normal flow.
- Avoid prolonged activity in salmon streams during spawning periods (March 15-June 15 and July 15-Nov. 30).
- Minimize excavation and fill at stream crossings and other disturbances to stream banks and channels.
- Use materials that are clean, non-erosive and non-toxic.
- Avoid using soil as fill except when installing culverts.
- Avoid altering stream flow.
- Divert runoff from roads and trails leading to stream crossings into undisturbed vegetation. Avoid directing runoff directly into streams, including ephemeral streams.

- Construct bridge, culvert or pole crossing at elevations higher than the road approach.
- If necessary, stabilize road and trail approaches to stream crossings with aggregate or other suitable material.
- Anchor one corner of bridge to prevent movement down stream.
- Stabilize exposed soil as soon as practicable.
- Maintain crossings in safe, functional condition.
- Close temporary crossings by removing culverts, poles, portable bridges and other obstructions as soon as crossings are no longer needed.

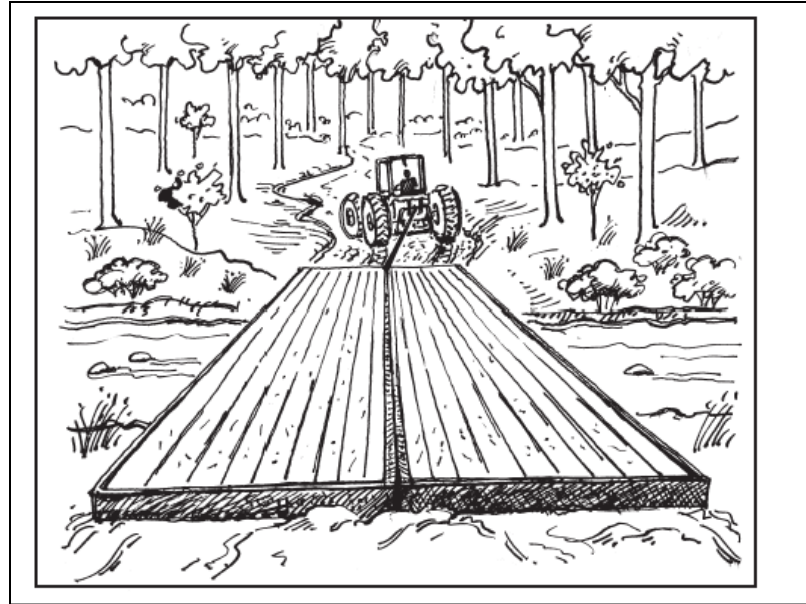


Temporary log bridge should sit higher than the road approaches to the bridge.

BRIDGES

GENERAL GUIDELINES

- Bridges are effective ways to keep equipment out of flowing streams.
- Utilize a bridge design that will provide safe access and minimize disturbance to the stream bank, channel, and the riparian management zone.
- Use temporary or portable bridges instead of culverts to access areas where permanent structures are not needed.
- Place them so as not to unduly constrict stream channels or impede flood waters.
- Anchor temporary bridges on one end with a cable or other device so they do not float away during high water.
- Install so they can be removed easily and promptly when they are no longer necessary.



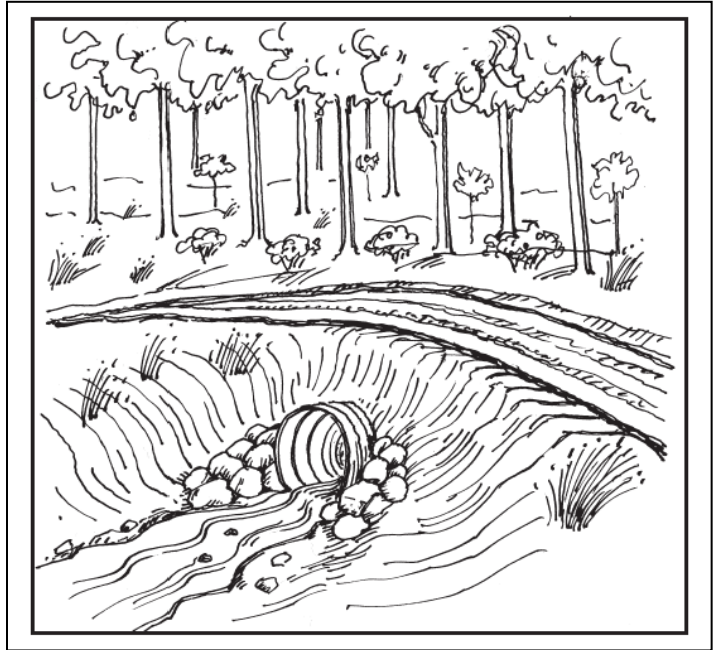
Portable bridge for temporary crossing.

CULVERTS

Consider using a permanent rather than a temporary culvert when the crossing is likely to be used again within 10 years. Avoid use if temporary or portable bridges are more suitable.

GENERAL GUIDELINES

- Use minimum size of 12 inches in diameter and large enough to pass flood flows. See Culvert Size Guidelines, Table 3.
- Use arch culverts where it is important to retain the natural stream bottom.
- Both ends should extend at least one foot beyond the edge of the fill material.
- Place in line with the natural stream course.
- Install at or slightly less than the natural stream slope.
- Compact fill material firmly around culverts, particularly around the bottom half to prevent water from seeping around the culvert.
- 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.



Culvert should extend at least 1 foot beyond road fill.

- Hollow logs are permissible in very small channels if they can handle anticipated stream flows, but should be removed once they are no longer needed.
- Keep culverts open and free of obstructions.
- Use flared end culverts or rip rap where necessary to protect culvert inlet from erosion.

Table 3. Culvert Size Guidelines

Acres Drained	Light Soils (Sands)			Medium Soils			Heavy Soils (Clays)		
	Flat	Mod.	Steep	Flat	Mod.	Steep	Flat	Mod.	Steep
	0- 5%	5- 15%	15% +	0- 5%	5- 15%	15% +	0- 5%	5- 15%	15% +
Culvert diameter in inches									
5	18	18	18	18	18	21	21	21	24
10	18	18	18	21	24	27	27	27	36
20	18	18	18	24	27	36	36	36	42
30	18	18	18	27	30	36	36	42	48
40	18	18	18	27	36	42	42	48	
50	18	18	18	30	36	48	48	48	
75	18	21	21	36	42				
100	21	21	24	36	48				
150	21	24	24	42					
200	24	30	30	48					
250	27	30	30						
300	30	36	36						
350	30	36	42						
400	36	36	42						

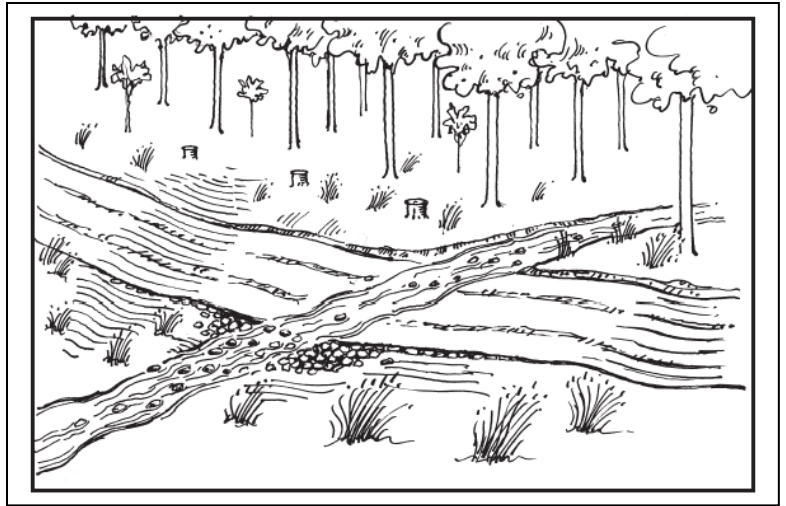
Data source:
Texas Best
Management
Practices for
Silviculture,
Texas Forestry
Assoc.

FORDS

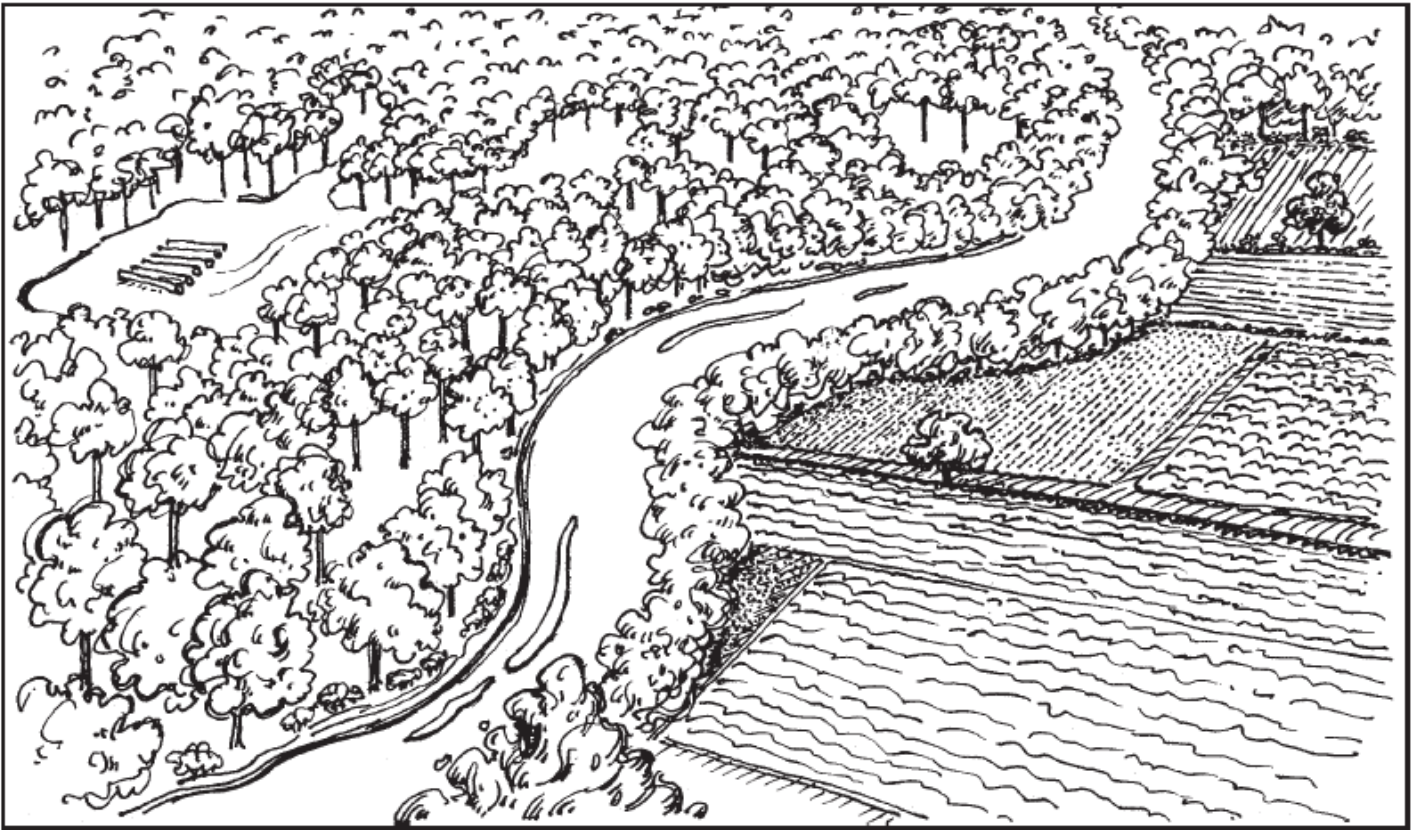
Avoid using fords if practicable, especially in areas of significant water quality concerns.

GENERAL GUIDELINES

- Select fording sites with gentle approaches, low banks, and hard and stable streambeds.
- Construct to conform as closely as possible to the original streambed to minimize water flow restrictions.
- Stabilize the streambed and approaches where necessary. Stabilizing material may include: corduroy mats, reinforced concrete planks, crushed rock, rip-rap or rubber mats.
- Avoid depositing soil in the stream during ford construction and use.
- Avoid use during high water.
- Pole fords should be used carefully to maintain water flow.
- Pole fords are not appropriate for perennial stream crossings.
- Remove pole fords immediately after use.



Stream ford approaches and streambed should be hard and stable.



Riparian zones provide buffer between waterways and agriculture and forestry activities.

Section V: RIPARIAN MANAGEMENT ZONES AND EPHEMERAL STREAMS

RMZs are natural buffer areas between logging and forestry activities and waterways.

RIPARIAN MANAGEMENT ZONES (RMZs)

An RMZ begins at the watercourse bank or sinkhole opening and extends inland. Trees may be harvested within an RMZ. The goal is to maintain a stable forest floor to filter sediment and other pollutants before runoff enters the main watercourse.

GENERAL GUIDELINES

- Make RMZs as wide as practical. See Table 4 for recommended RMZ widths based on watershed characteristics.
- When harvesting trees in the RMZ, minimize disturbance of the forest floor, exposure of mineral soil and degradation of stream banks, and leave adequate tree stocking to shade the stream.
- Locate roads and skid trails outside RMZs except where necessary for stream crossings.
- Minimize mechanical disturbance to the forest floor by using directional felling away from the water course and winching to skid trails outside an RMZ when necessary.
- Do not pile slash, fill or debris within these areas.
- Remove felled tops and logging debris from the channels of perennial and large intermittent streams.
- Place felled tops and debris a sufficient distance away from the water course to prevent flood impediments.

- Protect the forest floor to allow sediment to be filtered out before reaching the watercourse.
- Rule of thumb - expose no more than 10% bare, mineral soil, well distributed throughout an RMZ.
- Avoid locating equipment and material storage sites, maintenance sites and log landings within an RMZ.
- Avoid operating wheeled or tracked equipment in an RMZ and watercourses except on designated roads and stream crossings.
- Don't locate roads or skid trails on pond dams.
- Divert forest road and skid trail runoff onto stable areas before it enters the RMZ.
- Stabilize all roads, skid trails, cuts and fills in the RMZ as soon as practicable after construction and use.
- Avoid broadcast spray of pesticides or fertilizers within the RMZ.
- Cut few if any trees within 15 feet of permanent watercourses.
- Retain at least 50% well distributed canopy cover in the primary RMZ on perennial water courses.

NOTE: The Indiana Flood Control Act (IC 14-28-1) applies to all streams with a watershed greater than one square mile (640 acres) and prohibits the placement of tree tops in stream channels and their floodways which may unduly restrict its flood carrying capacity. Additional federal, state and local regulations may also apply (e.g. Federal Emergency Management Agency flood areas). See Appendix D for known regulations.

NOTE: If operating in a wetland, follow the ADDITIONAL federal wetland guidelines in Appendix B.

Table 4: Suggested Riparian Management Zone Widths

WATERCOURSE CHARACTERISTICS	TOTAL RMZ WIDTHS*					PRIMARY RMZ
	0-5% slope	5-10% slope	10-20% slope	20-40% slope	40%+ slope	
Perennial 40' wide	200	200	200	200	200	200 feet
Perennial 20-40' wide	75	75	75	105	105-165	75
Perennial 20' wide	50	50	65	105	105-165	35
Intermittent	25	45	65	105	105-165	—
Sinkhole openings	25	45	65	105	105-165	—
Water supply reservoirs and their perennial streams	75	90	130	210	210-300	75
Other lakes & ponds	35	45	65	105	105-165	35

*widths in feet on each side of watercourse

Note: Local modification of RMZ widths may be necessary to reflect landowner objectives or unique conditions (e.g. soil type, flood hazard, vegetation present, cold water fisheries, season of use, scenic quality, and importance of intermittent stream to municipal water supply.)

EPHEMERAL STREAMS

Ephemeral streams generally occur in the upper reaches of a watershed and flow after heavy rains, snow melt, or when soils are saturated.

GENERAL GUIDELINES

- Minimize soil disturbance, crossings and channel blockages.
- Remove channel blockages and stabilize erosive areas after use.
- Avoid broadcast applications of pesticides and fertilizers, if water is present.
- Avoid diverting runoff from skid trails and forest roads into ephemeral stream channels.

Section VI: LOG LANDINGS

Well planned and managed log landings will minimize impacts to the site, protect water quality, enhance visual quality, and often increase operation efficiency and safety. They also can be attractive, long term assets to a property.

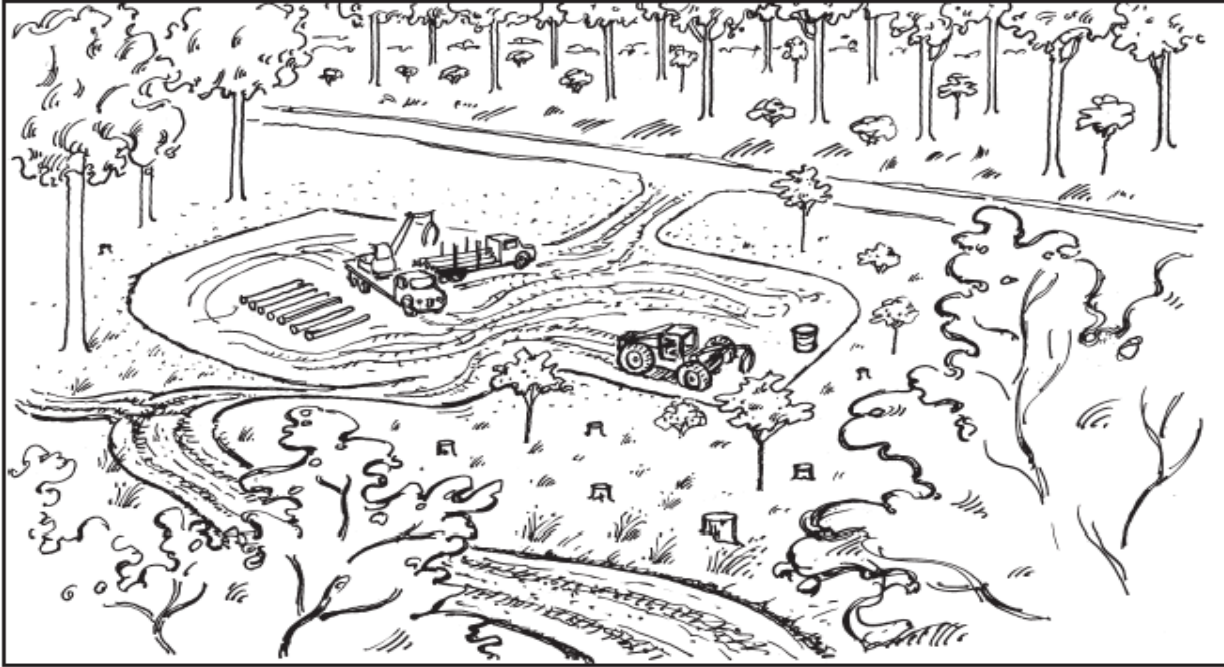
PLANNING LOG LANDINGS

Identify site limitations and job needs. Coordinate harvest tree selection, skid trails, log landings and access roads.

GENERAL GUIDELINES

- Keep the number and size of landings to the minimum needed to operate safely and efficiently.
- Choose a site that will hold up under anticipated use by heavy equipment.
- Avoid sensitive areas, such as riparian management zones, waterways, caves, springs, seeps, and open sinkholes.
- Maintain an undisturbed buffer strip between log landings and sensitive areas.
- Locate landings on slightly sloping ground where soil and site characteristics facilitate drainage and minimize erosion problems.
- Design landings to provide safe access and visibility onto highway when next to public roads.
- Consider aesthetics when planning log landings next to roadways and other visually sensitive areas.

- When possible maintain a buffer screen next to public roads and trails for aesthetic purposes.
- Notify appropriate utility companies before locating landings near overhead and underground utilities.



Landings are temporary storage areas.

CONSTRUCTION OF LOG LANDINGS

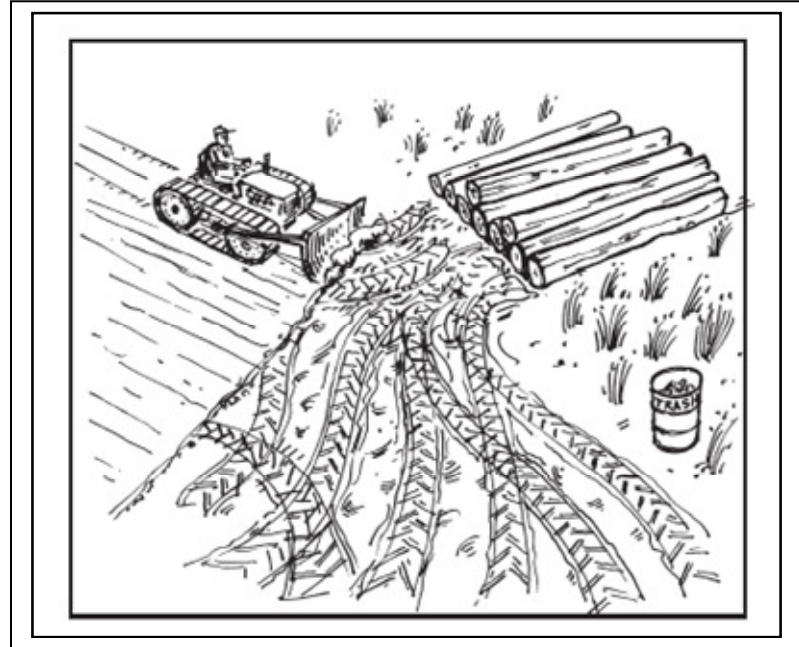
GENERAL GUIDELINES

- Minimize soil disturbance and clear only the size of landing needed.
- Clear high stumps, dead snags and other hazards.
- Construct water diversions to drain water away from the landing and onto a stable area of the forest floor.
- If leveling is necessary, cut and fill should not obstruct the natural drainage of the area.
- During construction, use temporary erosion and sediment control practices (such as silt fences) where there is significant erosion potential or where there are insufficient buffer strips next to waterways.

USE AND MAINTENANCE OF LOG LANDINGS

GENERAL GUIDELINES

- Restrict fueling and maintenance activities to designated areas of the landing. Handle all fuels and lubricants with care to avoid spills.
- Avoid use of the landing when conditions may lead to soil movement off site or when extensive rutting can occur and affect site and water quality.
- Apply coarse stone or other stabilizing cover as needed in extreme conditions.
- Leave log cutoffs in the woods or a designated area of the landing to minimize work hazards, improve landing efficiency and appearance.
- Minimize soil compaction, rutting and logging debris on agricultural and other non-forest lands.
- Keep the public road beds clean of mud and debris and maintain the public road drainage system.
- Maintain water diversion and erosion control measures to control runoff into and from the landing.



Keep log landings free of large ruts.

CLOSING LANDINGS

GENERAL GUIDELINES

- Remove all trash, containers, equipment and other contractor materials.
- Leave the landing in a usable condition, free of large ruts and logging debris.
- Do not block drainages with log cutoffs or other landing debris.
- Cut or lop standing snags and unsightly tree tops in visually sensitive areas. Visually sensitive areas may include landings next to roadways, residences and property access points.
- Seed and mulch landings, where there is significant erosion or aesthetic concern. Lime and fertilizer may be needed on some landings to achieve adequate and rapid revegetation. See seeding mixtures and lime and fertilizer rates in Appendix A.
- Install appropriate traffic barriers where needed to prevent off-road vehicle damage to recently stabilized areas and other conservation efforts.

Section VII: FUEL, LUBRICANTS AND TRASH

Serious contamination can have long lasting effects.

Improper handling of fuels, paints, solvents and lubricants can cause soil and water contamination. It can also damage water drinkability, recreational use and fisheries.

Report all fuel, lubricant and hazardous material spills, exceeding one pound or pint, which enter the waters of the state, including groundwater, and causes a sheen or creates damage to the water quality. Report within 2 hours to the Indiana Department of Environmental Management 24 hour hotline: 888-233-7745.

Additionally report spills: 1) near well heads, 2) operating fluids exceeding 55 gallons, 3) spills which may damage water quality, 4) spills exceeding your cleanup capabilities, and 5) any spill where there is doubt or when technical clarification or assistance is needed. Any spill not cleaned up is also reportable. (Indiana Spill Rule-327 IAC 2-6-1&2).

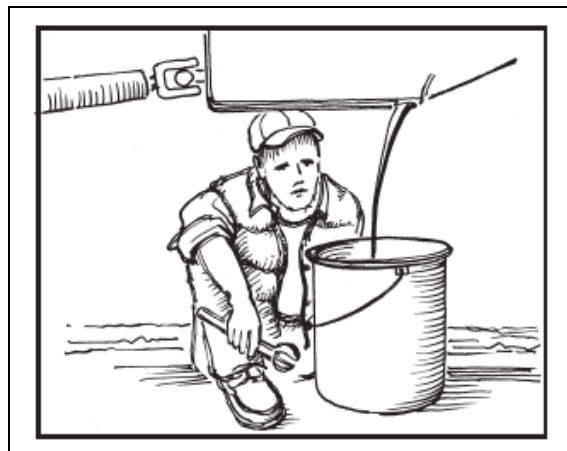
HANDLING FUELS, LUBRICANTS AND OTHER HAZARDOUS MATERIALS

GENERAL GUIDELINES

- Clearly specify and use a designated area for fueling, material storage and maintenance. This area should be away from waterways, areas prone to runoff or sensitive areas like caves, sinkholes, springs, seeps and riparian management zones.
- Use caution when fueling all equipment, even chainsaws, to avoid spills. See warning above.

EQUIPMENT BREAKDOWNS AND SPILLS

- Used oils, fuels, antifreeze and other materials may be considered hazardous and must be disposed of at approved sites. Do not mix wastes. For disposal site information contact the Indiana Department of Environmental Management (IDEM) at 317-233-7745. Toll free 888-233-7745.
- Place all drained lubricants, fuels, etc. in closed containers. Remove them from the site for disposal or recycling according to state and federal regulations.
- Drain oil filters when hot and dispose of used filters, oil cans and grease tubes properly. Drained metal cans and filters can be recycled as scrap metal.
- Maintain all equipment to avoid leaks.
- Clean up any spills that may have occurred according to state regulations. Provide receptacles, a spill kit and instructions for use in breakdown situations. As a minimum, the spill kit should include shovels, plastic sheeting (e.g. Visqueen*) for containment, plastic container to hold spill contaminated material, 2 bags of absorbent (dry sand, oil-dry, kitty litter, peatmoss, ground corncobs, sawdust, and new straw are suitable absorbing materials). The spill kit should also include an instruction packet, available from IDEM.



Always catch and properly dispose of or recycle petroleum products.

- Spills may be temporarily handled by: a) placing contaminated materials on heavy plastic and covering to protect from rainfall; b) using absorbents to soak up spilled materials for easy removal; c) constructing a dike to prevent off site movement of material.

*Name brand is provided for clarification only and is not a product endorsement.

LITTER

Litter or trash left on an operation site looks bad. It damages the beauty of a woods and reflects poorly on the operator and the landowner.

GENERAL GUIDELINES

- Provide and use trash receptacles at forest operations.
- Remove all litter when leaving the site and dispose of it properly.

Section VIII: NON-LOGGING BMPs

TREE PLANTING AND NATURAL REGENERATION

Begin the new stand as quickly as possible.

Forestation projects generally consist of four phases: 1) plan the project to reach intended goals; 2) prepare the site for successful forestation; 3) plant or regenerate trees; and 4) take care of the trees after establishment.

PLANNING THE FORESTATION PROJECT

Plan harvests to take advantage of natural regeneration. When tree planting on agricultural sites or to assist natural regeneration, consider these guidelines.

GENERAL GUIDELINES

- Choose tree species that meet planting objectives and are naturally suited to the planting site.
- Target previously cleared areas along streams, forested sites needing species enrichment, aesthetically sensitive areas, and unproductive or erosive sites slow to regenerate naturally.

SITE PREPARATION

Site preparation enhances seedling survival by reducing competing vegetation. It also makes an area easier to plant. The technique used depends on soil type, slope, condition of the site, existing natural vegetation, and cost. Soils, slope and ground cover are the three principal factors that determine the potential for erosion on any site. In Indiana, site preparation is often done by hand, mechanically or with the use of herbicides.

Mechanical and Hand Clearing

Mechanical site preparation involves the use of heavy equipment to clear the planting site of unwanted vegetation or planting obstructions. This may be as simple as plowing and discing an area of dense sod, or as major as completely clearing a site of undesirable trees (such as honey locust). The BMP goals are to keep the soil on site, avoid stream sedimentation and maintain site drainage. When mechanical site preparation is necessary consider these guidelines.

GENERAL GUIDELINES

- Limit clearing to slopes that will remain stable. Do not use heavy equipment to clear highly erodible areas or steep slopes (i.e. >20%).
- On steep slopes cut or girdle unwanted trees by hand and leave felled material on the site.
- Avoid removal of the forest's litter layer as much as possible on slopes. This can be done by hand clearing or using a raised dozer blade to move only woody material and avoid soil gouging. Do not expose more than 50% of the soil surface. Clearing while the ground is frozen will help minimize soil disturbance.
- Do not operate under wet soil conditions.

- Stabilize bare soil areas on cleared sites with a temporary cover crop. Don't use noxious and non-native perennial species, such as Kentucky 31 fescue and alfalfa unless needed for highly erosive soils. (See seeding mixtures in Appendix A.)
- Do not place cleared material in RMZs, sensitive wetlands or where it may block area drainage.
- Maintain an undisturbed buffer strip next to water courses and sinkhole openings.

Warning: The Indiana Flood Control Act prohibits construction and placing of fill, including woody debris, in floodway areas. Clearing in designated "floodways" may require a permit from the Indiana Department of Natural Resources, Division of Water. Heavy clearing in designated wetlands may also require a permit. For information call the Division of Water 317-232-4160 or The Division of Forestry 317-232-4105.

Chemical Site Preparation

Several herbicides may be used to eliminate weed competition or undesirable trees. With herbicides there is no soil disturbance. They can be used where steep slopes prevent use of machinery. Nevertheless, there are also risks in the use of herbicides. The following guidelines minimize these risks.

GENERAL GUIDELINES

- Always use the proper herbicide for the job and follow label instructions! The herbicide label is a legal document. Some herbicides are labeled as “restricted use” and must be applied by licensed individuals. If in doubt, contact a trained forester or herbicide dealer.
- Do not apply near water courses, sinkholes, springs or seeps.
- Maintain a buffer strip of at least 50' next to streams and water bodies to act as filters of any moving herbicides. When applying herbicide immediately next to streams, contact a trained forester for specific herbicide recommendations.
- Do not use broadcast herbicide applications where excessive runoff will be a problem.
- Do not apply herbicide sprays during windy periods.

PLANTING AND WEED CONTROL

Minimize off site soil and pesticide movement by following these guidelines.

GENERAL GUIDELINES

- Hand plant steep, erodible sites.
- When planting slopes greater than 5% by machine, plant on the contour where practical and safe.
- It is usually necessary to control competing weeds around the newly planted trees for 1-3 years.
- Remove all trash and litter from the planting site and dispose of it properly.
- Follow chemical site preparation guidelines to minimize undesired pesticide impacts.

Note: See the next section for additional chemical handling guidelines.

FOREST CHEMICALS

Don't spray chemicals directly on water.

Most water quality problems associated with pesticides and fertilizers are caused when they are spilled or sprayed directly on surface water. Use extra care when using chemicals in riparian management zones and wetlands, Section V.

The basic federal law regulating pesticides and their use is the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The Indiana State Chemist further regulates the use, handling, and application of pesticides. All pesticides are classified for "general" or "restricted" use. Restricted-use pesticides may be used only by or under supervision of certified applicators.

GENERAL GUIDELINES

- Read and follow all label instructions on chemical containers.
- Maintain a spill containment and cleanup kit appropriate for the pesticide being used.
- Report all spills to Office of the State Chemist: (317) 494-1583 (pesticides), (317) 494-1548 (fertilizers); and IDEM (888) 233-SPIL (toll free), or (317) 233-SPIL (233-7745).
- Prevent chemical leaks from equipment.
- Mix and load chemicals outside of RMZs, preferably in upland areas.
- Calibrate spray equipment to assure uniform application of the correct amount.
- Apply chemicals only under favorable weather conditions.
- If it is necessary to utilize chemicals in RMZs, use methods that will prevent the chemical from entering the water (e.g. use spot treatment, frill, or stump treatment methods).
- Use extra care when applying herbicides in areas where the chemicals will kill stabilizing vegetation on slopes, gullies and other fragile areas subject to erosion.

- Rinse spray equipment and discharge rinse water only in areas that are part of the application site and outside the riparian management zone.
- Dispose of chemical containers according to label instructions.



Oust®

herbicide

Dispersible Granules

<i>Active Ingredient</i>	<i>By Weight</i>
Sulfometuron methyl (Methyl 2-[[[(4,6-dimethyl-2-pyrimidinyl)amino]-carbonyl]amino]sulfonyl]benzoate)	75%
Inert Ingredients	25%
TOTAL	100%

EPA Reg. No. 352-401
U.S. Pat. 4,394,506

KEEP OUT OF REACH OF CHILDREN

CAUTION

STATEMENT OF PRACTICAL TREATMENT

IF IN EYES: Flush eyes with plenty of water. Call a physician if irritation persists.

For medical emergencies involving this product, call toll free 1-800-441-3637.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Causes (moderate) eye injury (irritation). Avoid contact with eyes or clothing.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants.
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of equipment washwaters.

FIRE AND FIRE CONTROL LINES

Control lines constructed by mechanized equipment should follow logging road and skid trail BMP standards to minimize soil erosion. Control lines constructed with hand tools should also follow these standards, modified as needed to reflect hand trail construction. See IDNR publications “Indiana Trail Construction and Maintenance Manual” available from the Indiana Department of Natural Resources, Division of Outdoor Recreation, 402 West Washington, Room W271, Indianapolis, IN 46204 (317-232-4070).

The primary concern regarding both wildfires and prescribed fires in terms of Best Management Practices is the effect fire and associated control measures have on surface water runoff. First- it should be noted that wildfires and prescribed fires are dangerous and should not be undertaken by the untrained.

GENERAL GUIDELINES

- Utilize trained fire personnel.
- Install BMP measures as soon as practical after fire containment.
- Locate control lines on the contour when possible. Avoid unsafe, underslung lines.
- Protect RMZs whenever possible. Utilize hand tools when constructing control lines into stream channels or RMZs.
- Construct control lines only deep enough and wide enough to stop the spread of fire.
- Control lines constructed by mechanized equipment should follow forest road and skid trail BMP standards to minimize soil erosion.
- Control lines constructed with hand tools should also follow these standards, modified as needed to reflect hand trail construction.

Additionally, when using controlled, prescribed fire as a management tool the following actions should be taken:

- Have a written burning and erosion control plan.
- Obtain necessary fire/burning permits.
- Plan control line location to protect water quality.
- Time prescribed fires so that soil moisture levels are sufficient to prevent the entire organic layer from being consumed.
- Avoid burns on steep slopes or in areas with highly erodible soils.
- Utilize natural barriers as fire breaks such as roads and rock outcrops to the extent possible.
- Establish unburned filter strips in situations where steep slopes, erodible soils, or the likelihood of substantial organic matter removal are present.
- Utilize “wet” lines, retardant, mowing or alternative vegetation for control lines when possible.

Fire questions should be directed to the Indiana Department of Natural Resources, Division of Forestry, Fire Control Headquarters, 6220 Forest Road, Martinsville, IN 46151 (765-342-4701).

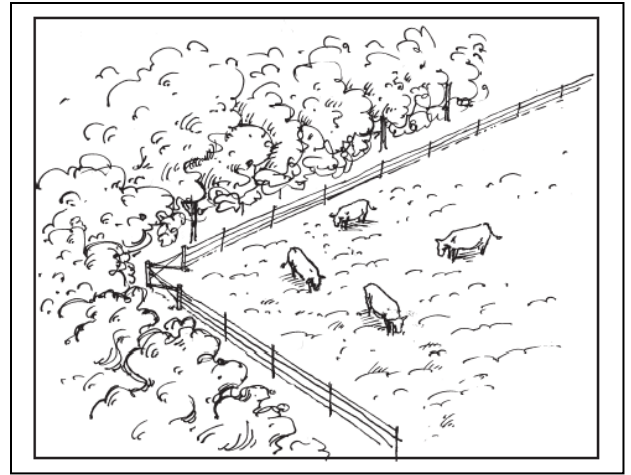
WOODLAND GRAZING

Keep livestock out of the woods.

Where farm animals and livestock have access to forest areas, there is a high risk of accelerated soil erosion and reduced water quality.

GENERAL GUIDELINES

- Keep livestock out of the woods. Small stable areas of the woods may be included in the pasture where necessary for shade, wind protection or access to water supplies.
- Convert some of the marginal forest land into stable, productive pasture with scattered or clumped trees for shade and shelter. Protect the remainder of the woods and the pasture trees from active grazing.
- Develop alternate livestock watering supplies away from water courses where practicable.
- Provide extra protection, such as fencing, around springs, streams, sinkhole openings and erosive slopes to exclude livestock traffic.
- Maintain a strip of undisturbed vegetation next to waterways to filter sediments and excess nutrients before they enter the water.

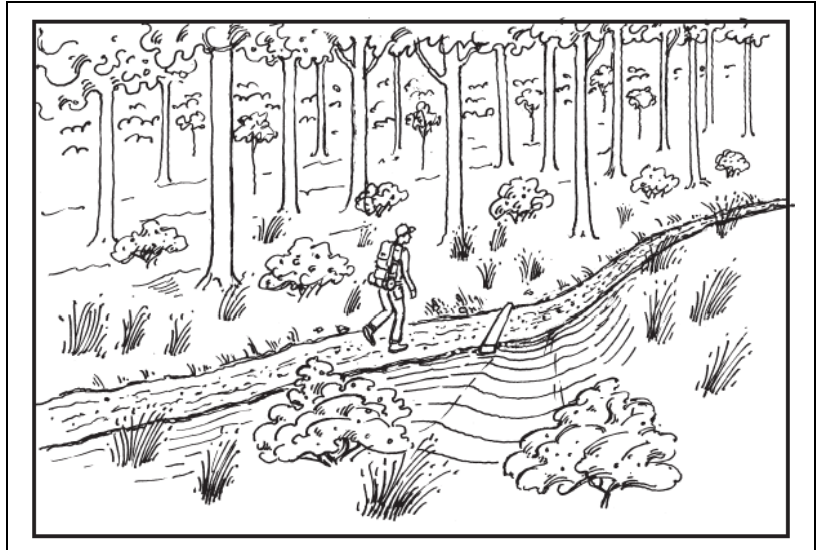


10-20 acres of woods are needed to equal food value of 1 acre of open pasture

RECREATION TRAILS

Designated trail systems may be necessary where recreation pressures are high. Forest access roads can serve as recreation trails. Trails should be well planned; constructed to protect user safety and minimize soil erosion; and maintained to ensure erosion control measures are functioning and safety hazards are minimized.

They should generally follow the guidelines for forest roads, stream crossings and RMZs. Specific BMP guidelines can be found in the “Indiana Trail Construction and Maintenance Manual” available from the Indiana Department of Natural Resources, Division of Outdoor Recreation, 402 West Washington Room W271, Indianapolis, IN 46204 (317-232-4070).



Trails should be constructed using the same drainage structures as forest roads.

GLOSSARY

aesthetics - The visual appearance of a site.

archeological area - An area where humans conducted some activity and left evidence of it behind, such as artifacts or other remains. Includes all human burial sites and sites of activity pre-1816. Newer sites may also be significant.

arch culvert - Culvert with arched upper portion, but flat bottom.

berm - Fill preventing movement of water off the road surface; Or, a low earthfill constructed in the path of flowing water to divert its direction, or accumulation beside the road.

Best Management Practice (BMP) - A practice determined to be the most practicable means of preventing or reducing non-point source pollution to help achieve water quality goals, and more generally, of protecting and conserving forest resources and forest land productivity.

broad based dip - A surface drainage structure specifically designed to drain water from a forest road while vehicles maintain normal travel speeds. Also known as a rolling dip.

buffer (filter) strip - A barrier of permanent vegetation established or left undisturbed down slope from disturbed forest areas to filter out sediment from runoff before it reaches a watercourse. Also known as a filter strip.

cistern - A receptacle for holding water or other liquid; especially, a tank for catching and storing rainwater.

compacting - The process of reducing the space between soil particles.

corduroy - Logs placed over a wet area in order to minimize the risk of rutting.

culvert - A metal, concrete, plastic or log pipe through which water is carried.

cut and fill - A process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

diversion - A surface drainage structure designed to drain water from forest roads and trails. There are several types of diversions including: broad based dips, water bars and turnouts.

duff - The partially decayed organic matter on the forest floor. Economic damage is avoided and adverse side effects are minimized when duff layer is left in place.

energy dissipater - Any type of diversion that slows the energy of moving water.

ephemeral stream - A watercourse generally without a well-defined channel which flows only in response to rainfall or snowmelt. Ephemeral streams, generally, flow for less than 20% of the year during normal rainfall.

erosion - The loosening and movement of soil particles.

FEMA - Federal Emergency Management Agency.

fill - Any solid material added to or redeposited in an area. It could alter the hydrological characteristics or obstruct the flow patterns where deposited.

flared end culverts - Culvert with sloped protruding ends to accommodate back fill.

flood (storm) event - A periodic overflowing of water onto land that is normally dry.

ford - A natural or reinforced stream crossing suitable for shallow streams with stable bottoms.

forest floor - All dead organic matter on the mineral soil surface in the forest, including litter and duff.

forestation - All types of tree planting, whether conversion of open land or after a harvest.

geotextile fabric - A product used as a soil reinforcement agent and as filter medium. It is made of synthetic fibers manufactured in a woven or loose non-woven manner.

grade - The slope or steepness of a road usually expressed as a percent.

grade break - A decrease in the steepness of a road accomplished with a broad based dip, switchback or other diversion.

gully - An eroded channel which has been deepened to the point that it cannot be removed by tillage.

intermittent stream - Watercourse with a well defined channel generally flowing in the channel for 20—90% of the year. Indicated by dashed blue lines on older topographical maps or thin, solid blue lines on newer topographical maps.

invasive species - Generally, a non-native species which, if introduced to a site, may spread and/or displace native plants or animals.

IPM - Integrated Pest Management, an ecological approach to pest management in which all available necessary techniques are consolidated into a unified program so that pest populations can be managed in such a manner that use of chemicals is minimized.

litter layer - The uppermost, slightly decayed layer of organic matter on the forest floor.

log landing - A place where trees and logs are gathered in or near the forest for further processing and transport.

mulching - Using organic residues (such as grass, straw, or wood fibers) or commercially available alternatives as a covering for exposed forest soil. It serves to control erosion and facilitates revegetation.

natural regeneration - The planned regeneration of a forest that either uses existing trees as a source of seed or encourages sprouting from stumps or roots.

Non-point source pollution (NPS) - Pollution 1) induced by natural processes, including precipitation, seepage, percolation and runoff; 2) not traceable to any discrete or identifiable facility; and 3) controllable through the utilization of best management practices.

NRCS - Natural Resources Conservation Service, an agency of the U.S. Department of Agriculture.

outsloping - A roadbed along a hill constructed so that water will flow across the road toward its downhill side.

percent grade - Change in elevation of a road per unit of length (e.g. a 10' rise over a 100' length is a 10 percent grade).

perennial stream - A stream that generally maintains water in its channel throughout the year. Indicated by solid blue lines on older topographical maps or thick, solid blue lines on newer topographical maps.

pesticide - Chemical substances, either liquid or granular, that are used for the control or eradication of undesirable insects, disease, vegetation, animals and other organisms. Herbicides, Insecticides, Fungicides and Nematicides are examples.

practicable - Capable of being effected, done, or executed; feasible and practical.

prescribed fire - The controlled application of fire to wildland fuels under specified environmental conditions in order to eliminate unincorporated organic matter or low undesirable vegetation.

riparian - An area adjacent to a body of water, such as the bank of river, pond, or small lake.

Riparian management zone (RMZ) - A buffer strip next to a river, stream, lake, pond, sinkhole opening or any other sensitive body of water.

riprap - Rock fragments (3" - 8" in size) often placed to protect from the erosive forces of flowing water or to stabilize an area for equipment traffic.

runoff - Surface flows channeled into the vegetation, duff, ditch or dispersion area to minimize soil erosion.

sediment - Eroded soil particles that are deposited downhill, or in a body of water, by surface runoff.

seep - A place where groundwater flows slowly to the surface and often forming a saturated soil area; a small spring.

sensitive area - Unique area to be given special consideration to prevent or minimize disturbance which may alter the site's uniqueness.

silt fence - Plastic strips or straw bales used as a fence to catch soil washing off of an area of bare soil.

sinkhole - A natural depression in a land surface connecting with a subterranean passage generally occurring in limestone regions and formed by solution or by collapse of a cavern roof.

site preparation - A forest activity to remove unwanted vegetation and other material to cultivate or prepare the soil for reforestation.

skid trail - A temporary pathway for dragging felled trees or logs to a landing for processing.

slash - The unwanted, unutilized and generally unmarketable accumulation of woody material in the forest, such as limbs, tops, cull logs and stumps, that remain in the forest as residue after timber harvesting.

spill kit - A kit containing materials and instructions for cleaning spills of hazardous or potentially hazardous materials.

spring - A flowing source of water originating underground.

stream channel - The natural ditch which conveys surface runoff water within well defined banks.

streambank - The sides of a channel that hold or carry water.

streambed - The bottom of a stream.

waterbar - A ditch and a hump across a trail or road, tied into the uphill side for the purpose of carrying water off of the road.

watercourse - A stream of water; river; a channel of water. Can also include bodies of open water and subterranean (underground) waterways.

wildfire - Uncontrolled fire occurring in forest land, brush land, and grass land.

APPENDIX A: Guidelines For Seeding Disturbed Areas

Site Preparation: It may be necessary to loosen compacted sites prior to seeding. This may include scarification of the site with a disc, rake, subsoiler, etc. to a depth of at least 3 inches. Steep slopes should be avoided since loosened soil can easily be washed off site.

Lime and fertilizer: Caution—Fertilizing may encourage the growth of exotic weed species and should be avoided where adequate nutrients naturally occur. A soil test is recommended to determine lime and fertilization needs. When a soil test is not practical, but poor soil fertility anticipated the following minimums can be used: 2 tons of agricultural lime and 1000 pounds of 6-12-12 fertilizer per treated acre.

Seeding: Several seed mixtures can do the job. Choose a mixture which is least or non-invasive, yet provides the desired soil stabilization and other benefits. Seeding with an annual plant can often provide adequate cover for the critical first year and allow natural vegetation to further stabilize the site. Additionally, some sites will require perennial seed mixtures for long term protection, while others may require no seed at all and rely only on natural re-vegetation. Refer to the seeding chart for recommended seed mixtures.

Mulching: Mulch materials may be needed to prevent surface compaction; hold seed, lime and fertilizer in place; reduce runoff and soil erosion; and prevent drying of seeds and seedlings. Spread mulch uniformly to cover 80-90% of the treated area. (Small grain straw, hay can be used as mulch at a rate of 1-1 1/5 bales per 1,000 square feet, or 50-65 bales per treated acre. Wood or bark mulch at a rate of 1,500 pounds per acre may also be used.) In some cases mulch alone may be sufficient to allow natural re-vegetation and stabilization.

GENERAL GUIDELINES

- Loosen compacted soil except on steep slopes.
- If soil fertility is known to be poor, use 2 tons ag. lime and 1000 lbs. 6-12-12 per acre.
- Use mix of annual plants to allow natural vegetation to come in after first year.
- In severe conditions use perennial mix.
- If required, mulch with 6 bales per 5,000 sq. t. or 50-65 bales per acre. Use 1,500 lbs. wood or bark mulch per acre.

Table A-1: Temporary Species For One Year Coverage
Choose one and use alone or with a perennial seed mix

Species (lbs/ac)	Seeding Rates (Without mulch)	Seeding Dates
<i>Late Season</i>		
winter wheat	120 (2 bu.)	Sept. 15-Oct. 30
cereal rye (Aroostook)	112 (2 bu.)	Sept. 15-Oct. 15
annual ryegrass	15	Aug. 1-Sept. 15
<i>Early Season</i>		
spring oats	96 (3 bu.)	Mar. 1-May 1
forage sorghum	20	May 1-June 15
foxtail millet	12	May 1-June 15
Japanese millet	15	May 1-June 15
cowpeas	40	May 1-July 1
pearl millet	10	May 1-June 15
browntop millet	15	May 1-June 15

Table A-2: Seeding Mixtures For Wildlife Habitat And Soil Protection

Species or Mixture	Seeding Rates (lbs/ac)	Seeding Dates (without mulch)
A. wheat or spring oats with: switchgrass, indiangrass, birdsfoot trefoil, big bluestem	25 5 8 8 6	Mar. 1 - May 30
B. orchardgrass with: Kobe, Korean, or Appalow lespedeza	10 10	Mar. 1 - June 1
C. orchardgrass birdsfoot trefoil	10 8	Mar. 1 - Sept. 15
D. orchardgrass timothy ladino-clover red clover	8 4 2 6	Mar. 1 - Sept. 15

Table A-3: Mixture For Wet Or Poorly Drained Areas

Species Mixture	Seeding Rates (lbs/ac)	Seeding Dates (without mulch)
Japanese millet	10	Mar. 1 - June 1
redtop	2	Mar. 1 - June 1
alsike clover	4	Mar. 1 - June 1

TABLE A-4: Mixtures For Bare/Highly Erodible Areas

Species or Mixture	Seeding Rates (lbs/ac)	Seeding Dates (without mulch)
<i>General Mix:</i>		
White clover	8	Aug. 1 - Sept. 1
Perennial rye grass	5	
Annual rye grass	8	Aug. 15 - Sept. 15
Creeping red fescue	10	Mar. 1 - May 1

Table A-4: Mixtures For Bare/Highly Erodible Areas (Continued)

<i>Sun and Partial Shade Mix:</i>		
*Kentucky 31 fescue and one of the following	20	Mar 1 - May 1 and Aug. 1 - Oct. 1
spring oats, buckwheat	30	Mar. 1 - May 1
creeping red fescue	20	Mar. 1 - May 1
Appalow sericea lespedeza	10	Mar. 1 - June 1
red top	2	Mar. 1 - Sept. 15
birdsfoot trefoil	10	Mar. 1 - Sept. 15
flatpea	30	Aug. 1 - Sept. 15
cereal rye, wheat, barley	30	Sept. 15 - Oct. 1
Full and Partial Shade Mix:		
Creeping red fescue	20	Mar. 1- May 1
& white clover	2	Aug. 1 - Sept. 1

*Kentucky 31 is considered an invasive species and should be used only in extreme cases where soil stability is needed quickly and there is a high probability that natural vegetation will be able to out-compete it in the shade.

Table A-5: Calculating Road Surface Acreage

Road Length	Road Width – Feet				
Feet	8	10	12	14	18
50	.01	.01	.01	.02	.02
100	.02	.02	.03	.03	.04
250	.05	.06	.07	.08	.10
500	.09	.12	.14	.16	.21
1000	.18	.24	.28	.32	.41
2000	.36	.48	.56	.64	.83
5280	.97	1.21	1.45	1.70	2.18

APPENDIX B: Federal Requirements For Forest Roads In Wetlands

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.

A wetland may not be under federal jurisdiction by the Army Corps of Engineers if it is isolated from other navigable waters. Contact the Army Corps of Engineers or IDEM to see if the wetland you are preparing to harvest is under federal or state jurisdiction and laws.

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 riparian management zones except at stream crossings. For more information, see Section V: Riparian Management Zones and Ephemeral Streams.
3. Road fill must be bridged, culverted, or otherwise designed to prevent restriction of expected flood flows.
4. Properly stabilize and maintain road fill 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 production.
13. Fill shall not be placed in water bodies or on land regarded as part of the National Wild and Scenic River System.
14. Use fill free from toxic pollutants in toxic amounts.
15. Completely remove all temporary fills and restore the area to its original elevation.

APPENDIX C: Sources Of Help And Information

DNR Division of Forestry

The Division of Forestry provides training and technical assistance to forest landowners, forest industries and natural resource managers. They also administer the: 1) Licensed Timber Buyers Law, 2) Classified Forest program on private lands and 3) management of State Forest lands.

State Office: Indiana DNR- Division of Forestry

402 West Washington, Rm W296

Indianapolis, IN 46204

317-232-4105

fax 317-233-3863

Website: <http://www.in.gov/dnr/forestry>

District Forester Offices

District Foresters can be reached in their offices most Fridays. To find the District Forester in your area, go to <http://www.in.gov/dnr/forestry/4750.htm>.

For a list of Indiana's State Forests, go to <http://www.in.gov/dnr/forestry/3631.htm>.

DNR Division of Water

The Division of Water administers the requirements of the Indiana Flood Control Act which restricts construction and fill activities in Indiana floodway areas. Permits for stream crossings or other floodway construction activities are issued through the DNR Division of Water.

State Office:IDNR Division of Water

402 West Washington, Rm W264

Indianapolis, IN 46204

317-232-4160

fax: 317-233-4579

Website: <http://www.in.gov/dnr/water>

DNR Division of Law Enforcement

The DNR Division of Law Enforcement conservation officers enforce the state's conservation laws- including the Flood Control Act, Licensed Timber Buyers Law and fish and game laws.

State Office:IDNR Division of Law Enforcement

402 West Washington, Rm W255 D

Indianapolis, IN 46204

317-232-4010

fax 317-232-8035

Website: <http://www.in.gov/dnr/lawenfor>

IN State Department of Agriculture - Division of Soil Conservation

The Department of Agriculture Division of Soil Conservation provides technical and financial assistance for soil conservation practices.

State Office:ISDA Division of Soil Conservation

150 West Market Street, Suite 414

Indianapolis, IN 46204

317-232-8770

fax: 317-232-1362

Website: <http://www.in.gov/isda/2343.htm>

DNR Division of Fish and Wildlife

The DNR Division of Fish and Wildlife administers the state's fish, wildlife and wetland programs.

State Office:IDNR Division of Fish and Wildlife

402 West Washington, Rm W273

Indianapolis, IN 46204

317-232-4080

Website: <http://www.in.gov/dnr/fishwild>

DNR Division of Historic Preservation and Archeology

For information on the protection and conservation of historic and archeological resources.

State Office:IDNR Division of Historic Preservation and Archeology

402 West Washington, Rm W274

Indianapolis, IN 46204

317-232-1646

Website: <http://www.in.gov/dnr/historic>

Indiana Department of Environmental Management (IDEM)

IDEM administers programs and regulations dealing with point and non-point source pollution. They deal with water quality issues. Report spills of toxic and other reportable substances to IDEM.

Emergency spill hotline: (24 hour toll free): 888-233-7745; 888-233-SPIL; 317-233-7745

IDEM Website: <http://www.in.gov/idem>

Indiana State Chemist Office

For information on pesticide handling, regulation, training and licensing contact the Indiana State Chemists office.

State Office:Office of the Indiana State Chemist

1154 Biochemistry Building

Purdue University

West Lafayette, IN 47907-1154

765-494-6271

To report spills: 765-494-1583 (pesticides)

765-494-1548 (fertilizers)

Website: <http://www.isco.purdue.edu>

Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service)

This agency of the U.S. Department of Agriculture provides technical and financial assistance in many soil conservation practices—including forestry best management practices. There are NRCS offices in every county in cooperation with the county Soil and Water Conservation District.

State Office: Natural Resources Conservation Service

6013 Lakeside Blvd.

Indianapolis, IN 46278

317-290-3220

Website: <http://www.in.nrcs.usda.gov>

Indiana Forest Industry Council (IFIC) and Industrial Foresters

IFIC is a forest industries association that conducts or sponsors logger training and workman’s compensation insurance and represents the forest industry on a variety of issues. Industrial foresters are professional foresters employed by an industry for the procurement of timber or other forestry management services.

State Office: Indiana Forest Industry Council (IFIC)

3600 Woodview Trace, Suite 311

Indianapolis, IN 46268

800-640-4452

Website: <http://www.ificsfi.org>

Consultant Foresters

Consultant foresters are independent professional foresters whose services are available to anyone on a fee or contractual basis. Their services are also available for a fee or other considerations. For a directory of consultant and industry foresters published by the Indiana Forest and Woodland Owners Association, go to <http://www.findindianaforester.org>

Indiana Hardwood Lumbermen's Association (IHLA)

IHLA is a non profit trade association comprised of sawmills, wholesalers, equipment vendors, secondary users and others who recognize the benefits of working together on projects of interest to the hardwood industry. The IHLA coordinates the Sustainable Forestry Initiative (SFI) efforts in Indiana.

State Office:**Indiana Hardwood Lumbermen's Association (IHLA)**

3600 Woodview Trace, Suite 311

Indianapolis, IN 46268

317-875-3660

800-640-IHLA

fax 317-875-3661

Website: <http://www.ihla.org>

Purdue University- Department of Forestry and Natural Resources

Purdue University—Department of Forestry and Natural Resources is the only accredited forestry degree program in Indiana and source of scientific and technical information on a variety of forestry and natural resources issues. Natural resources training programs and educational materials are also available through the Purdue Cooperative Extension Service.

Purdue University
Department of Forestry and Natural Resources
West Lafayette, IN 47907
765-494-3590
Website: <http://www.ag.purdue.edu/fnr>

Financial Assistance For Forest Management

Cost Sharing Programs

The DNR and other sources encourage the protection of natural resources during forest management activities by providing technical assistance and cost-share funding to owners of private forest lands. Contact the DNR Division of Forestry for cost share program information. Practices that may be eligible for cost sharing include:

- 1) Development of forest stewardship and logging access plans
- 2) Tree planting for reforestation and windbreaks
- 3) Timber stand improvement
- 4) Wildlife habitat enhancement
- 5) Soil and water protection and improvement

Classified Forest Program

Indiana's Classified Forest program allows landowners to dedicate their land as Classified Forest and receive property tax reductions, technical assistance and educational materials at little or no cost. In return landowners agree to take care of their forest in a stewardship manner for timber production, watershed protection and related benefits. The use of forestry BMPs protect the landowners obligations under this program. For more information contact the state (317-232-4105) or district office of the Indiana Division of Forestry.

APPENDIX D: Known Regulations

Summary of State and Local Forestry Regulation in Indiana Affecting Timber Harvesting

(Note: This listing may not include all existing regulations affecting forestry operations.)

State Regulations

Classified Forest Act (IC 6-1.1-6)-Requires landowners to follow an approved forest management plan. Owner must sustain the watershed protection and timber production benefits of forest land. Failure to comply can force removal from the program and tax penalties. This law is administered by the Indiana Department of Natural Resources, Division of Forestry.

Indiana Flood Control Act (IC 14-28-1)-Deals with construction and permitting activities in floodway areas. Examples of forestry activities that may trigger this law are stream crossings, and leaving logging debris in regulated streams or their floodway. This Act primarily pertains to streams and rivers with a drainage area larger than one square mile. This law is administered by the Indiana Department of Natural Resources, Division of Water.

Licensed Timber Buyers Law (IC 25-36.5-1-18)-Requires all those buying timber to be licensed by the state and bonded. This law is administered by the Indiana Department of Natural Resources, Division of Forestry.

Blue River Commission-Segments of the Blue River in Harrison County restrict tree cutting and other activities along its corridor. Permits may be needed before harvesting trees in these areas. This law is administered by the Blue River Commission.

2005 IN Senate Bill 518 “Right to Practice Forestry”- Protects loggers and landowners from nuisance lawsuits on private and public lands as long as they are following BMPs and “standard forestry practices.” At the time of publishing this guidebook, Senate Bill 518 had recently been signed by the Governor for passage into law.

County Regulations

Several counties have local ordinances requiring either logging permits or posting of road bonds. At least the following counties have some regulations:

- Crawford County (road hauling)
- Greene County (road hauling)
- Franklin County (selective cutting only in
Whitewater River Scenic District)
- Martin County (road hauling)
- Monroe County (Logging permit and road bond)
- Owen County (road hauling)
- Perry County (road hauling)
- Pike County (road hauling)

Some of these may be above the normal spring hauling restrictions found in nearly all counties. These regulations are administered by county government offices (e.g. plan commissions, highway departments).