WISCONSIN FOREST MANAGEMENT GUIDELINES

PUB-FR-226 2003

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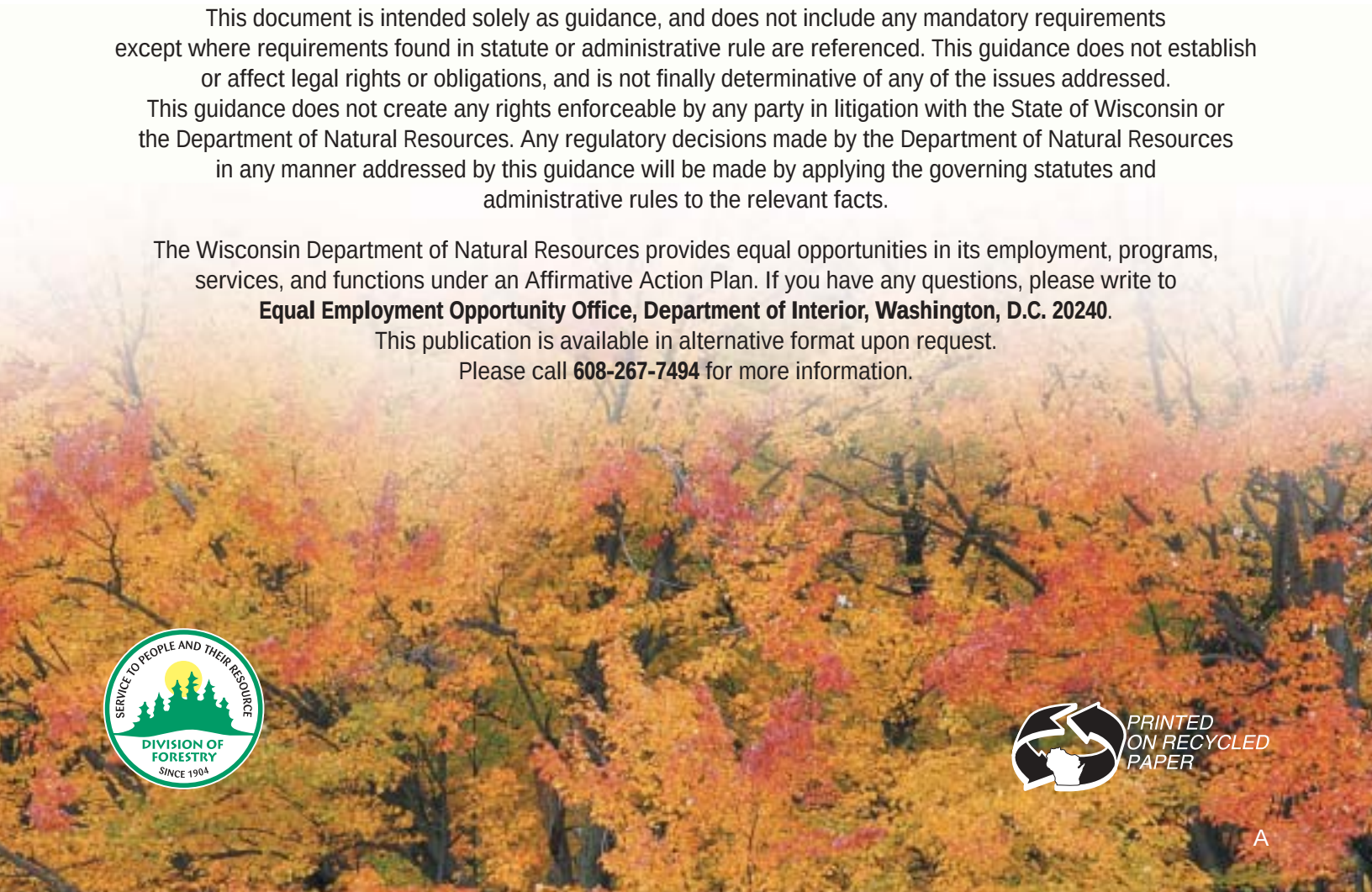
October, 2003



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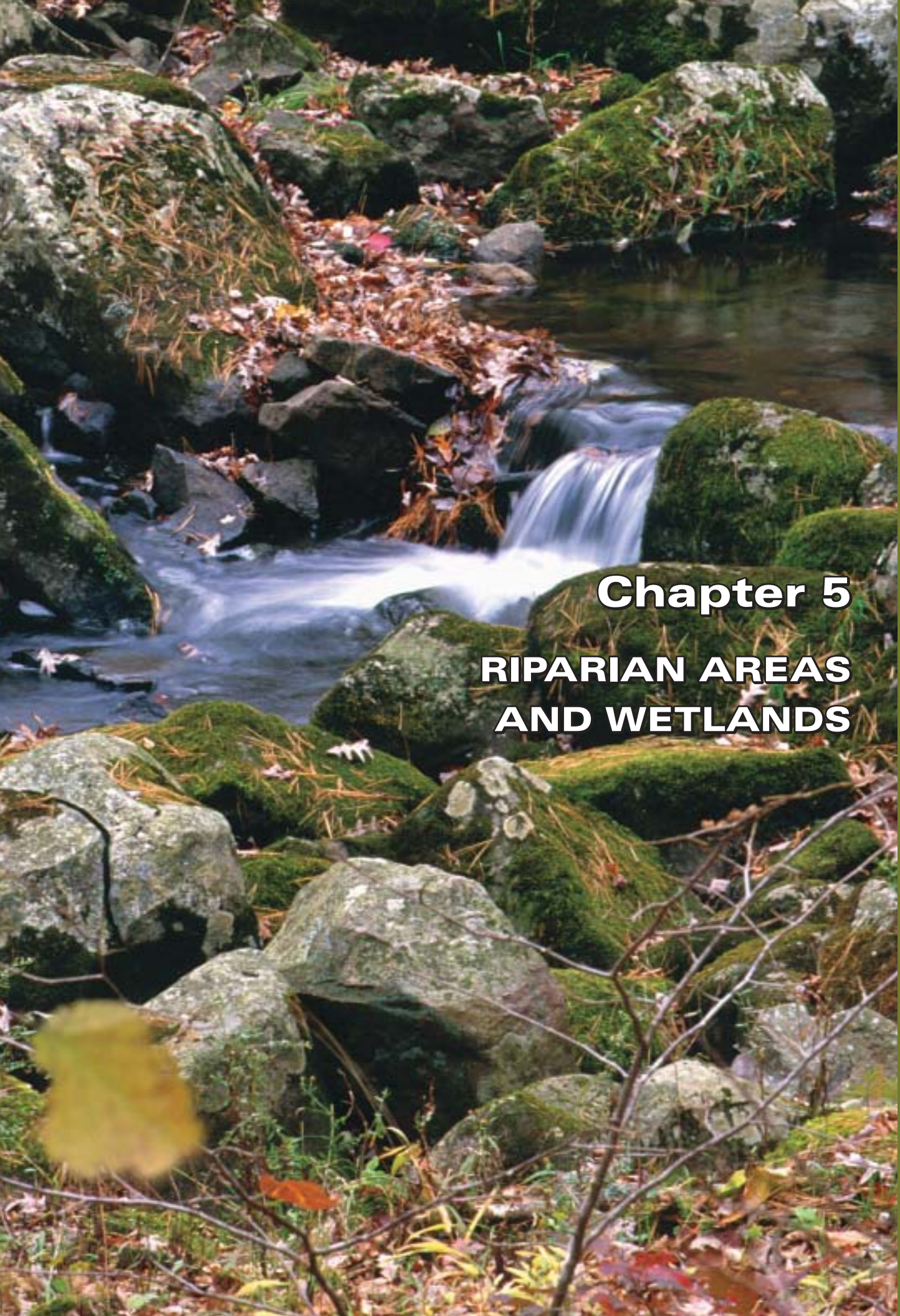

Chapter 5

RIPARIAN AREAS AND WETLANDS

CHAPTER 5 — RIPARIAN AREAS AND WETLANDS

THE VALUE OF RIPARIAN AREAS 78
- A Transition from Aquatic to Terrestrial Ecosystems 78
- Potential Threats to Riparian Areas: Pollutants and Impacts 79
- Protecting Riparian Functions and Values 81

RIPARIAN MANAGEMENT ZONES 84
- What Exactly is a Riparian Management Zone? 84
- Agricultural and Urban Areas 84
- Existing Regulations 85

BMPs FOR RIPARIAN MANAGEMENT ZONES 86
- **BMPs: Riparian Management Zones 86**
- **BMPs: Lakes and Navigable Perennial Streams 87**
- **BMPs: Navigable Intermittent Streams 87**
- **BMP: Non-navigable Streams 87**

WETLANDS 88
- **BMPs: General 88**

THE VALUE OF RIPARIAN AREAS

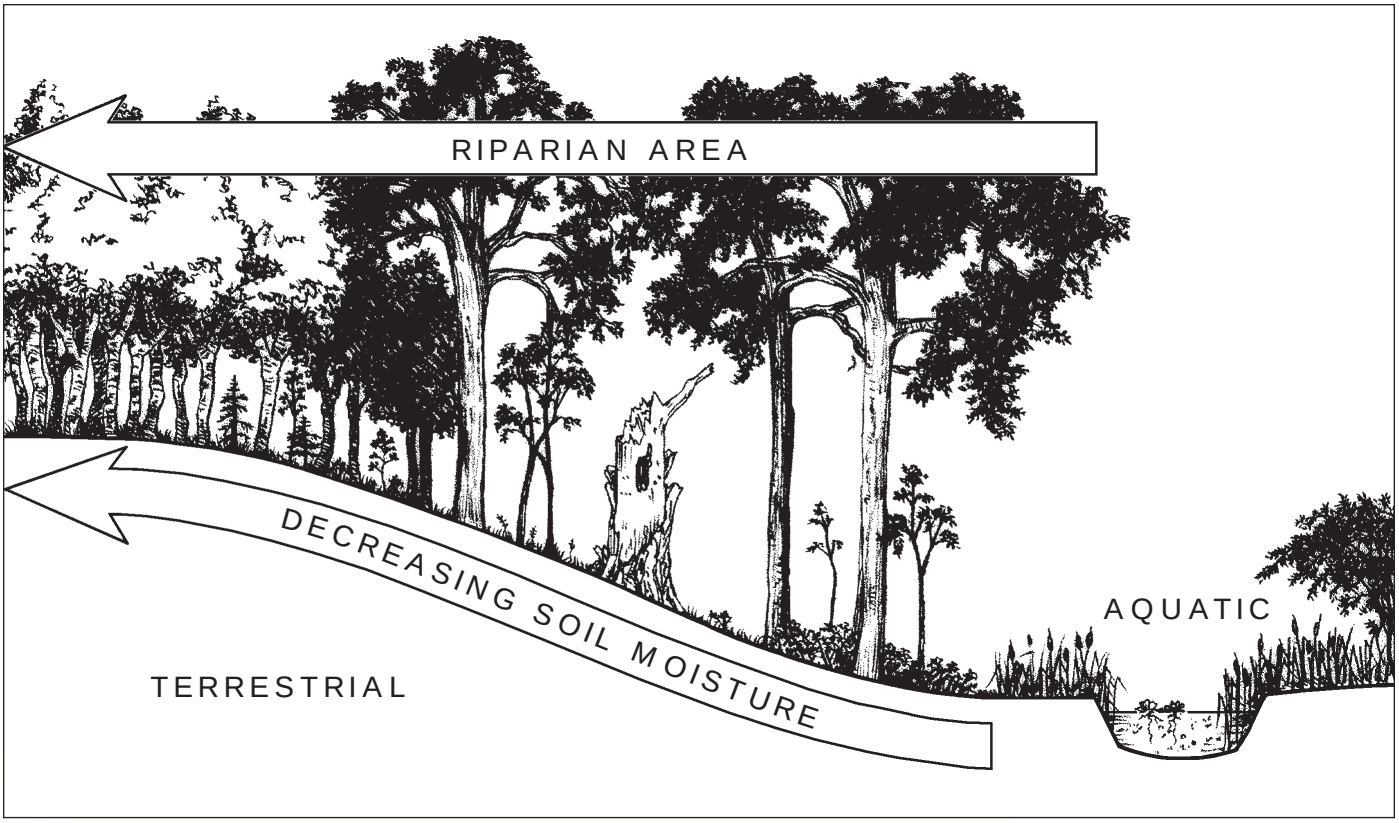

Figure 5-1: Transition from aquatic to terrestrial habitat in a riparian area.

A Transition from Aquatic to Terrestrial Ecosystems

A riparian area is the area of land and water forming a transition from aquatic to terrestrial ecosystems along streams, lakes and open water wetlands (see Figure 5-1).

Riparian areas are among the most important and diverse parts of forest ecosystems. They support high soil moisture and a diversity of associated vegetation and wildlife, and they perform important ecological functions that link aquatic and terrestrial ecosystems.

- Riparian areas maintain streambank, channel and shoreline stability as well as stream temperature and water quality.
- Riparian areas provide conservation and water storage, nutrient and food input to the aquatic system, in-stream structure of coarse woody debris, and a moderated microclimate.
- Riparian areas provide important habitat for many species of fish, mammals, birds, reptiles, amphibians, and insects.
- Riparian areas are also important for recreation, tourism, forest products, hunting, fishing, biological diversity, and provide many other values to humans.

To protect the functions and values of riparian areas, management practices are modified within **riparian management zones (RMZs)** for streams and lakes to protect water quality, fish, and other aquatic and terrestrial resources. These RMZs are applied adjacent to lakes and navigable perennial streams, navigable intermittent streams and non-navigable streams.

Potential Threats to Riparian Areas: Pollutant Types and Impacts

One of the biggest threats to water quality in the United States is **nonpoint source pollution**. Nonpoint source pollution occurs when surfacewater runoff from rainfall or snowmelt moves across or into the ground, picking up or carrying pollutants into streams, lakes, wetlands, or groundwater. Soil becomes a nonpoint source pollutant when water runoff carries large amounts of soil into a waterbody.

Nonpoint source pollution is the source for about half of all pollutants entering our nation's waters. Nationally, three to nine percent of all nonpoint source pollution comes from forestry practices. Because Wisconsin is relatively flat, only about three percent of the state's nonpoint source pollution comes from forestry practices. While three percent sounds small, localized nonpoint source pollution can be significant, and the cumulative effects of all sources can seriously degrade water quality in a drainage system.

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

SEDIMENT

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

In the world of nature, sedimentation is a slow, naturally occurring process – however, human activities often 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 aquatic plants. These plants are a source of food and habitat for fish and other aquatic organisms.

Accumulating sediment also constricts naturally flowing channels, leading to increased stream bank erosion and possible flooding. Suspended sediment can cloud the water, reducing the hunting success of sight-feeding fish, and can also damage the gills of some fish species, causing them to suffocate.

Figure 5-2: Large woody debris that falls naturally into streams can greatly benefit aquatic ecosystems.

ORGANIC DEBRIS

Leaves and **large woody debris** (usually large fallen logs, at least 12 inches in diameter, with an attached root ball) that naturally fall into streams can greatly benefit aquatic ecosystems. However, too much organic debris deposited in a short time can harm water quality. This can occur during logging when treetops and branches fall or wash into streams. Too much decomposing matter in streams can decrease dissolved oxygen in the water, which fish need to thrive and reproduce.

Figure 5-3: A small intermittent stream tumbles over the rocks down a southern Wisconsin hillside.

Figure 5-4: The invasion of reed canary grass in this bottomland hardwood stand has eliminated herbaceous plants and tree regeneration.

Figure 5-5: Vernal pools, or casual water, provide habitat for certain wildlife species. Forestry operations should be conducted at the proper time to avoid disruptions to these small ecosystems.

INVASIVE PLANTS

A number of non-native invasive species are impacting forested riparian areas and wetlands. Reed canary grass can rapidly overtake a site where the forest canopy is opened up by harvesting or wind damage. It is extremely difficult to regenerate bottomland forests once reed canary grass is established. Another non-native invasive species, glossy buckthorn, can form a dense shrub layer that also limits regeneration.

CHEMICALS

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

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 solar radiation. This can eliminate cold water fish, reduce dissolved oxygen, and affect the metabolism and development of fish.

NUTRIENTS

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

STREAMFLOW

Timber harvesting can increase peak streamflow which increases chances for flooding, streambank erosion, and sedimentation. If timber harvesting equipment compacts a large area of the 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 which provides cool, clean water to lakes and streams – helping to maintain steady streamflows and lake levels throughout the summer.

Harvesting can also contribute to an increase in peak streamflow. In basins where 60 percent or more of the trees are less than 15 years old, snow can melt several times faster than in older stands.

Figure 5-6: This headwater segment of a small southern Wisconsin perennial stream is designated Category 5 trout water. Forestry operations near such waters must be consistent with various regulations, and BMPs should be used within the riparian management zone.

Protecting Riparian Functions and Values

Clean water is essential to Wisconsin's economy and rich quality of life. Lakes and streams provide habitat for wildlife, fish and other aquatic species. Our forests play a vital role in purifying and maintaining clean water for streams, lakes and groundwater.

The most practical and cost-effective method to assure that forestry operations do not adversely affect water quality in Wisconsin is through the use of the voluntary **best management practices (BMPs)**. These BMPs are voluntary in the sense that they are not legally mandated. However, the Wisconsin Department of Natural Resources (DNR) strongly encourages their use by all Wisconsin forest landowners, land managers and forestry professionals. **BMPs are identified by a "✓" to help separate them from other recommendations in the guide.**

Several categories of public and private landowners in Wisconsin already use forestry water quality BMPs to guide their management activities. For example, compliance is required on DNR properties such as State Forests, and lands enrolled in the Managed Forest Law Program since 1995. In addition, the forestry water quality BMPs have been adopted by all 29 counties enrolled in Wisconsin's County Forest Law program. The majority of Wisconsin's industrial forestland is enrolled in the American Forest and Paper Association's Sustainable Forestry Initiative, which requires water quality BMP compliance and logger training as a condition of membership.

It is the policy of the U.S. Department of Agriculture Forest Service to promote and apply approved BMPs for the control of nonpoint sources of water pollution. Currently, BMPs developed by the Wisconsin DNR for nonpoint sources of water pollution support the Chequamegon and Nicolet National Forests.

In addition to the BMPs described in this manual, you should be aware of existing municipal, county, state, and federal regulations relating to forest management and water quality (see Appendices E and F for information on permits and regulations).

This guide can help you when making decisions about management activities on your land. **Applications of BMPs may be modified for specific site conditions with guidance from a natural resource professional, if modifications provide equal or greater water quality protection, or if the modification has no impact on water quality.** Seek professional advice on BMPs and all forest management activities from natural resource professionals such as:

- Consulting foresters
- Industrial foresters
- Wisconsin DNR foresters, fish managers, and water quality staff
- USDA Natural Resources and Conservation Service staff
- County Land Conservation Department staff

Figure 5-7: Too much decomposing debris, such as treetops and limbs from logging, can decrease the oxygen in streams which fish need to thrive and reproduce.

Careful planning for forest management activities, such as road construction, timber harvesting and site preparation will minimize nonpoint source pollution. A well thought-out plan will lead to harvest operations that use BMPs, remove forest products efficiently and profitably, and promote sustainable forest growth and water quality protection.

A comprehensive forest management plan should include forestry BMPs for water quality. The level of formality and detail should be appropriate to the project size, cost and environmental risk. The plan should also 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 (e.g., logger or road developer) working with the landowner and land manager, is usually responsible for implementing forestry BMPs.

Wisconsin DNR foresters and consulting or industrial foresters can work with you to develop a list of BMPs to include in your forest management plan. Cost-sharing assistance may be available for plans written by a consulting forester.

Figure 5-8: Wetland with scattered black spruce and tamarack surround a small northern Wisconsin lake.

Figure 5-9: Trees and other vegetation along the shoreline of this undeveloped northern Wisconsin lake help reduce soil erosion.

Use the following to plan forest management activities:

- Plan forest management activities to avoid operations in wetlands, including building landings, skid trails and roads. Where avoidance is not practical, minimize impacts by limiting the extent of wetland activities.
- Make a list of site-specific forestry BMPs you need to protect water quality in all timber sale contracts, timber harvest plans, and forest management plans.
- Develop a forest management plan that states the management objectives for the site. Plan operations to protect water quality by considering site conditions. Identify on a map the following site conditions:
  - Harvest unit boundary
  - Property boundaries
  - Existing forest road system (roads, skid trails and landings)
  - Sensitive areas which include streams, lakes, wetlands, flood plains, habitat areas for threatened or endangered aquatic, animal and terrestrial plant species, steep slopes, and erodible soils
  - Riparian management zones
  - Stream crossings
  - Equipment maintenance and fueling areas
- Locations of non-native invasive species that should be kept from spreading.
- The following resources can be used to identify site conditions:
  - **United States Geological Survey (USGS) Topographic Maps (7.5 minutes):** Available from the Wisconsin Geological and Natural History Survey, and some outdoor/sporting goods suppliers.
  - **Aerial Photographs:** Available from the Wisconsin DNR, the USDA Farm Services Agency, or the USDA Natural Resources and Conservation Service.
  - **County Soil Surveys:** Available from county land conservation departments and the USDA Natural Resources and Conservation Service.
  - **Floodplain Maps:** Available from your local county zoning administrators.
  - **Wisconsin Wetland Inventory Maps:** May be reviewed at DNR service centers and local county or municipal zoning offices, or can be purchased from the Wisconsin DNR, Bureau of Fisheries Management and Habitat Protection, PO Box 7921, Madison, WI 53707-7921.
- Conduct on-site evaluations.
- Obtain necessary permits and licenses before beginning management activities. For existing regulations pertaining to forest management activities, see Appendix E.
- Plan to stabilize bare soil as soon as possible after exposing it to prevent erosion into streams, lakes, wetlands, and riparian zones. This is especially important on steep slopes and erodible soils, in riparian management zones, and at stream crossings (see Chapter 11: Forest Roads).
- Maintain a spill containment and clean-up kit appropriate for the materials on the operation (see Chapter 10: General Operational Guidelines).

RIPARIAN MANAGEMENT ZONES

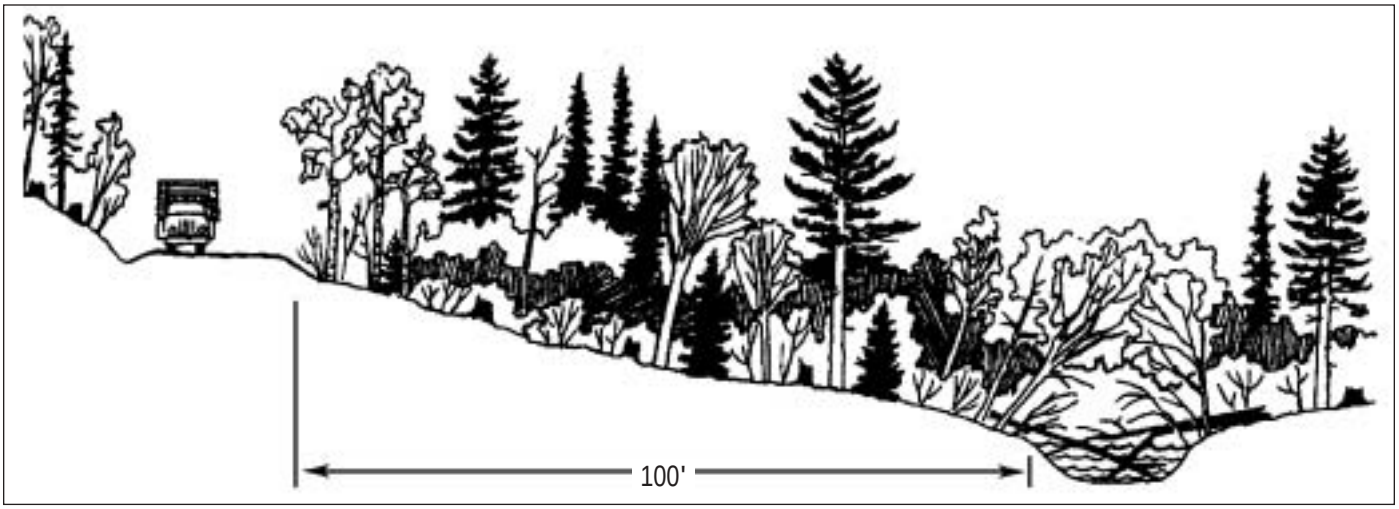

Figure 5-10: Cross-sectional depiction of a riparian area.

What Exactly is a Riparian Management Zone?

Riparian management zones (RMZs) 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 aquatic (water) and terrestrial (land) communities. Also, because these areas are next to water, RMZs help minimize nonpoint source pollution impacts to surfacewaters.

Riparian management zones help to:

- **Filter sediment and nutrients from runoff.** As runoff water moves through plants and the duff layer (needles, leaves and decaying 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, plants, leaves, and twigs slow surface runoff, allowing water to soak into the soil. This helps reduce peak flow levels in streams, and replenishes the groundwater that helps maintain lake levels and stream flows.
- **Shade streams.** In most cases, plants and trees along streambanks are necessary for shade, keeping water from becoming too warm for aquatic life in the summer.
- **Stabilize streambanks and lakeshores.** Trees and plants along streambanks and lakeshores reduce soil erosion because they 1) reduce the impact of raindrops on exposed soil, and 2) provide roots that hold the soil together which makes it more difficult for waves, currents and runoff to wash the soil away.
- **Provide food and habitat for aquatic organisms.** Fallen leaves and other organic debris from trees are the base of the food chain for aquatic organisms in small forest streams. Large woody debris creates riffle areas and plunge pools, critical habitat for fish and other aquatic organisms. The pools trap leaves and twigs long enough for microorganisms to decompose them. These microorganisms become food for insects and other invertebrates, which in turn become food for fish.

Agricultural and Urban Areas

Riparian zones are very valuable to agricultural, urban and forested areas. Runoff from cultivated fields, as well as city streets and lawns, can contain sediment, pesticides and fertilizer. Plants in riparian zones filter out these contaminants, reducing the amount of pollutants entering waterbodies. Riparian zone landowners in all agricultural and urban areas should maintain or restore riparian management zones. Do not allow livestock to graze in forested RMZs (contact the USDA Natural Resources and Conservation Service, or your local land conservation department to establish a grazing plan).

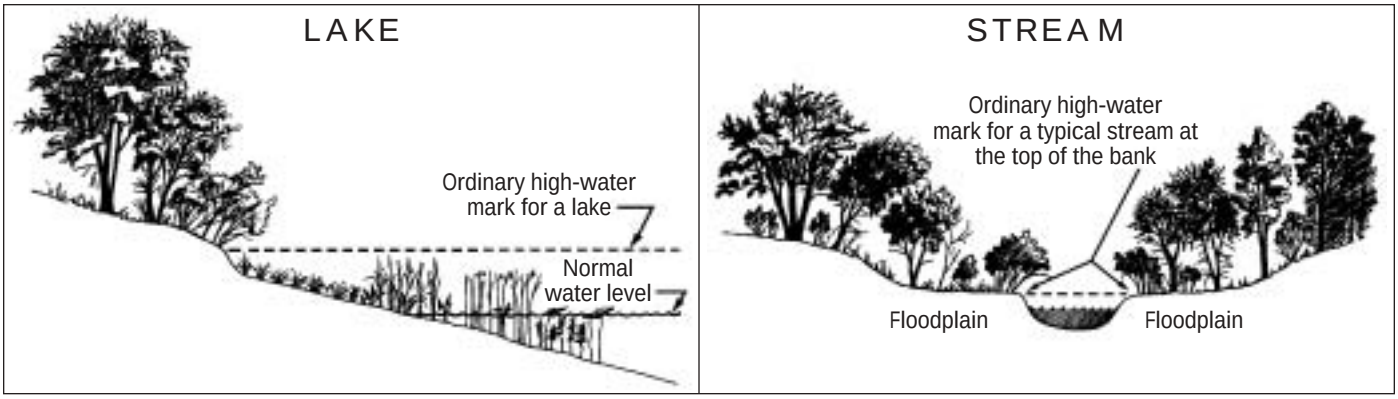

Figure 5-11: Ordinary high-water mark for a lake and stream.

LAKE/POND
A still waterbody that 1) is navigable, 2) has an ordinary high-water mark, and 3) has a bed and banks, and is a "reasonably permanent" body of water, although it may dry up during periods of drought.

STREAM
A watercourse that 1) has an ordinary high-water mark, 2) has bed and banks, 3) flows at least periodically, and 4) does not lose its character as a watercourse even though it may become braided in a wetland complex. There are two kinds of streams:

- **Perennial streams** have constant flow except during droughts.
- **Intermittent streams** flow only after rainstorms or snowmelt, and are dry most of the year. Intermittent streams must be protected because they channel runoff into perennial streams and lakes, and may become part of the aquatic ecosystem when water flows into them.

ORDINARY HIGH-WATER MARK
The point on a bank or shore up to which the presence and action of water is so continuous that it leaves a distinct mark either by erosion, destruction of terrestrial (land) vegetation, or other easily recognized characteristics.

NAVIGABLE
A waterway is navigable if it has bed and banks, and it is possible to float a canoe or other small craft in the waterway on a regular reoccurring basis – even if only during spring runoff.

NOTE: Lakes and streams (perennial and intermittent) identified on current U.S. Geological Survey (USGS) topographical maps (7.5 minute/1:24,000 scale), should be considered navigable. Other lakes and streams may be determined to be navigable by a Wisconsin DNR water management specialist. If you have a question about navigability, contact a Wisconsin DNR water management specialist.

Existing Regulations
All cutting practices next to lakes and navigable streams must be consistent with local county shoreland and wetland zoning ordinances. Wisconsin Administrative Code NR 115 provides state-required minimum standards for the cutting of trees and shrubbery to be included in county shoreland ordinances to protect the natural beauty, control erosion, and reduce the flow of effluents, sediments and nutrients from the shoreland area. A special exception (or conditional use) permit may be required to harvest next to lakes and navigable streams. When planning to harvest within the RMZ, contact your local county zoning office before beginning any harvesting. For more information about Administrative Code NR 115, see Appendix E.

Stream crossings, grading next to lakes and streams, and other forestry activities are also subject to permits as described in Appendix F. Contact a Wisconsin DNR water management specialist for more information.

BMPs FOR RIPARIAN MANAGEMENT ZONES

BMPs: Riparian Management Zones

There are three categories of riparian management zones for BMPs:

- Lakes and navigable perennial streams
- Navigable intermittent streams
- Non-navigable streams

BMPS COMMON TO ALL THREE RMZ CATEGORIES

✓ Locate roads outside the RMZ unless necessary for stream crossings. For stream crossings, follow recommendations in the Stream Crossings section of Chapter 11: Forest Roads.

✓ Locate landings outside the RMZ.

✓ Do not move into or pile slash within the RMZ. 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 duff layer.

NOTE: On steep slopes or highly erodible soils, you should widen the RMZ.

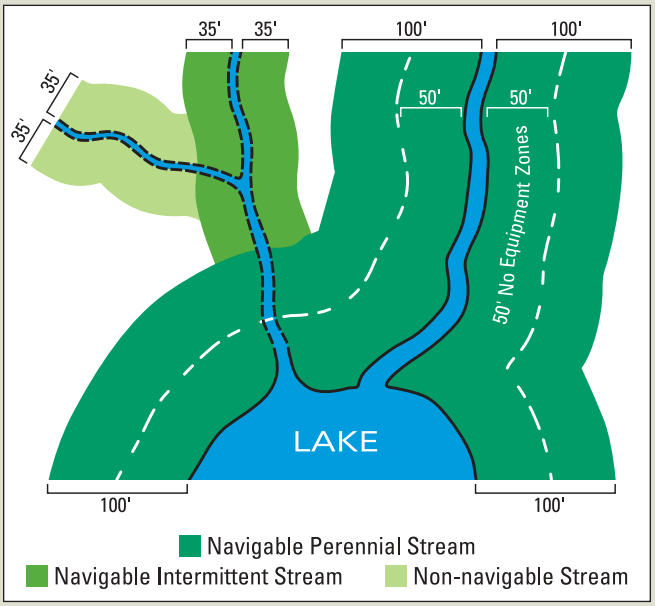

Figure 5-12: Three riparian management zone categories.

Figure 5-13: The RMZ is a strip of land alongside streams and lakes beginning at the ordinary high-water mark, and extending 35 or 100 feet landward as shown in Figure 5-12.

BMPs: Lakes and Navigable Perennial Streams

- ✓ The RMZ 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 100 feet landward.
- ✓ Harvesting plans should leave at least 60 square feet of basal area per acre in trees five inches diameter breast height (DBH) and larger, evenly distributed.
- ✓ Harvesting intervals should be a minimum of 10 years.
- ✓ Do not operate wheeled or tracked harvesting equipment within 50 feet of the ordinary high-water mark except on roads or at stream crossings.
- ✓ Use selective harvesting and promote long-lived tree species appropriate to the site. Long-lived tree species include 1) hardwoods such as sugar and red maple, white and black ash, elms, and oaks, and 2) conifers such as eastern hemlock, white pine, red pine, and white cedar.
- ✓ Develop trees 12 inches DBH and larger.

BMPs: Navigable Intermittent Streams

The RMZ 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 35 feet landward.

- ✓ Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high-water mark only when the ground is frozen or dry.
- ✓ Harvesting plans should leave at least 60 square feet of basal area per acre in trees five inches DBH and larger, evenly distributed.
- ✓ Use selective harvesting and promote long-lived tree species appropriate to the site. Long-lived species include 1) hardwoods such as sugar and red maple, white and black ash, elms, and oaks, and 2) conifers such as eastern hemlock, white pine, red pine, and white cedar.
- ✓ Harvesting intervals should be a minimum of 10 years.

BMP: Non-navigable Streams

Non-navigable streams are found in the field but may not be identified on current USGS topographical maps (7.5 minute/1:24,000 scale).

The RMZ 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 35 feet landward.

- ✓ Operate wheeled or tracked harvesting equipment within 15 feet of the ordinary high-water mark only when the ground is frozen or dry.

WETLANDS

Wisconsin state statutes (section 23.32) define a wetland as "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." Wisconsin wetlands include marshes, bogs, floodplain forests, wet meadows, and low prairies. These wetlands provide many functional values in the ecosystem.

- **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 surfacewater 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 by 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. Many of the rare and endangered plant species in Wisconsin are found in wetlands.

Forestry BMPs in wetlands protect water quality from erosion, and minimize changes to the surface and below-surfacewater movement that can occur from rutting and road building. Changing the surface and below-surfacewater 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 regulations are listed in Appendix E: Regulations (see Section 404, Chapter NR 103, and Chapter NR 117). When you suspect your project involves a wetland and want to know what regulations apply, the sequence of contacts include 1) your county zoning office, 2) a Wisconsin DNR water management specialist, and 3) the U.S. Army Corps of Engineers.

Maps from the Wisconsin Wetland Inventory can help you make a preliminary determination as to whether your project will affect wetlands. These maps may be reviewed at DNR offices and county or municipal zoning offices, or purchased from the Wisconsin Department of Natural Resources, Bureau of Fisheries Management and Habitat Protection, PO Box 7921, Madison, WI 53707-7921.

BMPs: General

- ✓ Follow all planning BMPs on pages 86 and 87 of this chapter. Whenever practical, avoid locating roads and landings in wetlands.
- ✓ 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 or frozen ground conditions.
- ✓ Identify riparian management zones along all streams and lakes.
- ✓ Do not move slash from upland sites into wetlands, and keep slash out of open water.
- ✓ Only use pesticides labeled for use in wetlands.
- ✓ If possible, avoid equipment maintenance and fueling in wetlands – otherwise, use extreme caution. Clean all spills promptly and properly (see Chapter 10: General Operational Guidelines).