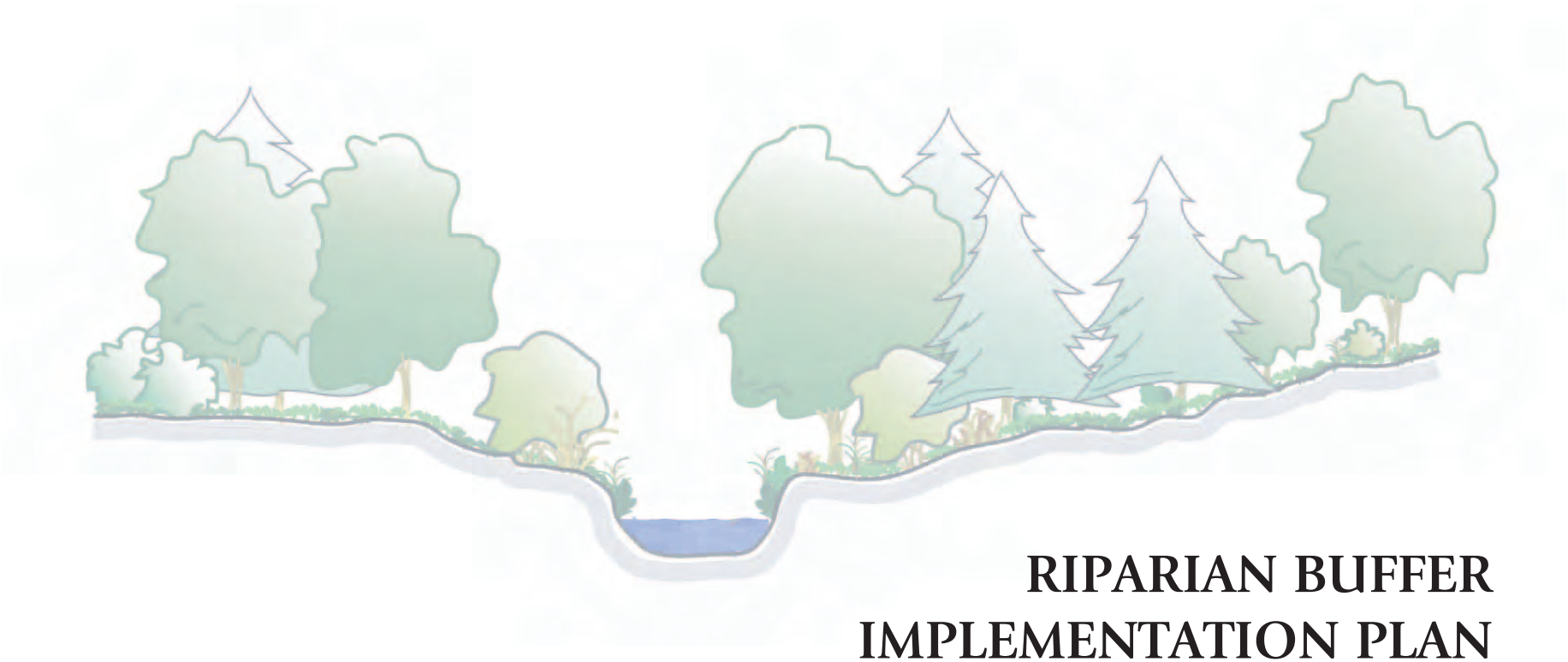

RIPARIAN BUFFER IMPLEMENTATION PLAN

July 2003

In Cooperation with the
Central Lake Superior Watershed Partnership
and the Marquette County Conservation District

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Introduction

One simple, yet extremely effective tool for protecting the health and integrity of Marquette's waterways is the use of vegetated buffers along its riparian (streamside) corridors. These riparian buffers are areas of vegetation located immediately adjacent to a water body or stream system. According to the EPA, these simple strips of vegetated land can offer an enormous number of environmental benefits, including:

- Restoring and maintaining the physical and biological integrity of the water resources
- Removing pollutants from urban stormwater
- Stabilizing stream banks resulting in reduced erosion and sedimentation
- Providing infiltration of stormwater run-off
- Maintaining base flow of streams
- Contributing organic matter that serves as a source of food and energy for the aquatic ecosystem
- Providing tree canopy to shade streams and regulate temperature (EPA 2002)

Vegetation along the Dead River helps to protect its water quality and aquatic habitat

Importance of Vegetation

As Marquette County continues to experience new growth and expanded development into more rural areas, the protection of riparian buffers becomes increasingly important. The increase in impervious surface that accompanies new development also means an increase in the amount of water running off of these surfaces and into local water corridors (See Figure 1). Studies show that on average, a typical city block generates nine times more runoff than a natural woodland area of the same size (EPA 1996). According to studies conducted by the Michigan Department of Natural Resources, "higher runoff correlates to decreased ground water recharge, decreased baseflow, increased and flashier stream flow, increases in temperature, turbidity, pollutants, erosion, and changes in aquatic biota" (Premo et al. 2001). New development is not the only activity that is a potential source of disruption to natural ecological processes. Marquette County has an active resource-based economy that depends on the extraction of natural resources to fuel industries such as mining and lumber production. These activities, while an asset to the local economy, can also reduce the health and integrity of the stream system if not properly managed.

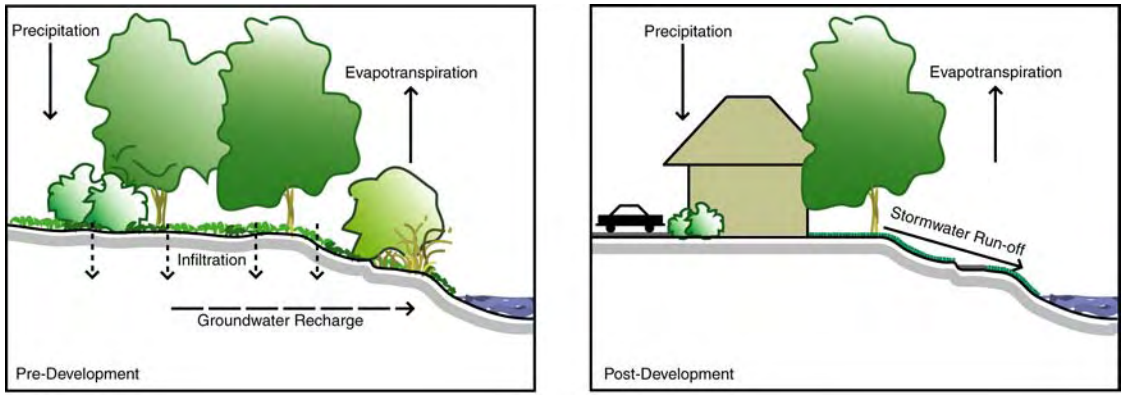

Figure 1: Impact of Impervious Surfaces

Guidelines for Implementation

This document will outline the general guidelines for the design and implementation of a riparian buffer program in Marquette County. This plan seeks to balance the ecological integrity of the area with the needs of private and commercial landowners.

Buffer Design

To help establish guidelines for permitted and restricted uses, the EPA and the Michigan Department of Environmental Quality recommend using a multi-zone approach to differentiate appropriate levels of activity within different areas of the riparian corridor. For Marquette County, a buffer of 50 feet in total width is recommended for both sides of the stream system. Within this 50 feet, the buffer is divided into two distinct zones, a Streamside Zone and an Outer Zone.

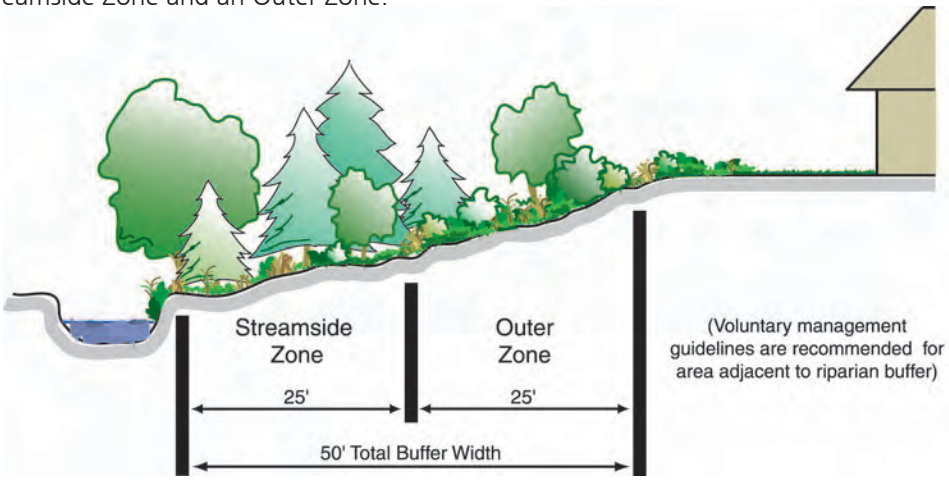

Figure 2: "Ideal" Riparian Buffer (Source: Apapted from Welsch 1991)

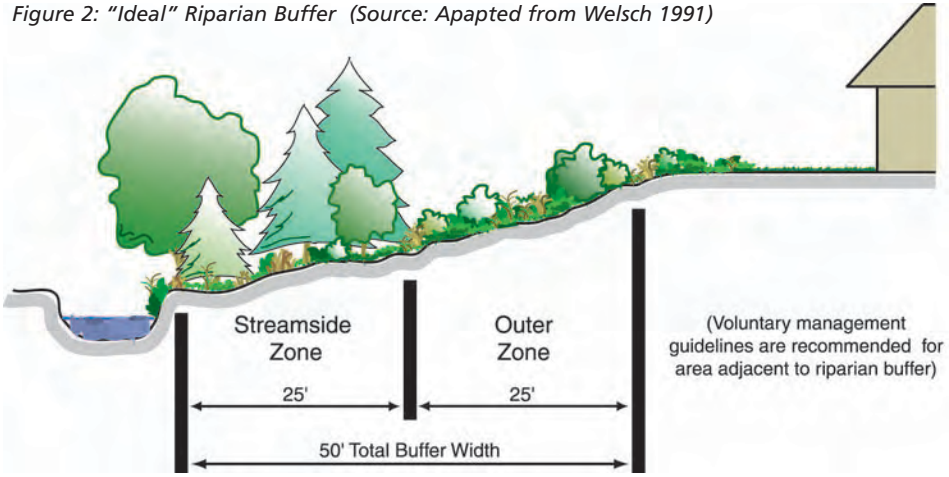

Figure 3: Acceptable Riparian Buffer (Source: Apapted from Welsch 1991)

Ideal Riparian Buffer:
Marquette's riparian buffer ordinance was designed to allow flexibility depending on the needs of the individual land owner. Figure 2 shows an "ideal" implementation of this buffer design. Such an implementation may appeal to the private land owner who is striving to do everything possible to protect the water quality of the stream adjacent to his or her property. In Figure 2, all vegetation within the entire 50-foot buffer zone has been retained.

Acceptable Riparian Buffer:
While Figure 2 shows an "ideal" scenario, this arrangement may not be feasible for every landowner, particularly those whose land is used for commercial lumber purposes. Figure 3 shows another acceptable implementation of the riparian buffer. In this case, the first 25 feet (the Streamside Zone) adheres to the "no-cut" rule and all existing vegetation is retained. Within the second 25 feet (the Outer Zone) the mature trees have been harvested, but the shrubs and herbaceous groundcover remain as required. Retaining this groundcover allows for the infiltration of run-off.

Zone 1 - The Streamside Zone
This area is defined as the first 25' from the stream's edge and is responsible for protecting the physical and ecological integrity of the stream system. Because of its critical importance in protecting water quality, Zone 1 has the most stringent restrictions.

Permitted Activities

- Footpaths
- Road crossings
- Utility right-of-ways
- Flood control structures

Restricted Activities

- Removal of existing vegetation (except where necessary to accommodate permitted uses)
- Soil disturbance (grading or filling)
- Use of pesticide or fertilizer
- Presence of livestock
- Use of motorized vehicles
- Construction of permanent structures

Zone 2 - The Outer Zone
The Outer Zone begins at the edge of Zone 1 and extends out another 25'. Its primary purpose is to protect the streamside zone and to provide distance between the streamside zone and any upland development. While the retention of the natural vegetation is encouraged, some management is allowed.

Permitted Activities:

- Removal of mature tree cover (retention of shrub layer and herbaceous groundcover is required to allow for infiltration of run-off)
- Bike paths
- Stormwater management facilities
- Approved recreational uses

Restricted Activities:

- Soil disturbance (grading or filling)
- Use of pesticide or fertilizer
- Presence of livestock
- Construction of permanent structures

Other Recommended Management Guidelines

While the official boundary of the Riparian Buffer ends 50' from the stream's edge, there are several voluntary steps that private landowners whose property abuts the buffer zone can take to further enhance its function. By following a few simple management guidelines, the effectiveness of the riparian buffer and its potential for protection of water quality and aquatic habitat can be increased.

Recommended Management Activities:

- Preserve natural vegetation to encourage infiltration of stormwater run-off
- Do not site septic fields adjacent to the riparian buffer
- Limit the amount of impervious surface located near the riparian buffer
- Do not site permanent structures adjacent to the riparian buffer

Permitted Uses

It is critical to the success of the riparian buffer that local residents have a clear understanding of the activities that are permitted or restricted by the new ordinance. While it does prohibit a number of activities in order to protect water quality, the ordinance also outlines a number of permitted activities that local land owners have communicated are important to them. Examples of several of these permitted uses are shown below in Figures 4-7. These uses include the incorporation of foot trails, biking paths, appropriate thinning of timber resources, and the construction of temporary structures where allowable.

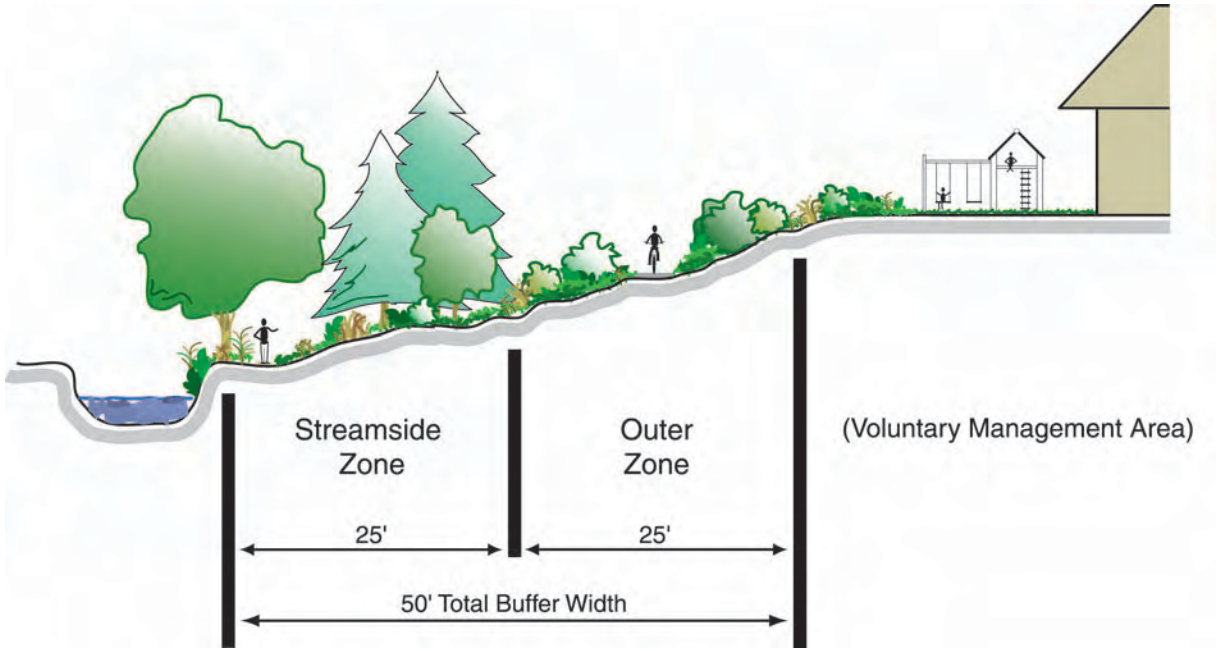

Figure 4: Examples of Permitted Uses within Riparian Buffer

Permitted Uses:
Figure 4 shows a cross-section of the area adjacent to a stream, including a number of activities permitted by the new riparian buffer ordinance. Within the Streamside Zone, an unpaved footpath allows pedestrian access along the streamside. Within the Outer Zone, a second, paved bike path has been installed, providing a scenic biking and jogging route. Within the Voluntary Mangement Area, a temporary structure, in this case a children's jungle gym, has been built. Permanent structures and areas of impervious surface (such as driveways) are located further away from the buffer's edge.

Figure 5 - Undisturbed Buffer: A "before" photograph demonstrates how dense vegetation within the Streamside Zone blocks views to the river and prohibits easy pedestrian access to the water for private land owners.

Figure 6 - Open Viewshed: "After" photo shows how vegetation within the Streamside Zone can be selectively removed to open up important viewsheds. Other remaining vegetation should be left undisturbed.

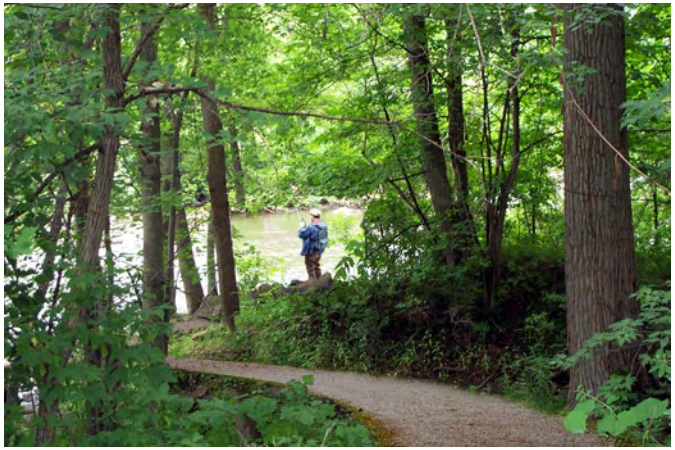

Figure 7 - Pedestrian Trail: "After" photo shows how vegetation within the Streamside Zone can also be selectively removed to provide pedestrian access down to the stream's edge for private land owners.

Exceptions to Buffer Width

While the 50' buffer is considered the general standard, there are situations where the presence of an ecologically sensitive area will require a modification to this buffer width. In order to ensure the protection of stream integrity, buffer expansions will be required for wetlands and areas of steep slope. See Figures 8 and 9 for a description of the methods used to determine the appropriate extension to the riparian buffer.

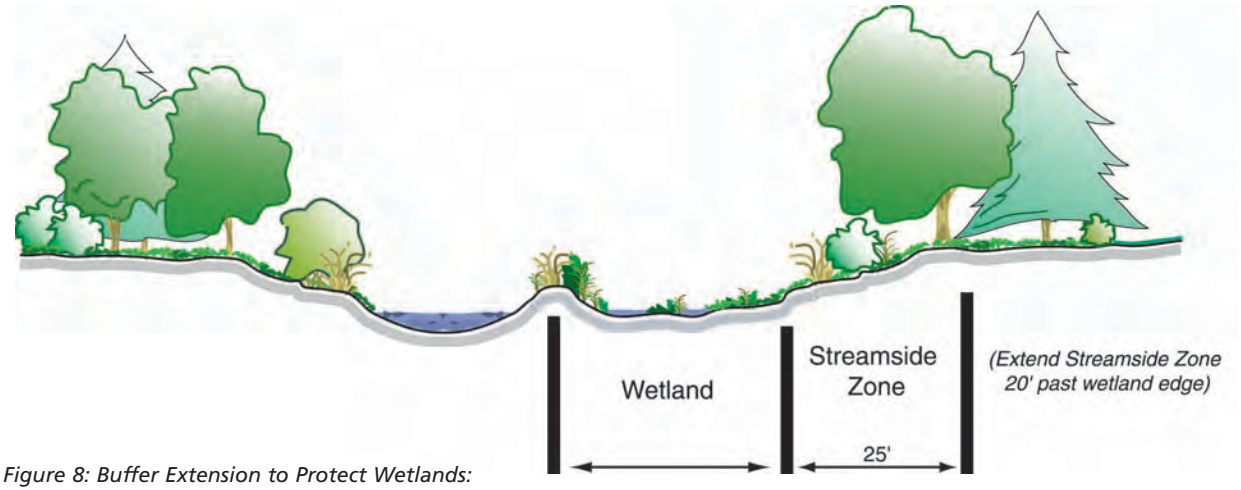

Figure 8: Buffer Extension to Protect Wetlands:

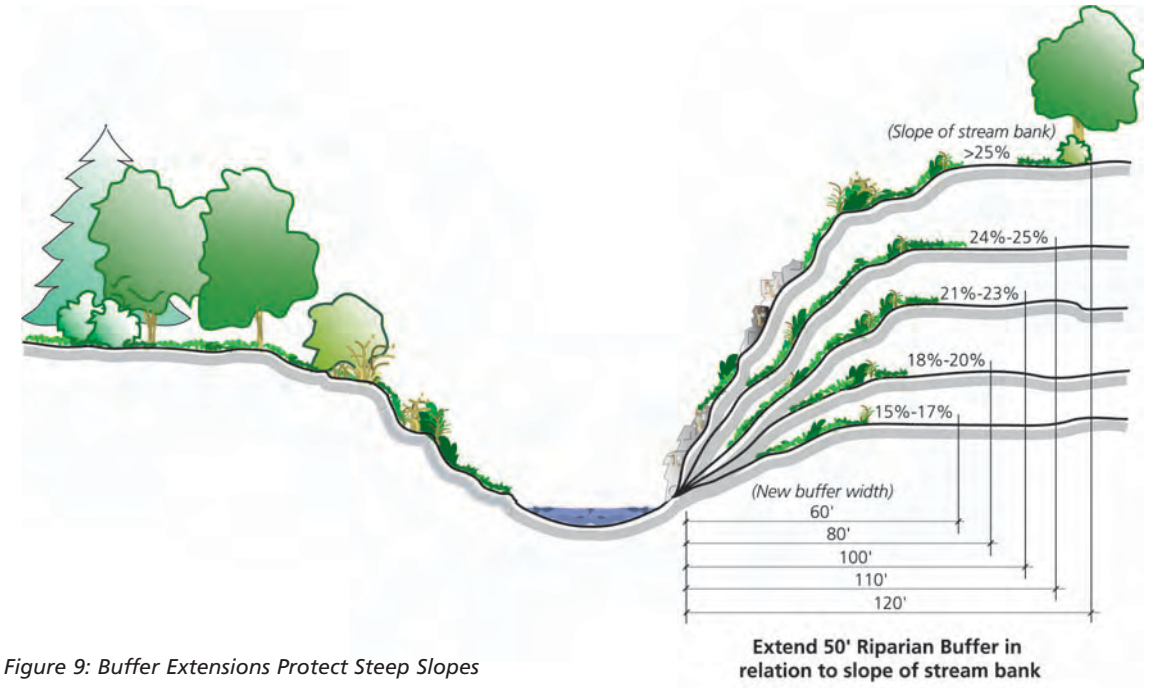

Figure 9: Buffer Extensions Protect Steep Slopes

Wetland Criteria:

Wetlands represent a critical component of nature's water purification system. Plant material helps take up nutrients, while sediment and other particulate matter is allowed to settle out. In order to protect these critical processes, the Streamside Zone should be expanded to incorporate the extent of the wetland, plus an additional 20' extending out from the edge of the wetland.

Steep Slope Criteria:

Steep slopes are vulnerable to erosion and rely on vegetation to help stabilize the area. For that reason, the 50' Riparian Buffer should be expanded in relation to the steepness of the slope. The following figures should be used to calculate the required extension to the 50' Riparian Buffer:

15%-17% Slope	Add 10 feet
18%-20% Slope	Add 30 feet
21%-23% Slope	Add 50 feet
24%-25% Slope	Add 60 feet
> 25% Slope	Add 70 feet

Water Pollution Hazards

In addition to permitted and restricted uses defined for each buffer zone, there are some general planning guidelines that can further protect the integrity of the stream system. These include restricting development within the 100-year floodplain, and siting land uses that pose a particular risk for water quality away from stream corridors (See Figure 10).

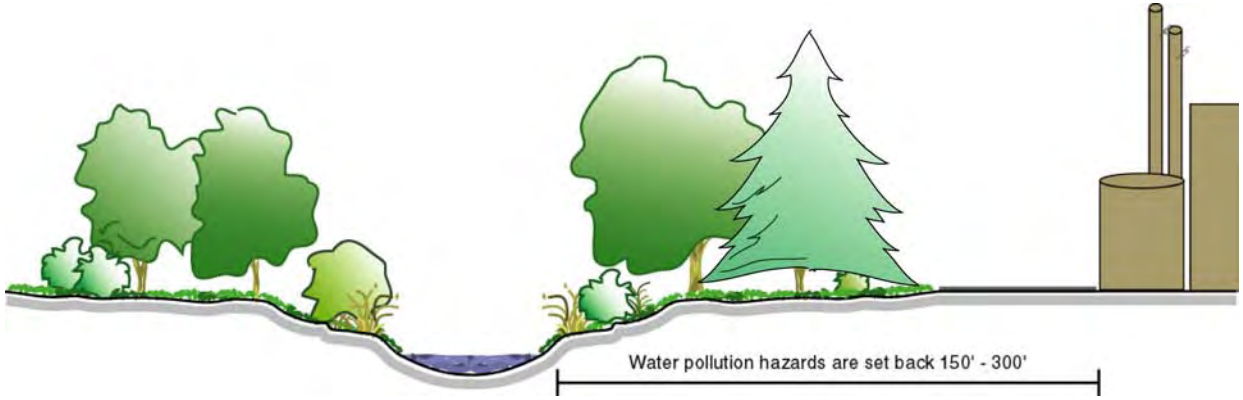

Figure 10: Buffering of Stream from Water Pollution Hazards

Pollution Hazard Criteria:
Some land uses are considered to be water pollution hazards and need to be located away from local waterways. Such uses include the storage of hazardous substances, petroleum storage facilities, septic drainfields, landfills, or animal feedlot operations. In order to protect the water from such hazards, these activities should be located 150' - 300' from the edge of a waterway.

Conclusion

The riparian zone represents a unique area of interaction between terrestrial and aquatic ecosystems. Because of the diversity of flora and fauna that are represented in this transition zone, it is one of the most ecologically complex and significant (Tonello et al.). By protecting this area through the use of a riparian buffer, residents have the opportunity to improve water quality, protect natural habitat, and preserve the rural character of their communities.

Riparian Buffer Ordinance

The following riparian buffer ordinance was adapted from the EPA's model buffer ordinance and designed to suit the specific needs of Marquette County.

Purpose

The purpose of a riparian buffer ordinance in Marquette County is to ensure the protection of water quality and aquatic habitat within the local stream systems. The protection of the natural vegetation adjacent to waterways is intended to protect the physical integrity of the system, reduce the amount of non-point source pollution entering these systems, and to protect and enhance the aquatic habitat of the region.

Outline of Ordinance

The proposed ordinance includes the following information:

Section I - Intent

Outlines the purpose of the ordinance

Section II - Background

Reviews the benefits such an ordinance would have for the local stream system

Section III - Definitions

Establishes standard definitions to ensure clear communication of the ordinance

Section IV - Design Standards for Riparian Buffers

Describes the detailed design of the riparian buffer including permitted and restricted uses

Section V - Buffer Management and Maintenance

Outlines permitted and restricted activities related to buffer management and maintenance

Section VI - Enforcement Procedures

Reviews the procedures for enforcement of the ordinance

Section IX - Waivers / Variances

Describes the process for obtaining a waiver or variance related to the buffer ordinance

Riparian Buffer Ordinance

Section I. Intent

The purpose of this ordinance is to establish minimal acceptable requirements for the design of buffers to protect the streams, wetlands, and floodplains of _____ *[jurisdiction]*; to protect the water quality of watercourses, reservoirs, lakes, and other significant water resources within _____*[jurisdiction]*; to protect _____ 's *[Jurisdiction's]* riparian and aquatic ecosystems; and to provide for the environmentally sound use of _____ *'s [jurisdiction's] land resources*.

Section II. Background

Buffers adjacent to stream systems and coastal areas provide numerous environmental protection and resource management benefits that can include the following:

1. Restoring and maintaining the chemical, physical, and biological integrity of the water resources
2. Removing pollutants delivered from urban stormwater
3. Reducing erosion and sediment entering the stream
4. Stabilizing stream banks
5. Providing infiltration of stormwater runoff
6. Maintaining base flow of streams
7. Contributing the organic matter that is a source of food and energy for the aquatic ecosystem
8. Providing tree canopy to shade streams and promote desirable aquatic organisms
9. Providing riparian wildlife habitat
10. Furnishing scenic value and recreational opportunity

It is the desire of the _____*[jurisdiction]* to protect and maintain the native vegetation in riparian and wetland areas by implementing specifications for the establishment, protection, and maintenance of vegetation along all stream systems and/or coastal zones within our jurisdictional authority.

Section III. Definitions

Active Channel

The area of the stream channel that is subject to frequent flows (approximately once per one and a half years) and that includes the portion of the channel below the floodplain.

Best Management Practices (BMPs)

Conservation practices or management measures that control soil loss and reduce water quality degradation caused by nutrients, animal wastes, toxics, sediment, and runoff.

Buffer

A vegetated area, including trees, shrubs, and herbaceous vegetation, that exists or is established to protect a stream system, lake, reservoir, or coastal estuarine area. Alteration of this natural area is strictly limited.

Development
1. The improvement of property for any purpose involving building
2. Subdivision or the division of a tract or parcel of land into two or more parcels
3. The combination of any two or more lots, tracts, or parcels of property for any purpose
4. The preparation of land for any of the above purposes

Nontidal Wetlands
Those areas not influenced by tidal fluctuations that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Nonpoint Source Pollution
Pollution that is generated by various land use activities rather than from an identifiable or discrete source and is conveyed to waterways through natural processes, such as rainfall, stormwater runoff, or groundwater seepage rather than direct discharges.

Pollution
Any contamination or alteration of the physical, chemical, or biological properties of any waters that will render the waters harmful or detrimental to
1. Public health, safety, or welfare
2. Domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses
3. Livestock, wild animals, or birds
4. Fish or other aquatic life

Stream Channel
Part of a watercourse either naturally or artificially created that contains an intermittent or perennial base flow of groundwater origin. Base flows of groundwater origin can be distinguished by any of the following physical indicators:
1. Hydrophytic vegetation, hydric soil, or other hydrologic indicators in the area(s) where groundwater enters the stream channel in the vicinity of the stream headwaters, channel bed, or channel banks
2. Flowing water not directly related to a storm event
3. Historical records of a local high groundwater table, such as well and stream gauge records.

Stream System
A stream channel together with one or both of the following:
1. 100-year floodplain
2. Hydrologically related nontidal wetland

Streams
Perennial and intermittent watercourses identified through site inspection and US Geological Survey (USGS) maps. Perennial streams are those which are depicted on a USGS map with a solid blue line. Intermittent streams are those which are depicted on a USGS map with a dotted blue line.

Water Pollution Hazard
A land use or activity that causes a relatively high risk of potential water pollution.

Section IV. Design Standards for Riparian Buffers

A. A riparian buffer for a stream system shall consist of a forested strip of land extending along both sides of a stream and its adjacent wetlands or steep slopes. The riparian buffer width shall be adjusted to include contiguous sensitive areas, such as steep slopes and wetlands, where development or disturbance may adversely affect water quality, streams, wetlands, or other waterbodies.

B. The riparian buffer shall begin at the edge of the stream bank of the active channel.

C. The riparian buffer shall be composed of two distinct zones, with each zone having its own set of permitted and restricted uses (See Figure 1).

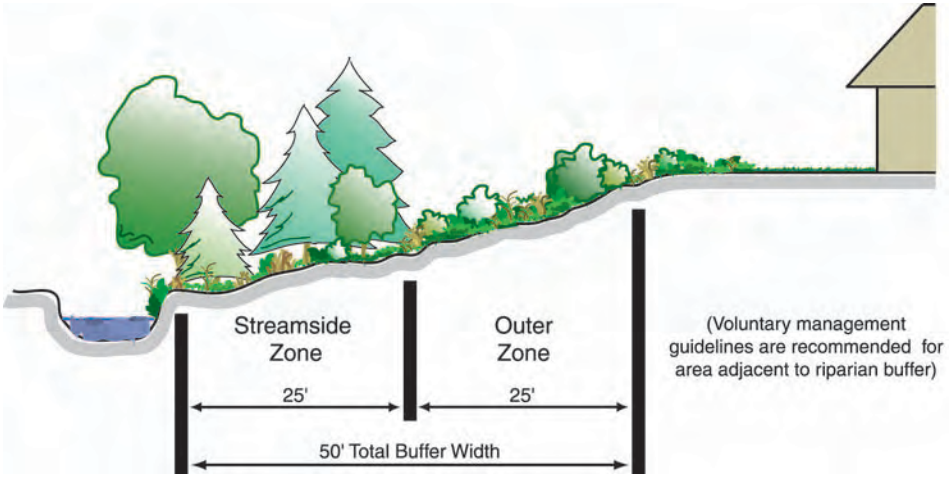

Figure 1: Two-zone Riparian Buffer

1. *Zone 1 - Streamside Zone*
    1. Protects the physical and ecological integrity of the stream ecosystem.
    2. Begins at the edge of the stream bank of the active channel and extends 25 feet from the top of the bank plus any additional buffer width as specified in this section.
    3. Allowable uses within this zone are highly restricted to:
        1. Flood control structures
        2. Utility right of ways
        3. Footpaths
        4. Road crossings, where permitted.
    4. Streamside Zone contains undisturbed natural vegetation.

2. *Zone 2 - Outer Zone*
    1. Protects key components of the stream and provides distance between upland development and the Streamside Zone.
    2. Begins at the outer edge of the Streamside Zone and extends 25 feet.
    3. Allowable uses within the Outer Zone are restricted to
        1. Biking or hiking paths
        2. Stormwater management facilities, with the approval of _____ *[jurisdiction].*
        3. Recreational uses as approved by _____ *[jurisdiction].*
        4. Removal of mature tree cover
    4. Middle Zone requires the retention of the shrub layer and herbaceous ground cover to allow infiltration of run-off.

Extensions to Minimum Buffer Width

A. The required width for the Riparian Buffer totals 50 feet (Zone 1 = 25', Zone 2 = 25'). This buffer shall be extended if wetlands or steep slopes are present.

1. Wetlands: When wetlands are present, the width of the Streamside Zone shall be adjusted so that the Zone 1 buffer will consist of the extent of the wetland plus 20-feet beyond the wetland edge.

2. Percent Slope: The riparian buffer width shall be modified if steep slopes are within close proximity to the stream and drain into the stream system. The following extensions will be added to the standard 50' Riparian Buffer in relation to the slope of the stream bank. The extensions are calculated as follows:

Percent Slope	Buffer Extension	Total Width of Riparian Buffer
15%-17%	add 10 feet	60 feet
18%-20%	add 30 feet	80 feet
21%-23%	add 50 feet	100 feet
24%-25%	add 60 feet	110 feet
> 25%	add 70 feet	120 feet

B. Water Pollution Hazards: The following land uses and/or activities are designated as potential water pollution hazards, and must be set back from any stream or waterbody by the distance indicated below:
    1. Storage of hazardous substances - (150 feet)
    2. Above ground or underground petroleum storage facilities - (150 feet)
    3. Drainfields from onsite sewage disposal and treatment systems (i.e., septic systems) - (100 feet)
    4. Raised septic systems - (250 feet)
    5. Solid waste landfills or junkyards - (300 feet)
    6. Confined animal feedlot operations - (250 feet)
    7. Subsurface discharges from a wastewater treatment plant - (100 feet)
    8. Land application of biosolids - (100 feet)

Section V. Buffer Management and Maintenance

A. The riparian buffer, including wetlands shall be managed to enhance and maximize the unique value of these resources. Management includes specific limitations on alteration of the natural conditions of these resources. The following practices and activities are restricted within both zones of the riparian buffer, except with approval by _____ *[jurisdiction]:*

1. Clearing of existing vegetation (except as noted previously)
2. Soil disturbance by grading, stripping, or other practices
3. Filling or dumping
4. Drainage by ditching, underdrains, or other systems
5. Use, storage, or application of pesticides, except for spot spraying of noxious weeds or non-native species consistent with recommendations of _____ *[jurisdiction]*
6. Housing, grazing, or other maintenance of livestock
7. Storage or operation of motorized vehicles within Zone 1, except for maintenance or emergency use.

B. The following structures, practices, and activities are permitted in the riparian buffer, with specific design or maintenance features, subject to the review of _____ *[jurisdiction]*:

1. Roads, bridges, paths, and utilities:
    1. An analysis needs to be conducted to ensure that no economically feasible alternative is available.
    2. The right-of-way should be the minimum width needed to allow for maintenance access and installation.
    3. The angle of the crossing shall be perpendicular to the stream or buffer in order to minimize clearing requirements.
    4. The minimum number of road crossings should be used within each subdivision, and no more than one fairway crossing is allowed for every 1,000 feet of buffer.

2. Stormwater management:
    1. An analysis needs to be conducted to ensure that no economically feasible alternative is available and that the project is either necessary for flood control, or significantly improves the water quality or habitat in the stream.
    2. In new developments, onsite and nonstructural alternatives will be preferred over larger facilities within the stream buffer.
    3. When constructing stormwater management facilities (i.e., BMPs), the area cleared will be limited to the area required for construction and adequate maintenance access, as outlined in the most recent edition of _____ *[refer to local jurisdiction's stormwater requirements]*.
    4. Material dredged or otherwise removed shall be stored outside the buffer.

3. Stream restoration projects, facilities and activities approved by _____ *[jurisdiction]* are permitted within the riparian buffer.

4. Water quality monitoring and stream gauging are permitted within the riparian buffer, as approved by _____ *[jurisdiction]*.

5. Individual trees within the riparian buffer that are in danger of falling, causing damage to dwellings or other structures, or causing blockage of the stream may be removed.

6. Other timber cutting techniques approved by the agency may be undertaken within the riparian buffer under the advice and guidance of _____ *[jurisdiction]* if necessary to preserve the forest from extensive pest infestation, disease infestation, or threat from fire.

C. All plans prepared for recording and all right-of-way plans shall clearly:
   1. Show the extent of any riparian buffer on the subject property
   2. Label the riparian buffer
   3. Provide a note to reference each zone of the riparian buffer stating: "There shall be no clearing, grading, construction or disturbance of vegetation except as permitted by the agency".
   4. Provide a note to reference any protective covenants governing all riparian buffers areas stating: "Any riparian buffer shown hereon is subject to protective covenants that may be found in the land records and that restrict disturbance and use of these areas."

D. All riparian buffer areas shall be maintained through a declaration of protective covenant, which is required to be submitted for approval by _____ *[jurisdiction]*. The covenant shall be recorded in the land records and shall run with the land and continue in perpetuity.

E. All lease agreements must contain a notation regarding the presence and location of protective covenants for riparian buffer areas and shall contain information on the management and maintenance requirements for the forest buffer for the new property owner.

F. An offer of dedication of a riparian buffer area to the agency shall not be interpreted to mean that this automatically conveys to the general public the right of access to this area.

G. _____ *[jurisdiction]* shall inspect the buffer annually and immediately following severe storms for evidence of sediment deposition, erosion, or concentrated flow channels and corrective actions taken to ensure the integrity and functions of the riparian buffer.

H. Riparian buffer areas may be allowed to grow into their vegetative target state naturally, but methods to enhance the successional process such as active reforestation may be used when deemed necessary by _____ *[jurisdiction]* to ensure the preservation and propagation of the buffer area. Riparian buffer areas may also be enhanced through reforestation or other growth techniques as a form of mitigation for achieving buffer preservation requirements.

Section VI. Enforcement Procedures

A. _____ *[jurisdiction]* is authorized and empowered to enforce the requirements of this ordinance in accordance with the procedures of this section.

B. If, upon inspection or investigation, the _____ *[jurisdiction]* is of the opinion that any person has violated any provision of this ordinance, he/she shall with reasonable promptness issue a correction notice to the person. Each such notice shall be in writing and shall describe the nature of the violation, including a reference to the provision within this ordinance that has been violated. In addition, the notice shall set a reasonable time for the abatement and correction of the violation.

C. Violations of these provisions are subject to the enforcement provisions of _____ *[jurisdiction's]* zoning ordinance.

Section VII. Waivers/Variances

A. This ordinance shall apply to all proposed development except for activities that were completed prior to the effective date of this ordinance and had received the following:
   1. A valid, unexpired permit in accordance with development regulations
   2. A current, executed public works agreement
   3. A valid, unexpired building permit
   4. A waiver in accordance with current development regulations.

B. The _____ *[jurisdiction's]* Zoning Board of Appeals may grant a variance for the following:
   1. Those projects or activities for which it can be demonstrated that strict compliance with the ordinance would result in a practical difficulty.
   2. Those projects or activities serving a public need where no feasible alternative is available.
   3. The repair and maintenance of public improvements where avoidance and minimization of adverse impacts to nontidal wetlands and associated aquatic ecosystems have been addressed.
   4. Those developments which have had buffers applied in conformance with previously issued requirements.

C. Waivers for development may also be granted in two additional forms, if deemed appropriate by the Zoning Board of Appeals:
   1. The buffer width made be reduced at some points as long as the average width of the buffer meets the minimum requirement. This averaging of the buffer may be used to allow for the presence of an existing structure or to recover a lost lot, as long as the Streamside Zone (Zone I) is not disturbed by the reduction and no new structures are built within the 100-year floodplain.
   2. _____ *[jurisdiction]* may offer credit for additional density elsewhere on the site in compensation for the loss of developable land due to the requirements of this ordinance. This compensation may increase the total number of dwelling units on the site up to the amount permitted under the base zoning.

D. The applicant shall submit a written request for a variance to the _____ *[jurisdiction]* . The application shall include specific reasons justifying the variance and any other information necessary to evaluate the proposed variance request. The agency may require an alternative analysis that clearly demonstrates that no other feasible alternatives exist and that minimal impact will occur as a result of the project or development.

E. In granting a request for a variance, the _____ *[jurisdiction]* may require site design, landscape planting, fencing, signs, and water quality best management practices to reduce adverse impacts on water quality, streams, wetlands, and floodplains.

Section VIII. Conflict With Other Regulations

Where the standards and management requirements of this ordinance are in conflict with other laws, regulations, and policies regarding streams, steep slopes, erodible soils, wetlands, floodplains, timber harvesting, land disturbance activities, or other environmental protective measures, the more restrictive shall apply.

Follow-up Information

Additional information on the creation and establishment of riparian corridors can be found at the EPA or the Michigan DEQ websites. Examples such as model ordinances or best management practices for the implementation of riparian buffers are provided.
Visit:
<http://www.epa.gov/owow>
<http://www.michigan.gov/deq>

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