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Water Quality Best Management Practices on Forest Lands

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Water is a vital component of Michigan's natural resources. Freshwater supplied by 11,000 inland lakes, 36,000 miles of rivers and streams, and the Great Lakes is the lifeblood of the state's ecosystems and one of the world's greatest sources of freshwater. Maintaining high water quality must therefore be a constant goal in all resource management activities. Healthy and stable forestlands contribute to surface and groundwater quality. If done improperly, forest management activities on these lands can potentially degrade water resources. Best management practices (BMPs) for protecting that quality have therefore been outlined by the Michigan departments of Natural Resources and Environmental Quality.

What are best management practices?

All activities in forest management — including road building, landing site location, harvesting and slash disposa — can potentially affect water quality. BMPs are a set of practices determined to effectively prevent or reduce non-point-source water pollution. These practices will maintain a water quality level compatible with water quality goals (Michigan Department of Natural Resources, 1994). Though many of these practices are voluntary, state and federal land management agencies, as well as private timber companies, have widely adopted BMPs to reduce the impacts of their activities.

Non-point-source pollution enters a water body from a vague, diffuse origin on the watershed. The pollutant is not carried by an obvious, confined or discrete delivery system, such as a pipe.

Why are they important?

Forest management activities can have serious impacts on Michigan's land and waters. Road building and machinery use can expose soils to erosion. Chemical runoff from accidental leaks or spills can find their way into wetlands, streams or the water table. Removing trees that shade water sources can increase water temperatures. Excessive debris from slash in waterways can trap sediments and choke streams. Any of these impacts can affect neighboring landowners who live downstream. Both the owners of the forested property and the forest operators are ultimately responsible for any damage they may cause to waterways or wetlands. Environmental protection laws exist that could result in significant penalties to the landowner who does not follow BMPs.

Let's look at several potential impacts of forest management in more detail.

- **Erosion and sedimentation into rivers, streams and other open water bodies** - This is the biggest impact that forestry activities can have on water quality in Michigan. Many activities involved in forest harvesting — including tree skidding, road building and landing site use — may remove topsoil from the forest floor. Additionally, heavy equipment used in harvesting activities can compact soils. These effects reduce the forest's ability to absorb and filter surface water. Exposed mineral soils are thus more vulnerable to erosion.
- **Chemical runoff** - Operating machinery during forest management activities requires fuel and lubricating oil that can potentially leak or spill

accidentally. These chemicals can easily find their way into groundwater or nearby surface waters. Specific legal guidelines direct the handling and disposal of fuels, lubricants and other toxic substances. All spills are illegal, and the operator is responsible for spill prevention and proper disposal. To avoid any possible accidental contamination, all equipment involved in harvesting or other management activities should be maintained in efficient working order.

- **Thermal pollution (heat)** - Trees and other vegetation that surround waterways help to reduce warm-season water temperatures by providing shade from direct sunlight. Removing this thermal protection can raise water temperatures, which can seriously affect the survival of some important fish species and other forms of aquatic life.

BMP guidelines have been designated to help protect existing land and water conditions. This fact sheet summarizes some of the practices included in the publication "Water quality management practices on forest land" (Michigan Department of Natural Resources, 1994). You may also consult your local forestry professional for additional information.

Best management practices—recommendations for soil and water protection

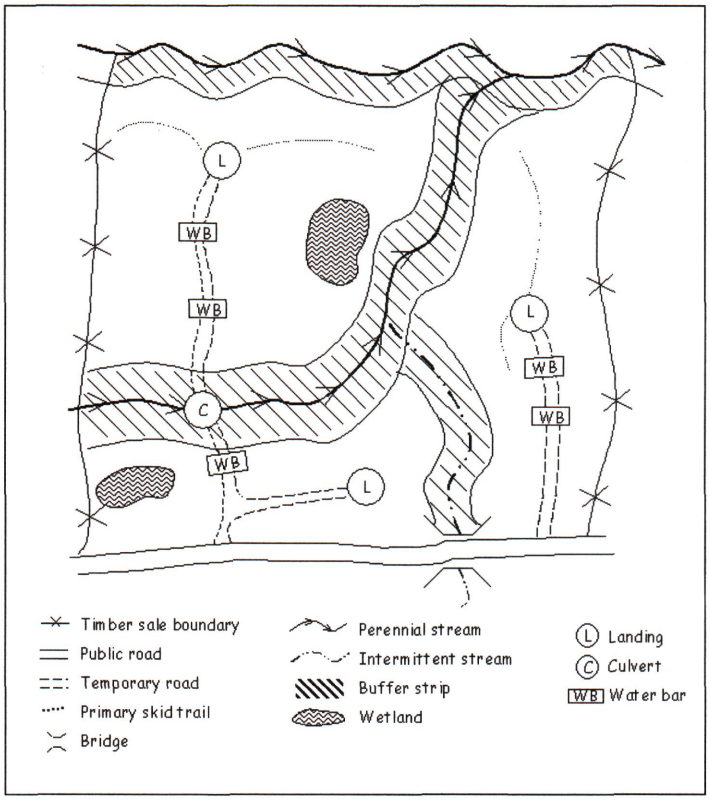
Developing a site plan and harvesting timber

Before any management practices are conducted on forested land, a thorough plan of proposed activities should be assembled. This plan should include a map that identifies property boundaries, streams and other surface water features, soils, slopes and known environmentally sensitive areas (Fig. 1). Potential log landings, stream crossings, main haul roads and skid trails should be designated. The total number and length of roads and skid trails should be minimized. Additionally, buffer strips should be delineated along all open water areas.

Because most forestry operations occur in remote locations, maintenance of equipment is commonly conducted on site. Equipment operators must make special efforts to prevent accidental spills of fuels, lubricants or other toxic materials.

They must also ensure proper maintenance of equipment to prevent leakage of these contaminants. Fueling areas should be located well away from water bodies and drainage structures. Proper receptacles for collecting solid wastes (such as oil filters and empty grease tubes) should be provided on site. Once collected, these solid wastes must be disposed of at an approved solid waste site.

Fig. 1. Sample site plan.



Streamside management zones, otherwise known as buffer or filter strips, are special areas along water bodies that help filter and trap suspended sediments, chemicals or other pollutants. They also provide shade for small waterways. The minimum suggested streamside management zone width is approximately 100 feet, with greater widths necessary if slopes along waterways are steep. It is essential that the soil and ground cover/humus within these buffer strips be left intact for these strips to function effectively. Extra precautions should therefore be taken when conducting forest practices within these buffer strips. These include locating equipment storage, haul roads and landings outside the buffer, removing all limbs and tops from streams, and minimizing the number of trees harvested to protect shade levels and existing forest floor conditions. These practices also minimize soil disturbance within the strip.

Building roads and trails

Road systems are the primary sources of access for all human uses of the forest, including harvesting. According to the U.S. Environmental Protection Agency (EPA), more than 90 percent of soil entering forested streams comes from roads used within the forest. Like other forest harvesting activities, building harvest-related roads and trails requires careful planning. Aerial photographs, U.S. Geological Survey topographic maps and soil maps are important when determining the optimum location for roads for removing and transporting forest products. These are readily available through your local professional forester or conservation district office. As a general rule, keep road grades at or below a 10 percent slope. Take advantage of roads that already exist on the property. Note soil texture and drainage on and around proposed roads and trails — some are poorly drained or seasonally wet. Identify potential obstacles, such as seeps, springs, ledges or rocky areas, and design the road system around them. Cross streams only when absolutely necessary, designing any crossings at as close to a 90 degree angle as possible. To allow the proper flow of side ditch storm runoff, seeps and small waterways and corrugated metal pipe culverts may need to be installed. For haul roads that have recently been created or upgraded, control soil erosion from runoff by using such structures as burlap dams, silt fences, straw bales or rip-rap to catch suspended sediment and slow down the movement of runoff water, which hastens erosion. In some cases, it may be best to construct and stabilize the roads one to two years before any forest harvesting. Once the forest management activities are completed, be sure the road surface is stabilized with appropriate (live) vegetative cover. See Fig. 2 for a checklist of important practices related to road building and culvert construction.

Fig. 2. A checklist for proper construction of roads and culverts in stream crossings.

Stream crossings-culvert checklist

- ❑ Permit applied for and approved by DEQ Land and Water Management Division.
- ❑ "Hasty" method or other DEQ-approved method used to determine culvert size.
- ❑ Culvert size greater than or equal to 18 inches, or diameter appropriate for calculated end area.
- ❑ Road grade decreased before reaching within 50 feet of a stream.
- ❑ Road crosses stream at right angle whenever possible.
- ❑ Pipe extends two feet or more beyond side slope of road.
- ❑ Alignment of pipe matches slope and alignment of stream.
- ❑ Surface water runoff is diverted off road at least 50 feet before stream crossing.
- ❑ Fill over culvert is at least 12 inches (or greater than half the diameter of culvert, if it's more than 24 inches in diameter).
- ❑ Rock rip-rap or other material placed at inlet and outlet of culvert.
- ❑ Base and sidewall fill is properly compacted to prevent water from seeping around and under culvert.

Road building checklist

- ❑ Road bank cuts are sloped, scarified, mulched and seeded.
- ❑ Roads follow contour with grades between 2 and 10 percent; grades greater than 10 percent are less than 300 feet in length.
- ❑ Roads having unstable soils have grades less than 8 percent; grades up to 12 percent are less than 150 feet in length.
- ❑ Roads are outsloped where gradient permits (2 to 10 percent grade); where insloped, adequate cross drainage is provided.
- ❑ Roads avoid gullies, seeps, springs, wetlands and poor drainage areas where possible.
- ❑ Borrow pits are shaped, stabilized and located away from streams.
- ❑ Diversion ditches, broad base dips or culverts are used at appropriate intervals.
- ❑ Roads are not graded when approaching within 50 feet of stream crossing.

Site preparation and reforestation

Forest management includes long-term attention to the forestland. Harvesting is but one activity. For a sustainable, healthy forest landscape, it is important to include site preparation and regeneration in management planning. Site preparation encourages the development of desired tree species and controls undesirable competing vegetation. Various mechanical site preparation procedures remove competing vegetation that reduce the supply of light, water and nutrients available for desired seedling species. Raking, disking and scarification are the typical methods. These techniques should be applied along the contour of the land, rather than down existing slopes. Always choose the method that will cause the least disturbance to the site while still achieving the landowner's objectives. Additionally, where chemical site preparation is used, landowners must also take the proper precautions to assure that herbicides applied to control weeds don't run off, drift or accidentally spill into water bodies.

Contact your local resource professional

This fact sheet is only an overview of what a landowner should know. The Michigan Department of Natural Resources (MDNR), the Department of Environmental Quality (DEQ) and your local resource professionals can provide more detailed information on where and when to use BMPs. These practices are important steps in protecting both Michigan's water and forest resources.

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