

5. RIPARIAN MANAGEMENT ZONES (RMZs)

Riparian Management Zones (RMZs) are sometimes called buffer strips, filter strips, or streamside management areas or zones (see Figure 2). An RMZ occurs on both sides of perennial or intermittent streams and around the perimeter of bodies of open water (e.g. open water wetlands or lakes) where **extra precaution** is used in carrying out forest management practices including timber harvesting activities.

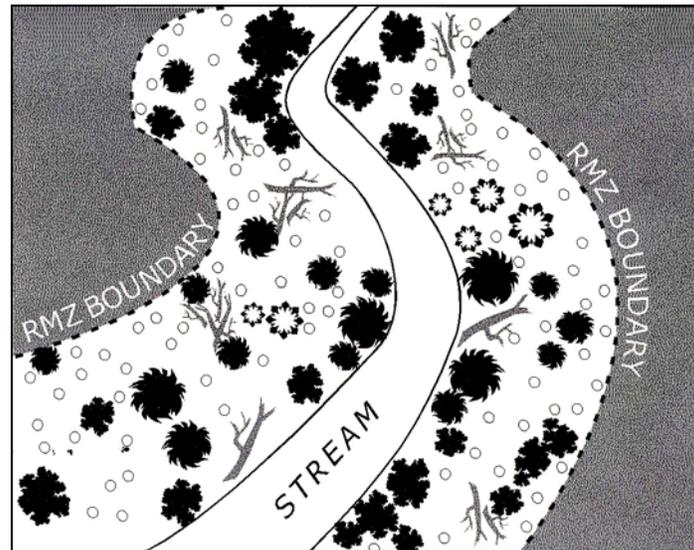


Figure 2. Example of a Riparian Management Zone

One of the purposes of a management zone is for water quality protection to provide an area of vegetation to interrupt water flow and to trap and filter out suspended sediments, nutrients, chemicals, and other polluting agents before they reach the body of water. An RMZ also provides shade to small streams, thus reducing thermal pollution.

That part of the zone nearest the stream bank can also make an important contribution to the aquatic food chain. As trees die within the RMZ, all or portions of them may fall over into the adjacent stream. This dead material provides aquatic habitat known as large woody structure (LWS). Naturally occurring LWS in lakes and streams provides essential areas of shaded cover for fish, amphibians and aquatic insects and can provide important isolated platforms for reptiles and small mammals. As a general rule, trees that have the potential to provide LWS to a lake or stream should not be cut.

Forest Management Activities within the Riparian Management Zone

Michigan's BMPs do allow for forest management activities within the RMZ. These include equipment operation and timber harvesting. The key is ensuring the water quality protection function of the RMZ is maintained (see Section "RMZ Water Quality Function Factors") throughout the harvesting operation.

The RMZs should be maintained along all perennial and intermittent streams, lakes or ponds where nearby management activities result in surface/soil disturbance, earth changes and where erosion and sediment transport occur during rain events. An example of this is a newly constructed forest road where the base consists entirely of compacted soil and the road begins eroding after a rain event.

The RMZs are critical to watersheds, wildlife, fish, trees, and people for many different reasons. These zones are essential for diverting pollutants flowing toward a waterway. Adequate vegetation in a RMZ helps filter and trap pollutants such as sediment, excess nutrients, and other contaminants before they reach surface waters. Excessive disturbance of the forest floor within the RMZ minimizes its ability to prevent nonpoint source pollutants from reaching a stream or other water body. In fact, such disturbance might lead to the transport of sediment directly from the RMZ to the water body adjacent to it.

Site Specific Factors to Consider

Landowners considering forest practices in or near a RMZ must plan carefully to assure that the water quality functions of the RMZ are maintained. Those unsure of the water quality impacts of a planned activity should seek the advice and assistance of foresters or other natural resource professionals familiar with RMZ functions, or leave the RMZ undisturbed. The following are site-specific factors to consider prior to harvesting or conducting other management activities in the RMZ:

- Water body characteristics.
 - DNR designated trout stream.
 - Greater than 50 feet in width (typical beaver dam building activity not a concern on these streams).
 - Less than 50 feet in width (typical beaver dam building activity is a concern on these streams).
- Designated Natural River (There are specific rules and regulations for each designated Natural River system).
- Slope.
- Soils.
- Aesthetics.
- Existing vegetation.
- Shade requirements to maintain water temperature.
- Time of year activity is scheduled to occur.
- Availability of large woody structure for the adjacent water body.
- Recent precipitation.
- Extent of soil saturation.

Riparian Management Zone Water Quality Function Factors

The water quality function of RMZs can be maintained by meeting the following specifications:

- ▶ When setting up the timber sale, make sure the forester or logger establishes a minimum RMZ width of 100 feet, from each side of a stream, measured from the top of the bank of the lake or stream or the ordinary high water mark. RMZ width should be increased as slope percentages increase (see Table 1). RMZ width shown in Table 1 may need to be increased where domestic water supply could be impacted.
- ▶ Zone width may have to be increased along State designated "Natural Rivers" and federally designated "Wild and Scenic Rivers" as designated in their management plans.
- ▶ Minimize disturbance of the forest floor in the RMZ (a recommended goal is to have less than 10% of the soil disturbed).

- ▶ Harvesting/cutting specifications should be modified to retain a sufficient number of trees to maintain shading of streams and to leave a relatively stable and undisturbed forest floor (less than 10 percent soil exposure).
- ▶ Locate haul roads outside of RMZs. Where a road must cross a stream, it should do so at right angles. A permit from DEQ to construct a stream crossing is required.
- ▶ Locate equipment storage and maintenance sites and landings outside all RMZs.
- ▶ Remove all limbs and tops from harvested trees from streams and open water wetlands as these are considered sources of “unnatural” organic debris and impact aquatic habitat, including lowering levels of dissolved oxygen required to maintain a healthy coldwater fisheries.
- ▶ Skidding logs in the RMZ should be avoided whenever possible. Use of knuckleboom harvesters or removing logs with a cable and winch is better.
- ▶ Skidders should not be operated in RMZs when soils are saturated as the soil easily compacts and runoff is not easily absorbed by the soils in the RMZ.
- ▶ If cutting must occur in the RMZ, every effort should be used to remove timber from the zone with techniques such as cable harvesting, or use of tracked equipment with knuckle boom cranes (see Figure 3) to ensure equipment is not negatively impacting the RMZ’s soil base. Even if the soil is not scarified, compaction will decrease the ability of the soil to absorb runoff.
- ▶ All roads, cuts and fills in the RMZ must be stabilized. Use appropriate seeding and mulching procedures (see Appendix E). Energy dissipaters (e.g. rock ranging from 3-12 inches in diameter) should be installed at inlets and outlets of cross-drainage culverts located underneath roads approaching a stream.
- ▶ Drainage structures such as culverts, diversion ditches, conveyor belt water bars, and broad-based dips should be installed according to BMP specifications (see section 7) prior to roads and primary skid trails entering the boundary of a RMZ.



Figure 3. An Example of a Knuckleboom Harvester.

(Note tracks and boom which allow it to remove timber from a RMZ with little soil disturbance.)

Riparian Management Zone Widths

More and more, forest water quality research indicates that a 100 foot or 30 meter RMZ is the minimum needed to protect water and aquatic habitat quality when conducting forest management activities adjacent to a water body, especially if the activity provides a source of sediment (e.g. a dirt based forest road). Widths from 50 feet to 500 feet have also been suggested if management objectives include protecting wildlife habitat or controlling beaver activity on smaller streams.

Table 1 illustrates the minimum recommended widths for RMZs based on slope. Note that these widths are for overland sheet flows only. Nonpoint source pollutants transported via concentrated flows into a RMZ will usually require additional measures, such as placing geotextile silt fence overlain by riprap or large sized rock, ranging from 3-12 inches diameter, for a width of 3 feet and a length of 5 feet (Michigan Department of Transportation, 2003)

When measuring for a proper width of a RMZ, take into account the natural variability of the landscape and widen the RMZ accordingly. Slope can be calculated with several methods, including using a string and line level, or using the services of a licensed professional surveyor. Remember that it takes years for deposited sediment to be cleansed from a stream, so the landowner or the land manager should err on the side of caution when establishing the width of a RMZ.

Table 1. Minimum Riparian Management Zone Width Adjusted for Slope.

Slope of Land Above Water Body or Stream (%)	Minimum Width of Riparian Management Zone (Feet)
0-10	100
10-20	115
20-30	135
30-40	155
40-50	175
50 +	Timber removal is not advised due to the high potential for erosion and sediment transport.

Table 2. Soil Erosion Susceptibility.

Surface Soil Texture	Susceptibility to Erosion (1=highest)
Silt, silt loam, loam, very fine sandy loam	1
Sandy clay loam, silty clay loam, clay loam	2
Clay, silty clay, sandy clay, very fine loamy sand	3
Sandy loams, loamy sands, sands	4

(Re-printed courtesy of the Minnesota Forest Resources Council.)

Designated Trout Streams and Management Within the Riparian Management Zone

Certain streams, located throughout Michigan, are labeled by the DNR as “Designated Trout Streams” because these streams contain significant populations of trout or salmon. The DNR Director’s Order FO-210 lists all designated trout streams, and is available upon request, or can be found online at www.michigan.gov/dnr.

Excess erosion of sand sediment into streams is broadly regarded as a serious threat to the viability of trout streams in northern Michigan. Research has demonstrated that relatively small increases in sand erosion into streams can greatly reduce spawning habitat and habitat for the food supply (e.g. caddis fly or mayfly larva). When topography is relatively flat, sediment can stay in a given stream for several decades. Thus, it is critical to maintain a healthy, functional RMZ to prevent sediment from reaching Michigan’s streams, as part of any BMP system.

Trout are sensitive to changes in habitat requirements, and require a clean gravel bed, along with large woody structure and cool water temperatures to sustain their populations in a given coldwater stream. Because of these narrow population sustaining requirements, forest management activities or even allowing the operation of skidders within the RMZ may be different what is “typical” practice for RMZ management. On streams smaller than 50 feet in width, dam construction by beavers can be a significant source of damage to many of these smaller coldwater streams, destroying in their ability to sustain healthy trout populations. The DNR encourages forest managers or landowners to establish a RMZ 300 feet in width in which the regeneration of aspen is prevented.

Possible management options within the RMZ that favor trout and associated aquatic habitat are: 1) leaving large super-canopy trees within 50 feet of the stream bank as a source of shade and large woody structure (wood that is four inches or greater in diameter), 2) manage to promote the health and vigor of longer-lived coniferous (e.g. white pine and hemlock) and deciduous species (e.g. sugar maple), 3) harvest only trees that are 50 feet away from the stream and that can be transported out of the RMZ without disturbing the soil (see Figure 3 as an example of a piece of harvesting equipment that allows this)

Management for Shade Intolerant Species within the RMZ

To meet wildlife goals, landowners may consider that managing for shade intolerant species, particularly aspen, within the RMZ is desirable but still want to protect the water quality protection functions of the RMZ. In general, landowners, loggers and land managers should consider if the amount of timber harvest removal is compatible with the ecology of the stream. Warmwater rivers or streams are ideal candidates for this type of management. With the help of a forester, creative silvicultural and harvesting methods can be employed to allow for both goals. While large scale clearcuts should be avoided in the RMZ, it might be possible to regenerate species like aspen using other harvesting methods. For example, small clearcuts $\frac{1}{4}$ to $\frac{1}{2}$ acre in size spaced appropriately throughout the RMZ may be an option. Cuts like these mimic natural disturbance regimes known as blowdowns.

Another example is designate cutting in the RMZ to a higher residual basal area (BA) such as 20 -25 basal area than what would occur outside the RMZ (total clearcut). This provides enough sunlight to promote regeneration of aspen or other shade intolerant species. Also consider leaving a higher basal area (e.g. 60-80 BA) or clusters of mature longer-lived trees within 50 feet of the stream bank for shade, soil and bank stabilization and a source of large woody structure. Refer to Appendix A-Glossary for the definition of basal area.



Natural River Regulations and RMZs

There are currently 16 legally designated Natural River Systems in Michigan. Part 305, Natural Rivers, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), provides the DNR with the legal authority for managing these river systems. Note that in all the management plans, the term “vegetative buffer strip” is used in place of the term Riparian Management Zone. However, for the purposes of this document, the term “RMZ” will be used to avoid confusing the reader.

All forest management activities within the legally designated RMZ are regulated. A permit is required before any activities can take place. A Natural River management plan has been developed for each designated river. Each plan includes use and development standards for private and public lands. The State is required to manage its lands and programs in accordance with the adopted Natural River plan. For more detailed information and the listing and location of all 16 Natural Rivers, visit the DNR Natural Rivers website at www.michigan.gov/dnrriver.

In addition, all public agencies must comply with the Rules for Utilities and Publicly Provided Facilities adopted as mandated by Part 305. These rules include standards related to road/stream crossings, erosion control, management of vegetation in utility corridors and others.

Natural River plans typically include standards related to public access site development, campgrounds, land and stream alteration, motorized vehicle use and vegetative buffer requirements. Thirteen of the 16 rivers also have State zoning rules based on the plans that contain private land development standards for residential development and limited commercial activity such as campgrounds, canoe liveries and rental cabins. Most rivers also have local zoning ordinances in effect based on Natural River plans.

The RMZs are maintained to provide fisheries and wildlife habitat, filter runoff, provide shade to maintain cool water temperatures, prevent streambank erosion and sedimentation of the Natural River system, screen new developments and maintain the aesthetic qualities of the Natural River system. On public lands, RMZs may range from 50 feet to 200 feet wide on each side of the river or tributary. Private land buffers also vary, but are statutorily limited to a width of no more than 100 feet on each side of the river. Dead, diseased, unsafe and fallen trees, as well as noxious plants, can be removed within the RMZ.

Under a permit issued by the DNR, trees and shrubs may be selectively pruned or thinned for timber harvest, habitat improvement or to maintain public utility facilities. Clearcutting is not usually permitted within the buffer.

Other development standards for public land are designed to maintain the natural character of the river corridor, limit the impacts of recreational use and help prevent resource damage. New campgrounds have development standards such as setbacks for campsites and associated structures. New access site standards may restrict sites to “walk-in” only and include setbacks for parking areas. Within 400 feet of the river, motorized vehicle use is usually restricted to designated public roads and access roads to permitted areas. Land alteration is prohibited in areas of high groundwater.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act, (Pub. L. 90-542 as amended; 16 U.S.C. 1271-1287) is legislation enacted by Congress and establishes federal protection for designated free-flowing rivers throughout the country. They are designated as “Wild and Scenic Rivers.” This designation regulates the management and control of development on these river systems.

In Michigan, there are 16 Wild and Scenic River systems. The management and regulations for these river systems occur strictly within the administrative boundaries of Michigan's three National Forests. Each component of the Wild and Scenic rivers system is administered to protect and enhance a variety of values and certain uses of a designated river are limited. Emphasis is given to protecting its aesthetic, scenic, historic, archaeological, and scientific features and values.

For more information, such as the listing and location of those river systems within Michigan, visit the website: <http://www.nps.gov/rivers/wildriverslist.html>.

6. FOREST ROADS

Forest roads are that part of a forest land road system, either temporary or permanent, which are designed and maintained for the transportation of timber products and often maintained and used for access for resource protection and recreation activities. They are usually minimum standard roads, i.e., single lane with turnouts, surfaced with locally available materials or just the underlying bare soil that is compacted and graded after the vegetative cover is removed. Commercially processed gravel underlain by geotextile is good for use in critical erosion areas. Properly laid out, constructed and maintained forest roads provide safe operations over longer periods at desirable vehicle speed. Operating and maintenance costs, as well as sedimentation runoff, are reduced because of proper construction (this includes installation of BMPs), placement and regular maintenance.

It is important to also be aware of load limit restrictions that are in place for those county or State roads which serve as part of the transportation route from the logging site to the mill.

Planning and Forest Road Placement

- **Use of Soil Surveys**

When constructing new forest roads or upgrading old ones, knowing the soil types that exist where the road(s) will be placed can be essential to knowing how to construct the road itself to minimize soil erosion. Most of the counties in Michigan have completed soil surveys.

Contact the local Conservation District, Natural Resource Conservation Service, or the County Extension Office for information about obtaining or using a soil survey. The description of a particular soil covers the nature and limitations of the soils, erosion hazard, rock outcrops, construction, and engineering properties of each soil series.

- **Other Factors in Road Placement**

Reconnaissance of the property generally should be done before constructing a road or roads. This consists of looking at the property with a road plan in mind and developing an idea of where roads should or should not be built. Consider the following points during road reconnaissance:

- ▶ Terminal Points – Where is the system going to start and end? Where is the best access from public roads? Where are the landings going to be?
- ▶ Grades – Roads designed with a slope of 10% or less are usually the easiest to maintain.
- ▶ Topography – Roads on moderate side hills are easiest to build and drain.